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SY Tank Farm Ventilation Isolation Option Risk Assessment Report

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FOREWORD

The following study was prepared as input to the Westinghouse Hanford Company engineering evaluation of possible options for the configuration of the SY Tank Farm ventilation system. The study used a subset of analytical and problem-solving techniques typically applied in the performance of probabilistic risk assessments. In particular, fault and event trees were used to systematically consider component failures which contribute to the probability of combustion given the occurrence of an episodic gas release event in tank 101-SY or 103-SY.

The product of this study was a listing of relative ignition or combustion frequencies, between 12 ventilation system configurations, of flammable gas within tanks 101-SY or 103-SY or the SY Tank Farm ventilation system. The frequencies were normalized to the December 1991 ventilation configuration (i.e., the frequency of flammable gas combustion associated with the current configuration is assigned the value of 1). Thus, although certain techniques typically used in the preparation of risk assessments were applied in this study, actual quantification of risk was not explicitly calculated. The implicit assumption in this study was that the consequence of flammable gas ignition was the same regardless of the initiator (or spark source). By assuming a single and certain consequence, the risk associated with any single spark source with respect to any other may be assumed to be directly proportional to the frequency of occurrence of that spark source. This study, therefore, did not consider the nature and quantification of accident consequences. The following phenomenological details were not considered here, but would be considered in a complete risk assessment:

- Size of gas release event (GRE)
- Distribution and composition of GRE flammable gas mixtures as a function of time, including the effects of dilution with air in the ventilation system
- Feasibility of flammable gas migration to all assumed spark sources
- Feasibility and nature of flame propagation from all assumed spark sources outside the tank back into the tank vapor space.

Consideration of all the issues related to consequence calculations involved a significant amount of technical uncertainty. It was not the intention of this study to resolve the uncertainties associated with GRE characterization and accident progression phenomenology because it was highly unlikely that resolution of these uncertainties could be achieved in the desired time frame. Where frequencies of gas combustion required insight into uncertain phenomena, the study conservatively used a worst case approach. In some cases, this involved the assignment of a probability of 1 for an intermediate step in an accident sequence even though there may be no documented technical basis for doing so. This "worst case" approach was also adopted to accommodate the fact that complete component failure and reliability data for ignition sources were not readily available for tank farm systems. In cases where there was data uncertainty, the analysts used frequency values they judged to be conservative.

The two principle results of the study are the normalized "risk" rankings for the 12 ventilation configurations and a listing of the component failures that contribute to 90 percent of the risk. Both of these results must be interpreted carefully to avoid misuse of this study. Presenting results in the form of rankings was one way to reach conclusions without directly resolving phenomenological and data base uncertainties. To say that a certain failure "dominates" risk or that a particular configuration results in the most risk, however, does not necessarily say that either the failure or the configuration are unacceptable. Currently, the study lists a set of components whose failure was assumed to create a spark source and contribute to the overall risk of flammable gas ignition. The study indicated that none of the alternative ventilation configurations seem to provide a significant improvement in risk for flammable gas combustion. The proper use of these results is, therefore (1) to conclude that there is currently no compelling risk-based argument to modify the ventilation system per the 11 alternative configurations, and (2) to consider the listing of dominant ignition sources for more detailed study and possible corrective actions.

The user of this study needs to be aware of the following additional conditions and limits of applicability:

1. This study considers the SY Tank Farm configuration as of December 1991 and does not reflect additions, changes, and deletions after that time.
2. The specific ranking of relative risk and specific list of dominant ignition sources may not be preserved if assumptions based on improved understanding of failure mechanisms, failure frequencies, and accident phenomenology could be incorporated.
3. Since much of the numerical data recorded in the appendixes reflects engineering judgment specific to the context and approach of this study, these appendixes are not recommended for alternative use or reference without consulting the authors.
4. This study provides input to an engineering assessment of options for the SY Tank Farm ventilation system. It is not intended to provide all the necessary justification for a particular decision and is not, by itself, a safety assessment for any of the considered ventilation configurations.

EXECUTIVE SUMMARY

1.0 BACKGROUND

The safety of the 241-SY Tank Farm ventilation system has been under extensive scrutiny due to safety concerns associated with tank 101-SY. Hydrogen and other gases are generated and trapped in the waste below the liquid surface. Periodically, these gases are released into the dome space and vented through the exhaust system. This attention to the ventilation system has resulted in the development of several alternative ventilation system designs. The ventilation system provides the primary means of mitigation of accidents associated with flammable gases. This report provides an assessment of various alternative ventilation system designs.

2.0 OBJECTIVES

The objective of this risk assessment is to determine which of the isolation options for the SY Tank Farm ventilation system has the least risk.

3.0 SCOPE

Twelve ventilation configurations were analyzed to obtain the final results. The risk measure that is used to compare the configurations is the likelihood of a hydrogen explosion following a burp in tanks 101-SY or 103-SY with the ventilation system operating or not operating.

Certain assumptions were made to limit the scope of the risk assessment. One major assumption was that accident scenarios with hydrogen explosions following a large "burp" dominated risk. Therefore, including hydrogen

explosion due to a release during window activities would not significantly increase the total risk. The basis for this assumption is that many of the activities and spark sources present during window activities are included in the large burp models. Consequently, the 12 configurations were evaluated only for hydrogen explosions following a large burp. Other critical assumptions are documented in Section 6.1.

4.0 REVIEW

A draft of this report was reviewed by Dr. Gary Powers, Vice President of Design Sciences Inc., and a member of the Westinghouse Hanford External Advisory Committee; Jon Young, a Science Applications International Corporation (SAIC) consultant; and various Los Alamos National Laboratory staff under Dr. Desmond Stack's management. A draft of this report has also been reviewed by Westinghouse Hanford Company Quality Assurance, Independent Safety, and Tank Farms Operations and Engineering staff. Comments from these reviews were considered and incorporated as appropriate.

5.0 RESULTS

The results of the analysis indicate that three of the configurations have a significantly higher risk than the other nine configurations. The existing ventilation configuration (Case 5) is one of the "other" nine. No configuration has a significantly lower frequency of hydrogen explosion than the existing configuration. The existing configuration consists of all tanks connected to the K1 primary ventilation system with a portable exhaustor (P28), acting as a backup, connected to a tee in the main SY ventilation header near the K1 primary ventilation system.

The three configurations that have a significantly higher risk than the other nine configurations have the common characteristic of having a portable exhauster attached to the top of tank 103-SY. This increases the risk because flame propagation back to tank 103-SY from the exhauster is assumed to be 1.0.

The insights gained from this analysis are probably of as much importance as the comparison of the 12 ventilation configurations. Three areas of insight are presented here:

- Insights regarding the major contributors to ignition or ventilation failure
- Insights regarding actions that could reduce the likelihood of component failure
- Insights identified as lessons learned.

The three areas of insight discussed below apply to all the configurations, except where noted.

5.1 MAJOR CONTRIBUTORS TO IGNITION OR VENTILATION FAILURE

5.1.1 Major Contributors to Ignition

The majority of the contributors to the likelihood of an ignition leading to an explosion in the tank vapor space are failures of the sampling equipment and instrumentation. The two major factors are: (a) lack of fault detection between burp events; and, (b) the probability of flame propagation from sampling equipment back to the tank.

5.1.2 Failure of the Ductwork Bonding

The existing configuration (Case 5) shows approximately 1 percent of the total likelihood of the ignition during a burp event is due to electrostatic

discharge caused by ductwork bonding failure. The rest of the cases show less than 1 percent contribution to the total likelihood. The lack of checks on bonding integrity is the major factor associated with this failure.

5.1.3 Failure of the Ventilation System

The major contributor to the likelihood of failure of the ventilation system to be operating during a burp episode is a human error resulting in valve MK-4501 on tank 101-SY being closed when a burp occurs.

5.1.4 Ignition and Ventilation Failure

The major contributors to ignition and ventilation system failure leading to an explosion in the tank vapor space are combinations of the human error resulting in valve MK-4501 on tank 101-SY being closed and failures of the sampling equipment and instrumentation.

5.2 POTENTIAL ACTIONS TO REDUCE THE LIKELIHOOD OF FAILURE

5.2.1 Routine Equipment Checks

For failures that can be detected by routine inspection and/or testing, checking them once a month will reduce the likelihood of failure by about a factor of 10. Equipment subject to this change include instrumentation, sampling, and ductwork bonding.

5.2.2 Reducing the Amount of Sampling Equipment Operating During a Burp

Reducing the required sampling equipment powered and/or operating during each burp event could reduce the likelihood of an ignition.

5.2.3 Administrative Controls

Administratively controlling the position of valve MK-4501 on tank 101-SY could reduce its likelihood of being closed during a burp event by a factor of 10.

5.2.4 Flame Propagation Assessment

Better understanding of the propagation of the flame from the sampling equipment back to the tank may result in a reduction of the prediction of the likelihood of ignition leading to an explosion in the tank vapor space.

5.3 LESSONS LEARNED

Failures of the rotating machinery (e.g., ventilation fans) are not major contributors to either ignition or ventilation system failures in the proposed configurations.

Better understanding of propagation of the flame front from the sampling equipment and ventilation ducting back to the tank will provide better predictions of the likelihood of ignition.

Some routine monthly preventive maintenance activity could reduce ignition likelihood by about a factor of 10.

A more detailed study is needed to determine if instrumentation failures that effect power are capable of continuing to produce sparks after the initial failure.

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LIST OF TERMS

AC	Alternating Current
CAFTA	Computer-Aided Fault Tree Analysis
CAM	Continuous Air Monitor
CASS	Computer-Automated Surveillance System
CVI	Certified Vendor Information
DOE	U.S. Department of Energy
DP	Differential Pressure
FATHOMS	Fluid and Thermal Analysis Multiple Systems
FIC	Food Instrument Corporation
FM	Factory Mutual Research Corporation
FTCD	Fails to Close on Demand
FTOD	Fails to Open on Demand
FTRC	Fails to Remain Closed
FTRO	Fails to Remain Open
FTRTCP	Fails to Return to Correct Position
GC	Gas Chromatographs
GM	Geiger-Mueller
GMS	Gas Monitor System
GRE	Gas Release Event
HEPA	High-Efficiency Particulate Air
HTC	Hanford Type Code
INEL	Idaho National Engineering Laboratory
IREP	Interim Reliability Evaluation Program Procedures Guide
LFL	Lower Flammability Limit
LIT/FIC	Liquid Level Gauge
LLI	Liquid Level Indicator
NBS	National Bureau of Standards
NC	Normally Closed
NO	Normally Open
OVM	Organic Vapor Monitor
PID	Photoionization Detector
ppm	parts per million
RL	Richland Field Office
RLG	Radar Level Gauge
SAIC	Science Applications International Corporation
SRL	Savannah River Laboratory
TFPC	Tank Farm Production Control
UL	Underwriters Laboratories
WG	Water Gauge

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DEFINITIONS

Component - Any distinctive element of a system as defined by the system analyst (e.g., valve, pipe, diesel engine and pump).

Component failure rate - The rate of failure per unit time or per demand that a component is estimated to fail.

Event Tree - An inductive logic method for identifying and organizing accident sequences and their associated end-states. The events subsequent to the initiating event are usually related to the functions that prevent or mitigate the accident sequence.

Fault Tree Analysis - An analytical technique whereby an undesired state of a system is specified and the system is analyzed to find the most credible ways in which the undesired state can occur.

Fault Tree - A top-down graphical model of the various parallel and sequential combinations of faults that will result in the occurrence of the specified undesired top event. It is not a model of all possible system failures or all possible causes for system failure but is constrained by the top event. The fault tree includes only those faults that contribute to the top event.

Gate - A representation of the logic operator that indicates how various inputs to the gate are combined (e.g., "AND", , gate indicates that all the inputs must occur for the output of the gate to occur and an "OR", , gate indicates that any one of the inputs to the gate can cause the output of the gate to occur).

Minimal Cutset - The minimum number of basic events that if they occur are sufficient to cause the top event to occur.

Probabilistic Risk Assessment (PRA) - A quantitative assessment of risk, where the risk is a function of accident frequency and consequence.

System - A functionally related group of components (e.g., the SY ventilation system's function is to cool the primary tank and minimize radioactive vapor releases from the primary tank to the atmosphere by keeping a vacuum on the tank).

Undesired Event - Undesired state of a system/component (usually a state that is important from a safety viewpoint).

Window - Period of time following a tank 101-SY burp that work is allowed in the tank provided a number of parameters remain within the established criteria.

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SY TANK FARM VENTILATION, ISOLATION OPTION RISK ASSESSMENT REPORT

1.0 INTRODUCTION

1.1 BACKGROUND

The 241-SY Tank Farm contains three double-shell tanks designated as 101-SY, 102-SY and 103-SY. Each tank is designed to contain approximately one million gallons of high-level radioactive waste solution.

The safety of the 241-SY ventilation system has been under extensive scrutiny, resulting in the development of several alternative ventilation designs. The differences in these designs created a need for an assessment of the frequency of a hydrogen explosion occurring in tank 101-SY and tank 103-SY with the ventilation system operating and not operating.

A key reason for the attention to 101-SY is the safety concerns surrounding its behavior. Hydrogen and other gases are generated and trapped in the waste below the liquid surface. The surface level of the waste in the tank gradually increases due to the trapped gases. Periodically, these gases are released into the dome space and vented through the exhaust system. This event is called a "burp." When a burp occurs, the surface level of the liquid in the tank decreases, and a potentially flammable mixture of gases is present in the tank dome space.

1.2 OBJECTIVE

The objective of this risk assessment is to determine which isolation option of the SY Tank Farm ventilation system has the least risk.

1.3 SCOPE

This limited-scope risk assessment will be incorporated into an ongoing risk assessment of the entire operation of the SY Tank Farm. The SY Tank Farm risk assessment will involve not only ventilation considerations, but other hazardous conditions such as misroutings and release mechanisms outside the tank containment.

The risk measure that is used to compare the configurations is the likelihood of a hydrogen explosion following a burp in tank 101-SY or 103-SY with the ventilation system operating or not operating.

To accommodate schedules and funding limits, the scope of the risk assessment was limited by certain assumptions. For instance, it was assumed that accident scenarios representing the likelihood of hydrogen explosions following a large burp dominate the risk related to the SY ventilation system. This assumption is based on gas monitoring results that indicate that the only time significant volumes of potentially flammable gases exist in the dome space is during a burp release. This assumption is also based on the fact

that many of the activities and spark sources present during window activities were included in the large burp models. If the previous assumption is correct, the inclusion of hydrogen explosions from a release during window activities would not significantly increase the total risk. Consequently, the 12 cases were evaluated only for hydrogen explosions following a large burp. If the assumption previously stated is to be verified quantitatively, then further analysis is required.

1.4 CONTENTS OF REPORT

Chapter 2.0 provides a facility description of the SY Tank Farm. Chapter 3.0 contains a description of the 12 ventilation configurations. Chapter 4.0 describes the database development techniques. Chapter 5.0 presents the preliminary accident sequence analysis discussion. Chapter 6.0 presents the results of this report. Chapter 7.0 gives the conclusions of the report. Chapter 8.0 is a reference list. Appendix A is the Hanford Site nonreactor type code file. Appendix B gives the failure rate assumptions, unavailability and unreliability time assumptions, and data justification for all the configurations. Appendix C lists the basic event and type code report files. Appendix D shows the fault tree models. Appendix E gives the cutset files. Appendix F gives information on intrinsically safe, qualified testing and purging as related to Class 1, Division 1 locations.

2.0 SY FACILITY DESCRIPTION

2.1 PRIMARY TANK VENTILATION SYSTEM

The ventilation system for each tank consists of two separate systems: the primary tank system (K1) and the annulus system (K2). This report considers only the primary ventilation system. The K1 ventilation system creates a vacuum in each tank. The capacity of the system fans is limited so that tank vacuum will not exceed 6.0 in. water gauge (WG). When a K1 exhaustor is processing 800 ft³/min air, it creates an average vacuum of 1.5 to 3.5 in. WG per tank.

The primary ventilation system exhausts air that has entered through pit cover blocks and gases generated by radiological decay of the tank contents.

The primary ventilation system in the SY Tank Farm (see Figure 2-1) has a moisture separator pad (de-entrainer), steam heating coil, a National Bureau of Standards (NBS) filter, and two high-efficiency particulate air (HEPA) filters. The filtered air is discharged to the atmosphere through the exhaustor fan and stack.

The exhaust first passes through a de-entrainer. A de-entrainer is a wire mesh pad that separates entrained moisture and impurities from the primary tank air stream. Differential pressure (DP) indicator DPI-2-1 measures DP across de-entrainer K1-1-1.

After passing through the de-entrainer, the air is directed into the K1-2-1 heater which warms the air to prevent moisture condensation or ice formation on the HEPA filters. The heater raises the temperature 20 °F and is regulated by temperature controller TC-1-1. The air temperature is measured by temperature indicator TI-1-1 before passing through the heater and is measured again downstream of the HEPA filters.

The air is filtered by an NBS prefilter and two HEPA filters. The HEPA filters are a minimum of 99.95 percent efficient at filtering particles 0.3 microns and larger in size.

Across each HEPA filter, the DP is measured by DPI-2-2 and DPI-2-3, respectively. Detection of high DP across the first HEPA filter annunciates an alarm, indicating service is required. Low DP across the second HEPA filter will not be detected because the pressure switch has been jumpered out due to operational concerns. Efforts are going on to return the switch to operation. A negative pressure exceeding 6 in. WG across the entire ventilation unit will automatically shut the fan down. The automatic shutdown of the exhaust unit will not automatically be reversed once the condition clears. The exhaustor must be manually restarted following a shutdown.

After passing through the filters, vapor is drawn through the K1-4-1 exhaust fan and exhausted through the stack. Exhaust stack monitoring is provided by a continuous air monitor (CAM) and a proportional record sampler. The CAM samples the exhaust stream by using a beta/gamma detector that is interlocked to the exhaust fan. A signal shuts down the fan when high radiation is detected. A remote alarm is activated when the CAM fails. The

Figure 2-1. Primary Tank Airflow and Control Diagram.

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record sampler accumulates the particles from a portion of the exhaust stream. Airborne particulates are collected on filter paper in the record sampler. The amount of radioactive particulate contamination is determined by removing the filter paper and manually counting the contamination level. These two systems are independent, so failure of one will leave the other in service. Prompt repair of failed air monitoring equipment is administratively controlled.

Loss of power to the ventilation system shuts down the exhaust fans and monitoring equipment. Backup electrical power is supplied to the primary and annulus exhauster by a portable diesel generator that must be manually started. During a loss of power, the tank vapor space pressure will equalize with atmospheric pressure in a process called breathing. Air flow during tank breathing will take the path of least resistance. Loss of instrument air to the tank farm causes the loss of vapor space pressure transmitters and associated alarms.

2.1.1 1,000-ft³/min Portable Exhauster

Air enters the exhauster via an opening in the vessel being ventilated. It passes through flexducting and a 12-in. manually operated butterfly valve and then into a de-entrainer. The air continues through a flow diffuser, two electric coil heaters, another flow diffuser, two HEPA filters, the exhaust fan and through the exhaust stack to the atmosphere (see Figure 2-2).

The de-entrainer removes a major portion of liquid droplets carried by the inlet air. The coil heaters lower the relative humidity. This equipment protects the HEPA filters from moisture damage. Flow diffusers produce a more uniform air velocity in the duct, providing uniform heating of the vapor as it passes through the heater coils. Removal of entrained particulates is accomplished by the HEPA filters. The exhaust stack contains flow straighteners and velocity and radiation monitor probes.

Exhaust stack radiation monitoring is provided by a CAM and a proportional record sampler. The 1,000-ft³/min portable exhauster radiation monitoring unit differs from that of the K1 exhauster in that the unit consists of two radiation detectors: an alpha radiation analyzer (RAN-EXH-1) and a beta/gamma radiation analyzer (RAN-EXH-2). These two analyzers will shut down the exhaust fan upon detection of high radiation and activate local bell and beacon alarms.

2.2 SY TANK FARM INSTRUMENTATION

Instrumentation and alarm systems for each tank monitor parameters such as liquid level, sludge level, temperature, leak detection, pressure, and area radiation (see Figure 2-3).

2.2.1 Liquid Level Detectors

Each tank is equipped with an automatic liquid level gauge (LIT/FIC) and backup manual tape (LLI). The LIT/FIC is located on a tank riser and consists of a plummet suspended on a tape, tape reel, sight glass, control box, air

Figure 2-2. 1,000-ft³/min Portable Exhauster.

39208006.28

Figure 2-3. Tank Leak Detection System.

39208006.27

purge and water flush sprays. In automatic operation, the plummet is periodically lowered until electrical conductivity between the plummet and the liquid surface is achieved. The tape reading is automatically converted to an electrical signal which is transmitted to the Computer-Automated Surveillance System (CASS).

The manual tape consists of a metal tape with a steel plummet that extends into the tank and a reel at the riser top. The liquid level is detected by electrical conductivity when the plummet contacts the surface. The manual tape in 101-SY is completely enclosed in what is called a flake housing. The liquid level can be read directly from the tape through a sight glass contained in the flake housing. The manual tapes in 102-SY and 103-SY are not completely enclosed.

2.2.2 Sludge Level Detectors

Sludge level probes are used to measure the depth of the sludge layer at the bottom of the tanks. As currently operated there is a potential for seven sludge weights in each of the SY tanks; however, only one sludge weight is currently installed in 101-SY and is not currently used to measure sludge depth. Each probe has a 2-in.-diameter steel "doughnut" that contacts the surface of the sludge. When sludge measurements are being taken, the steel doughnut is suspended by calibrated tape from a reel. The probe is lowered until resistance to its movement is encountered. The difference between this tape reading and the reading obtained when the tank was empty represents the sludge depth.

2.2.3 Temperature Elements

A single probe containing 18 thermocouples is used to monitor waste temperatures at various levels in the primary tank. Thermocouples are strategically distributed, vertically, to achieve a representative sample of temperatures. The thermocouples send a voltage output signal to the tank farm instrument building and the CASS monitoring.

2.3 CENTRAL PUMP PIT

A central pump pit is located above the center of the tank dome, and the tops of three risers are located in the pit. Central pump pits have two purposes: supernatant filling and removal; and slurry distribution. For supernatant removal, central pump pits are designed to house a deep-well turbine pump. These pits also have a slurry distributor to evenly spread slurry in the tank.

2.4 101-SY INSTRUMENTATION

A great deal of attention has been focused on tank 101-SY because of its behavior. Monitoring of various tank parameters has increased in number, type, and frequency. Additional monitoring systems are planned for future installation. Figure 2-4 shows an arrangement of the gas monitoring equipment.

Figure 2-4. 241-SY-101 Ventilation Header Gas Monitoring System.

2.4.1 Teledyne Hydrogen Analyzer

The Teledyne hydrogen analyzer (NAN E-5 H₂ Analyzer) is a continuous system that takes a sample of gas from the 101-SY vent header, routes it through the analyzer, and returns it to the header. The hydrogen analyzer is a thermoelement type analyzer. Gases from the tank flow across a small heating element (5 V), which is maintained at a constant temperature. Because of the high thermal conductivity of hydrogen, the presence of hydrogen in the gas conducts more heat away from the heating element and more electrical current is required to maintain the temperature. The current is proportional to the amount of hydrogen present.

The hydrogen levels detected by the analyzer are displayed as follows:

- (1) an electro-potential indicator mounted on the surface of the analyzer,
- (2) a strip chart recorder located in the instrument building, and
- (3) a computer workstation located in CASS at the 2750-E building. The analyzer was a spare from T Plant with no certified vendor information (CVI) available. Also, it is not rated as an intrinsically safe design but flame arresters were installed on the analyzer inlet and outlet lines to minimize the chance of flame propagation back to the ventilation header.

The hydrogen analyzer is housed in a standard nonairtight cabinet. There are no leak detection devices to indicate a tube has leaked downstream of the vacuum pump. The vacuum pump is not considered a spark source due to vane failures because the blades are made of carbon. However, spark sources due to catastrophic failure within the vacuum pump do exist.

2.4.2 Cryogenic Sampler

When the tank burps, inlet solenoid valves automatically open, and the cryogenic sampler pulls a sample off of the 101-SY ventilation header. The cryogenic sampler consists of two impingers that are connected in series to the ventilation header. A vacuum pump will draw exhaust gases through a flexible tygon vacuum hose into the impingers, trapping any gas constituents that have a boiling point greater than -80 °C. At a specified time (approximately 4 hours), the solenoid valves will close, and the cryogenic sampler will no longer take gas samples. The exhaust is returned to the main ventilation header near tank 103-SY via 1/2-in. tubing. The vacuum pump is not considered a spark source due to vane failures because the blades are made of carbon. However, spark sources due to catastrophic failure within the vacuum pump do exist. The cryogenic sampler is not housed in an enclosed cabinet.

Samples from the impingers will be routed to the 222-S Laboratory for total activity and water analysis, and to PNL for gas chromatography/mass spectroscopy and archival.

2.4.3 Ammonia Bubbler

The ammonia bubbler system consists of four sets of two impingers that are connected in line to the ventilation header. A vacuum pump will draw exhaust gases through a flexible tygon vacuum hose at rate of 1.0 L/min into

the impinger solvent, trapping any gas constituents that are soluble in the solvent. The solvent is a 0.1000 molar boric acid solution prepared by the Analytical Standards Lab, Westinghouse Hanford Company. At a specified time (approximately 2-hour intervals), each set will have a sample of exhaust gases drawn through. A sampling operator will collect the samples by manipulation of a series of valves and will disconnect the sampler without breaking the system boundary. The exhaust is returned to the main vent header near tank 103-SY via 1/2-in. tubing. The vacuum pump is not considered a spark source due to vane failures because the blades are made of carbon. However, spark sources due to catastrophic failure within the vacuum pump do exist. The ammonia bubbler is housed in an enclosed cabinet.

Upon completion of the sampling routine, each impinger orifice will be capped to ensure no loss of sample. Within a short time after the burp, each sample impinger will be removed from the tank farm area and taken to the 222-S Laboratory for analysis. The samples will first be checked for total activity and then be analyzed for total nitrogen concentration using a modified Kjeldahl titration.

2.4.4 Gas Chromatograph

Two gas chromatographs (GCs) are on line for a gas release event. The first was installed to measure hydrogen exclusively. The second gas chromatograph, installed after the October 1990 event, is used to detect other gases such as nitrogen (N_2), carbon monoxide (CO), hydrogen (H_2), oxygen (O_2), carbon dioxide (CO_2), and methane (CH_4). Both gas chromatographs are continuous systems and return exhaust to the 101-SY vent header. The gas chromatographs run off the same vacuum pump as the Teledyne hydrogen analyzer. The gas chromatographs are housed in an enclosed cabinet.

2.4.5 Gas Monitor System Equipment

The 101-SY gas monitor system (GMS) equipment is designed to remove gas samples from the tank dome for analysis. The samples are exhausted from the GMS into the tank exhaust header upstream of the HEPA filters. The hydrogen analyzer pulls a sample from the tank 101-SY riser 17B and is housed in a shack located east of riser 17B. The GMS hydrogen analyzer differs from the Teledyne hydrogen detector. The analyzer detects hydrogen by an electrochemical reaction which produces a voltage proportional to the concentration of hydrogen in the system. Figure 2-5 shows an arrangement of the gas monitoring equipment. This piece of equipment has CVI data, is an inherently safe design, and is qualified as intrinsically safe by the U.S. Department of Energy (DOE), Richland Field Office (RL) (see Appendix F).

2.4.6 Organic Vapor Meter

An organic vapor meter (OVM) (Model 580S) detects and quantifies most organic vapors with a highly positive photoionization detector (PID). The OVM is in a box to the side of the SY tank farm primary exhaust stack. The OVM Model 580S has an operating range of 0 to 2,000 parts per million (ppm) with a

Figure 2-5. 241-SY-101 Riser 17B Gas Monitoring System.

minimum detectable of 0.1 ppm. No support gases are required. This particular OVM model is purchased as an intrinsically safe design (see Appendix F).

2.4.7 Slack Detector Circuit

The slack detector circuit senses when the tape goes slack on the tank automatic liquid level gauge (LIT/FIC) due to a nonconductive liquid surface. Once a slack tape is sensed, the LIT/FIC plummet stops, and a measurement is sent to CASS. The 101-SY LIT/FIC was modified by installing an intrinsically safe relay circuit (see Appendix F) that reduces the voltage to the slack tape switch. The voltage was reduced so that any spark generated by the slack tape switch would have insufficient energy to ignite a flammable vapor.

2.4.8 Radar Level Gauge

The radar level gauge (RLG) is positioned on riser 13A. The radar gauge is being tested as an alternative surface-level measurement method to the FIC and manual tape. The RLG is a noncontacting, surface-level instrument for continuous level gauging of bulk storage tanks. The device uses radio frequency principles in its operation and is intrinsically safe (see Appendix F).

2.4.9 Camera/Lights

The television camera with light assembly sits in a 42-in. riser. Another light assembly sits in a second 42-in. riser. This equipment is used to observe and record activities taking place in the tank which lead up to the periodic "burp" during which hydrogen is released. "Burp" events are recorded to determine the characteristics of the event. The black and white video camera is enclosed in a purged stainless steel housing per NFPA 496, 1989 Edition, Purged and Pressurized Enclosures for Electrical Equipment (see Appendix F).

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3.0 DESCRIPTION OF CASES

The pre-existing system (as of Window E, before December 28, 1991) (considered in option 1) consists of tanks 101-SY, 102-SY, and 103-SY connected to the K1 primary ventilation system. A portable exhaust (P-28) is connected to tank 101-SY at riser 7B but only operated if the K1 ventilation system fails. The existing system (since January 1, 1992) (considered in option 2) consists of tanks 101-SY, 102-SY, and 103-SY connected to the K1 primary ventilation system. A portable exhaust (P-28; only operated if the K1 ventilation system fails) is connected to a tee in the main SY ventilation header near the K1 primary ventilation system. A filtered air inlet is installed on 101-SY at riser 7B. The system considered in option 3 is the same as the system considered for option 1 except that portable exhaust P-28 is operated continuously.

The 12 configurations analyzed consist of three options of four cases each.

3.1 OPTION 1

The first ventilation option discussed uses the pre-existing ventilation system. The four different configurations for this option are given below. For a graphical representation of the four configurations, see Figures 3-1 to 3-4.

- Case 1 Tanks 101-SY, 102-SY and 103-SY are connected to the K1 primary ventilation system; portable exhaust (P-28) is connected to tank 101-SY at riser 7B and operated only if the K1 ventilation system fails.
- Case 2 Tank 101-SY is connected to the K1 primary ventilation system; tanks 102-SY and 103-SY are isolated from tank 101-SY and connected to portable exhaust (P29); portable exhaust (P-28) is connected to tank 101-SY at riser 7B and operated only if the K1 ventilation system fails.
- Case 3 Tanks 101-SY and 102-SY are connected to the K1 primary ventilation system; tank 103-SY is isolated from tanks 101-SY and 102-SY and connected to portable exhaust (P29); portable exhaust (P-28) is connected to tank 101-SY at riser 7B and operated only if the K1 ventilation system fails.
- Case 4 Tanks 101-SY and 103-SY are connected to the K1 primary ventilation system; tank 102-SY is isolated from tanks 101-SY and 103-SY and is ventilated with a spare exhaust P(29); portable exhaust (P-28) is connected to tank 101-SY at riser 7B and operated only if the K1 ventilation system fails.

3.2 OPTION 2

The second ventilation option discussed uses the existing ventilation system. The four different configurations for this option are given below. For a graphical representation see Figures 3-5 to 3-8.

- Case 5 Tanks 101-SY, 102-SY, and 103-SY are connected to the K1 primary ventilation system. Portable exhaustor (P-28; only operated if the K1 ventilation system fails) is connected to a tee in the main SY ventilation header near the K1 primary ventilation system. A filtered air inlet is installed on 101-SY at riser 7B. This is the present configuration as of January 1992.
- Case 6 Tank 101-SY is connected to the K1 primary ventilation system. Portable exhaustor (P-28; only operated if the K1 ventilation system fails) is connected to a tee in the main SY ventilation duct near the K1 primary ventilation system. A filtered air inlet is installed on 101-SY at riser 7B; tanks 102-SY and 103-SY are isolated from tank 101-SY and are connected to a portable exhaustor (P29).
- Case 7 Tanks 101-SY and 102-SY are connected to the K1 primary ventilation system. Portable exhaustor (P-28; only operated if the K1 ventilation system fails) is connected to a tee in the main SY ventilation duct near the K1 primary ventilation system. A filtered air inlet is installed on 101-SY at riser 7B; tank 103-SY is isolated from tanks 101-SY and 102-SY and is connected to a portable exhaustor (P29).
- Case 8 Tanks 101-SY and 103-SY are connected to the K1 primary ventilation system. Portable exhaustor (P-28; only operated if the K1 ventilation system fails) is connected to a tee in the main SY ventilation header near the K1 primary ventilation system. A filtered air inlet is installed on 101-SY at riser 7B; tank 102-SY is isolated from tanks 101-SY and 103-SY and is ventilated with a spare portable exhaustor.

3.3 OPTION 3

The third ventilation option discussed consists of the K1 primary ventilation system (P-23) and a portable exhaustor running at 101-SY riser 7B. A Fluid and Thermal Analysis Multiphase Systems (FATHOMS) code analysis was performed that showed that air would still be exhausted through both the P-23 and the portable exhaustor (P-28) following a burp (Letter 23230-92-SAW-002). The four different configurations for this option are stated below. For a graphical representation see Figures 3-9 to 3-12.

- Case 9 Tanks 101-SY, 102-SY, and 103-SY are connected to the K1 primary system; portable exhaustor (P-28) is connected to tank 101-SY at riser 7B and is operated continually.

- Case 10 Tank 101-SY is connected to the K1 primary system ventilation system; tanks 102-SY and 103-SY are isolated from tank 101-SY and are connected to portable exhausters (P29); portable exhauster (P-28) is connected to tank 101-SY at riser 7B and is operated continually.
- Case 11 Tanks 101-SY and 102-SY are connected to the primary system ventilation fan (P-23); tank 103-SY is isolated from tanks 101-SY and 102-SY and is connected to portable exhauster (P29); portable exhauster (P-28) is connected to tank 101-SY at riser 7B and operated continually.
- Case 12 Tanks 101-SY and 103-SY are connected to the primary system ventilation fan (P-23); tank 102-SY is isolated from tanks 101-SY and 103-SY and is connected to a spare portable exhauster; portable exhauster (P-28) is connected to tank 101-SY at riser 7B and operated continually.

Figure 3-1. Case 1--Ventilation Configuration.

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Figure 3-2. Case 2--Ventilation Configuration.

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Figure 3-3. Case 3--Ventilation Configuration.

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Figure 3-4. Case 4--Ventilation Configuration.

39208006.21

Figure 3-5. Case 5--Ventilation Configuration.

39208006.20

Figure 3-6. Case 6--Ventilation Configuration.

39208006.19

Figure 3-7. Case 7--Ventilation Configuration.

39208006.18

Figure 3-8. Case 8--Ventilation Configuration.

39208006.17

Figure 3-9. Case 9--Ventilation Configuration.

39208006.16

Figure 3-10. Case 10--Ventilation Configuration.

39208006.15

Figure 3-11. Case 11--Ventilation Configuration.

39208006.14

Figure 3-12. Case 12--Ventilation Configuration.

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4.0 DATABASE DEVELOPMENT

4.1 DATA RETRIEVAL METHODS

As part of the tank 101-SY ventilation option report, various sources of quantitative and descriptive data were investigated. Because a centralized data retrieval location is virtually nonexistent, there was difficulty in developing a statistically significant database.

When there is insufficient data for a sound, site-specific database, generic data is used based on similar facilities. Several generic databases are available, but most were established to support nuclear power plant studies. Because this report deals with a nonreactor facility, obtaining numerical data was difficult. Much of the data was obtained from the Hanford Type Code (HTC). The HTC was prepared by the Risk Assessment Technology Group by gathering data from generic nuclear reactor databases such as Idaho National Engineering Laboratory (INEL), Science Applications International Corporation (SAIC), Interim Reliability Evaluation Program Procedures Guide (IREP), and Savannah River Laboratory (SRL) and selecting the most applicable data. The HTC is shown in Appendix A. This appendix lists the component identifier, failure rate, and description.

4.2 FAILURE RATE, UNAVAILABILITY, UNRELIABILITY TIME ASSUMPTIONS, AND DATA JUSTIFICATION

Appendix B lists the basic events, the failure rate (λ) at which a specified failure occurs, the component tau (τ) or t values and the description for the data. Depending on the component repairability or nonrepairability, a value of tau or t was given. The description section expands on how these values were obtained. The basic event files used to quantify the accident sequences are shown in Appendix C. This appendix gives the component identifier (e.g., T1153A), component description, and the probability used in the fault trees. Each basic event listed matches a basic event given in the fault trees, which are shown in Appendix D.

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5.0 ACCIDENT DESCRIPTION

5.1 EVENT TREE DESCRIPTION

Based on knowledge gained during the SY Tank Farm familiarization, 12 preliminary functional event trees were constructed to represent three major types of SY Tank Farm ventilation configurations. A functional event tree represents the sequence of functions that must fail to result in the accident sequence. A systemic event tree represents the sequence of system failures that result in the undesired accident sequence. A functional event tree provides a more generic overview of the accident sequence than a systemic event tree. There are three major types of SY Tank Farm ventilation options (corresponding to options 1, 2, and 3 described in Section 3.0):

1. Primary ventilation system P-23 works
2. Primary ventilation system works with filtered air inlet at 101-SY riser 7B
3. Primary ventilation system P-23 works with portable exhaustor running at 101-SY riser 7B.

The functional event trees begin with an assumption of an event occurring or a condition existing in the tank. The causes of these initiating events or conditions are not addressed in this report.

The first, second, third, and fourth functional event trees relate to the first major SY Tank Farm ventilation option mentioned above, primary ventilation system P-23 works. The majority of the events are similar; the differences are in the unavailabilities or unreliabilities. The first four functional event trees, as shown in Figures 5-1, 5-2, 5-3, and 5-4 begin with the event that a tank burp occurs. The second condition addressed in the event tree is whether a burp occurs in tank 101-SY or 103-SY. The third condition is whether the ventilation system for the tank of concern works. The fourth event is whether an ignition source is present. The branch of the event tree that goes up indicates the event/condition is true, the branch that goes down indicates the event/condition is false. The letters A, B, C, and D associated with the various cases are defined as follows:

- A = 101-SY with ventilation
- B = 101-SY without ventilation
- C = 103-SY with ventilation
- D = 103-SY without ventilation.

The letters associated with the fan designator (P-28S or P-28R) in the event trees are defined as follows:

- S = Standby
- R = Running.

The fifth, sixth, seventh, and eighth functional event trees relate to the second SY Tank Farm ventilation option mentioned above, primary ventilation system P-23 works with filtered inlet at 101-SY riser 7B. The

majority of events are similar; the differences are in the unavailabilities or unreliabilities. Figures 5-5, 5-6, 5-7, and 5-8 begin with the event that a tank burp occurs. The second condition addressed in the event tree is whether a burp occurs in tank 101-SY or 103-SY. The third condition is whether the ventilation system works for the tank of concern with a filtered inlet at 101-SY riser 7B. The fourth event is whether an ignition source is present.

The ninth, tenth, eleventh, and twelfth functional event trees relate to the third SY Tank Farm ventilation option mentioned above, primary ventilation system P-23 works with portable exhaustor running at 101-SY riser 7B. The majority of events are similar; the differences are in the unavailabilities or unreliabilities. Figures 5-9, 5-10, 5-11, and 5-12 begin with the event that a tank burp occurs. The second condition addressed in the event tree is whether a burp occurs in tank 101-SY or tank 103-SY. The third condition is whether the ventilation system works for the tank of concern with portable exhaustor (P-28) running at 101-SY riser 7B. The fourth event is whether an ignition source is present.

Figure 5-1. Case 1--Functional Event Tree.

Hydrogen Explosion Initiated by Burp in 101/103-SY

39208006.1

Figure 5-2. Case 2--Functional Event Tree.

Hydrogen Explosion Initiated by Burp in 101/103-SY

39208006.2

Figure 5-3. Case 3--Functional Event Tree.

Hydrogen Explosion Initiated by Burp in 101/103-SY

39208006.3

Figure 5-4. Case 4--Functional Event Tree.

Hydrogen Explosion Initiated by Burp in 101/103-SY

39208006.4

Figure 5-5. Case 5--Functional Event Tree.

Hydrogen: Explosion Initiated by Burp in 101/103-SY

39208006.5

Figure 5-6. Case 6--Functional Event Tree.

Hydrogen Explosion Initiated by Burp in 101/103-SY

39208006.6

Figure 5-7. Case 7--Functional Event Tree.

Hydrogen Explosion Initiated by Burp In 101/103-SY

39208006.7

Figure 5-8. Case 8--Functional Event Tree.

Hydrogen Explosion Initiated by Burp in 101/103-SY

39208006.8

Figure 5-9. Case 9--Functional Event Tree.

Hydrogen Explosion Initiated by Burp in 101/103-SY

39208006.9

Figure 5-10. Case 10--Functional Event Tree.

Hydrogen Explosion Initiated by Burp In 101/103-SY

39208006.10

Figure 5-11. Case 11--Functional Event Tree.

Hydrogen Explosion Initiated by Burp in 101/103-SY

39208006.11

Figure 5-12. Case 12--Functional Event Tree.

Hydrogen Explosion Initiated by Burp in 101/103-SY

39208006.12

5.2 MODEL ASSUMPTIONS

The fault tree models that were developed to represent various events on the event trees were constructed based on the following assumptions.

1. For all electrical faults causing sparks, power remains applied to the component following the electrical fault.
2. Lightning, gasoline fires, and range fires cause the shutdown of the ventilation system AND result in an ignition source.
3. A burp in a given SY tank does not result in a flammable mixture ever existing in either of the other SY tanks or even in proximity to the other SY tanks instrumentation.
4. The "ventilation operating" case means that the ventilation continues to operate until the mixture of gases in the tank of consideration is below the lower flammability limit (LFL).
5. If the ventilation fails and is not restored, the ammonia bubbler and cryogenic vacuum pump would not be shut down at 4 and 8 hours, respectively, as present procedures dictate, but would be run for at least 45 hours. (This 45 hours is the residence time of flammable gas in 101-SY when the ventilation system is shut down.)
6. Closing of any tank outlet butterfly valves due to mechanical failure would not produce a spark.
7. If power is lost to the SY Tank Farm, there is no power to any SY Tank Farm instrumentation.
8. A flammable gas mixture exists in the tank of concern, through the ventilation path to the exhaust stack following any burp.
9. The inlet valve to a portable exhauster is fully open when the exhauster is normally running.
10. Not every possible ignition source was explicitly modeled if it was obvious that the probability of that ignition source occurring was insignificant from an accident sequence frequency point of view (e.g., ignition sources from a backup fan that would only occur if the main fan failed to operate).
11. Specifically defined failure modes can result in flammable gas mixture transport to the location of an ignition source.
12. Any flammable gas mixture that is ignited at the location of the ignition source can propagate back to the tank via sampling lines or ventilation ducting.

5.3 ACCIDENT SEQUENCES

The fault trees represent the accident sequences given in the event trees shown in Figures 5-1 through 5-12. According to Table 5-1, 13 Computer-Aided Fault Tree Analysis (CAFTA) fault tree files and basic event files were used to quantify the accident sequences. (For example, for Case 5: Part A used the results from Case 1A, Part B used the results from Case 5B, Part C used the results from Case 1C, and Part D used the results from Case 5D.) The solutions of the 13 fault trees are the unique solutions that represent all the possible cases (12 cases times 4 scenarios [A,B,C,D] = 48 solutions). Thus, Table 5-1 shows the fault trees that are correlated with multiple solutions. The basic event files are shown in Appendix C. This appendix gives the component identifier (e.g., T1153A), component description, and the probability used in the fault trees.

The bases for the mission time values given in cases 1A, 1B, 1C, 1D, and 9A vary. The mission time is the time flammable mixture is in the tank of concern. The assumed residence time of flammable mixture in the tank dome space for case 1A and 9A was given in document WHC-EP-0406 (page ix). Case 1B residence time was calculated by using a nondocumented FATHOMS run. An engineering judgement of the residence time was used for case 1C. Since cases 1A and 1B refer to 101-SY and cases 1C and 1D refer to 103-SY, then the case 1D residence time was calculated by using the ratio of cases 1A/1B = 1C/1D.

5.4 ACCIDENT SEQUENCE QUANTIFICATION

The following is an example of how to use the various appendices to calculate the frequency values for any given case.

- Determine the appropriate cutset file name from information in Table 5-1. If you are interested in the frequency of hydrogen explosion following a burp in tank 101-SY for Case 5A see cutset file SYC1A.CUT. The cutsets are shown in Appendix E. In the cutset file of interest, look at the first cutsets (listed from highest frequency to lowest frequency), and find the ignition sources by identifier and description. (For example, In cutset file SYC1A.CUT the fourth cutset is a two-event cutset. The first event is IE-101 [identifier], "BURPS PER YEAR IN 101-SY" [description], and the second event is the ignition source T1173C [identifier], "ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (BELLOWS & MOTOR)" [description].)
- More information about the ignition source is given in Appendix B under the appropriate subdivision. (For example, the ignition source T1173C, from the previous paragraph, is located in the subdivision of Appendix B related to Case SYC1A. The hourly failure rate related to causing a spark is given (5E-07/H) and the applicable time in hours for this event is given (2400H). The CAFTA formula used to combine the failure rate and time is referred to in the detailed description and given at the beginning of each subdivision of Appendix B.

- If a failure rate refers to the HTC Database by type code (for example, SI I), look in Appendix A for details regarding that type code and references for the associated failure rates.
- Appendix C gives printouts of the CAFTA input files that summarize the numbers used to calculate the unavailability or unreliability of each basic event discussed in Appendixes B and E.
- Appendix D contains the plots of the fault tree logic that was used to quantify the various cases.

The calculations of the frequency of a hydrogen explosion following a burp involve several areas of conservatism for specific accident sequences, several of which are dominant accident sequences. These areas of conservatism are listed below:

- The assumption that a flammable gas mixture exists in the tank of concern, through the ventilation path to the exhaust stack following any burp. (In the example given above for the event IE-101, the implicit assumption is that following any burp there will be a flammable gas mixture in the ventilation path to the exhaust stack with a probability of 1.0.)
- The assumption that defined failure modes result in flammable gas mixture transport to the location of an ignition source. (In the example given above for the event T1173C, the assumption is that if the bellows on the vacuum pump leaks it could allow a flammable gas mixture to be transported along the vacuum pump shaft to the vacuum motor with a probability of 1.0.)
- The assumption that a flammable gas mixture ignites and propagates back to the tank via sampling lines or ventilation ducting has a probability of 1.0 in certain accident sequences. (In the example given above for the cutset [IE-101; T1173C], the implicit assumption is that a flammable gas mixture ignites at the vacuum pump motor and results in a flame propagating back to the 101-SY Tank dome space. It is recognized that the path back to the tank would proceed along the shaft, through the leak in the vacuum pump bellows, through the sample line attached to the vacuum pump, and back to the 101-SY Tank dome space. The probability that the flame would propagate back to the tank and cause an explosion in the dome space is assumed to be 1.0 for this cutset.)

Therefore, the absolute frequency values should not be used for any other purpose than the comparison of configurations based on this report.

Table 5-1. Classification of Basic Event and CAFTA Files.

Case	Sequence	Mission time (hours)	CAFTA file	Basic event file
1	A	1.6	SYC1A.CAF	SYC1A.BE
	B	45	SYC1B.CAF	SYC1B.BE
	C	0.1	SYC1C.CAF	SYC1C.BE
	D	2.8	SYC1D.CAF	SYC1D.BE
2	A	SEE 1A	SEE 1A	SEE 1A
	B	SEE 1B	SEE 1B	SEE 1B
	C	SEE 1C	SYC2C.CAF	SYC2C.BE
	D	SEE 1D	SYC2D.CAF	SYC2D.BE
3	A	SEE 1A	SEE 1A	SEE 1A
	B	SEE 1B	SEE 1B	SEE 1B
	C	SEE 1C	SYC3C.CAF	SYC3C.BE
	D	SEE 1D	SYC3D.CAF	SYC3D.BE
4	A	SEE 1A	SEE 1A	SEE 1A
	B	SEE 1B	SEE 1B	SEE 1B
	C	SEE 1C	SEE 1C	SEE 1C
	D	SEE 1D	SEE 1D	SEE 1D
5	A	*SEE 1A	SEE 1A	SEE 1A
	B	SEE 1B	SYC5B.CAF	SYC5B.BE
	C	SEE 1C	SEE 1C	SEE 1C
	D	SEE 1D	SYC5D.CAF	SYC5D.BE
6	A	SEE 1A	SEE 1A	SEE 1A
	B	SEE 1B	SEE 1B	SEE 1B
	C	SEE 1C	SEE 2C	SEE 2C
	D	SEE 1D	SEE 2D	SEE 2D
7	A	SEE 1A	SEE 1A	SEE 1A
	B	SEE 1B	SEE 1B	SEE 1B
	C	SEE 1C	SEE 3C	SEE 3C
	D	SEE 1D	SEE 3D	SEE 3D

Table 5-1. Classification of Basic Event and CAFTA Files.

Case	Sequence	Mission time (hours)	CAFTA file	Basic event file
8	A	SEE 1A	SEE 1A	SEE 1A
	B	SEE 1B	SEE 1B	SEE 1B
	C	SEE 1C	SEE 1C	SEE 1C
	D	SEE 1D	SEE 5D	SEE 5D
9	A	1.0	SYC9A.CAF	SYC9A.BE
	B	SEE 1B	SYC9B.CAF	SYC9B.BE
	C	SEE 1C	SEE 1C	SEE 1C
	D	SEE 1D	SYC9D.CAF	SYC9D.BE
10	A	SEE 1A	SEE 9A	SEE 9A
	B	SEE 1B	SEE 9B	SEE 9B
	C	SEE 1C	SEE 2C	SEE 2C
	D	SEE 1D	SEE 2D	SEE 2D
11	A	SEE 1A	SEE 9A	SEE 9A
	B	SEE 1B	SEE 9B	SEE 9B
	C	SEE 1C	SEE 3C	SEE 3C
	D	SEE 1D	SEE 3D	SEE 3D
12	A	SEE 1A	SEE 9A	SEE 9A
	B	SEE 1B	SEE 9B	SEE 9B
	C	SEE 1C	SEE 1C	SEE 1C
	D	SEE 1D	SEE 9D	SEE 9D

KEY:

A = 101-SY with ventilation

C = 103-SY with ventilation

B = 101-SY without ventilation

D = 103-SY without ventilation

* Case 5A. Based on analysis documented in letter 25130-91-SAW-027, a residence time of 5 hours was calculated. However, increasing the residence time to 5 hours did not change the dominant cutsets calculated using 1.6 hours. The dominant cutsets make up 99 percent of the total cutset frequency values expressed to two significant figures. These dominant cutsets are shown in Appendix E.

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6.0 RESULTS

Table 6-1 shows the normalized risk measures based on the existing configuration (Case 5), ranked from lowest to highest, of hydrogen explosion accidents as a result of a large burp. The frequencies of the four accident scenarios (A,B,C,D) for each case are summed to get the total case frequency (risk measure). The actual frequency values are found in Appendix E. The normalized values given in Table 6-1 are obtained by taking the total frequency value of Case X and dividing it by the total frequency value of Case 5.

The risk measure that is used to compare the configurations is the likelihood of a hydrogen explosion following a burp in tank 101-SY or 103-SY with the ventilation system operating or not operating.

Table 6-1. Normalized Risk Measure Results.

Case number	Normalized risk measure (normalized to Case 5)
Case 1	.95
Case 4	.95*
Case 8	1.0
Case 5	1.0
Case 9	1.2
Case 12	1.2*
Case 2	4.2
Case 6	4.2*
Case 10	4.4
Case 3	11.9
Case 7	11.9*
Case 11	12.1

* These cases were not independently analyzed; Case 4 used the same results as Case 1, Case 12 used Case 9 results, Case 6 used Case 2 results, and Case 7 used Case 3 results.

The column of normalized frequencies represents the summation of the frequency of a hydrogen explosion from a large burp in tank 101-SY and a large burp in tank 103-SY for each case.

The existing configuration consists of all tanks connected to the K1 primary ventilation system with a portable exhaustor (P28), acting as a backup, connected to a tee in the main SY ventilation header near the K1 primary ventilation system. The three configurations that have a significantly higher risk than the other nine configurations have the common characteristic of having a portable exhaustor attached to the top of tank 103-SY. This increases the risk because flame propagation back to tank 103-SY from the exhaustor is assumed to be 1.0.

The important ignition sources used in the fault trees are given below in Table 6-2.

Table 6-2. Important Ignition Sources.

Component	Specific component
Chemical Cell Vacuum Pump Failure	Seal and Motor
Whittaker Chemical Cell H2 Analyzer	
Catastrophic Failure of Chemical Cell Vacuum Pump	Bearings
Chemical Cell Vacuum Pump	Bearings
P-23 CAM Vacuum Pump Operation	Motor
P-23 VP-EXH-K1-2 Vacuum Pump Failure	Seal and Motor
P-23 VP-EXH-K1-1 Vacuum Pump Failure	Seal and Motor
Catastrophic Failure of K1-4-1 P-23 Fan (mechanical spark)	
P-23 Ventilation Ductwork due to failed bonding	
Pressure Switch K1-PS-2-1 (P-23)	
Pressure Switch K1-PS-3-1 (P-23)	
P-28 CAM Vacuum Pump Operation	Motor
Catastrophic Failure of P-28 CAM VP-1 Vacuum Pump	Bearings
Catastrophic Failure of P-28 CAM VP-2 Vacuum Pump	Bearings
Catastrophic Failure of P-28 CAM VP-3 Vacuum Pump	Bearings
P-28 CAM VP-1 Vacuum Pump Failure	Seal and Motor
P-28 CAM VP-2 Vacuum Pump Failure	Seal and Motor
P-28 CAM VP-3 Vacuum Pump Failure	Seal and Motor

Table 6-2. Important Ignition Sources.

Component	Specific component
P-28 Heaters HTS-1 and HTS-2 (locked out)	
P-28 "Elephant Trunk" Connection due to Failed Bonding	
Pressure Switch P28-PS-1	
Pressure Switch P28-PS-2	
Pressure Switch P28-PS-4	
Insufficient Bonding/Grounding of Tank Riser (electrostatic spark)	
Metal Striking Metal Inside Tank Due to Support Failure (mech. spark)	
Ammonia Bubbler Vacuum Pump Operation	Motor
Teledyne Vacuum Pump Operation	Motor
Teledyne Vacuum Pump Failure	Seal and Motor
Explosion Proof Light or Light Lead Faults	
Organic Vapor Monitor (OVM) System	
Manual Level Probe	
FIC Level Probe	
Removal of Sludge Weights (7)	
Leak Detector LDE-03A-1 in the 103-SY Pump Pit	
Sludge Weight/Cable Striking Sampling Tubes (mech. spark)	

A point of interest is the calculated value of installing sparkless fans in the SY Tank Farm ventilation system. If the accident scenarios involving sparks produced by ventilation fans were eliminated from the integrated risk for a ventilation configuration case, it would conservatively represent the change in risk from using the existing ventilation fans versus sparkless fans. This change results in less than a 1 percent change in the integrated risk for any of the 12 cases evaluated.

6.1 GENERAL INSIGHTS

The insights gained from this analysis are probably of as much importance as the comparison of the 12 ventilation configurations. Three areas of insight are presented here:

1. Insights regarding the major contributors to ignition or ventilation failure.
2. Insights regarding potential actions to reduce the likelihood of component failure.
3. Insights identified as lessons learned.

The three areas of insights discussed below apply to all the configuration except where noted.

6.1.1 Major Contributors to Ignition or Ventilation Failure

6.1.1.1 Major contributors to ignition. The majority of the contributors to the likelihood of an ignition leading to an explosion in the tank vapor space are failures of the sampling equipment and instrumentation. The two major factors are lack of fault detection between burp events, and the probability of flame propagation from sampling equipment back to the tank.

6.1.1.2 Failure of the ductwork bonding. Case 5D shows that approximately 1 percent of the total likelihood of the ignition during a burp event is due to electrostatic discharge caused by ductwork bonding failure. The lack of checks on bonding integrity is the major factor associated with this failure.

6.1.1.3 Failure of the ventilation system. The major contributor to the likelihood of failure of the ventilation system to be operating during a burp episode is a human error resulting in valve MK-4501 on tank 101-SY being closed when a burp occurs.

6.1.1.4 Ignition and ventilation failure. The major contributors to ignition and ventilation system failure leading to an explosion in the tank vapor space are combinations of the human error resulting in valve MK-4501 on tank 101-SY being closed and failures of the sampling equipment and instrumentation.

6.1.2 Potential Actions to Reduce Likelihood of Failure

6.1.2.1 Routine equipment checks. For failures that can be detected by routine inspection and/or testing, checking them once a month will reduce the likelihood of failure by about a factor of 10. Equipment subject to this change include instrumentation, sampling, and ductwork bonding.

6.1.2.2 Reducing the amount of sampling equipment operating during a burp. Reducing the required sampling equipment powered and/or operating during each burp event could reduce the likelihood of an ignition.

6.1.2.3 Administrative controls. Administratively controlling the position of valve MK-4501 on tank 101-SY could reduce its likelihood of being closed during a burp event by a factor of 10.

6.1.2.4 Flame propagation assessment. Better understanding of the propagation of the flame from the sampling equipment back to the tank may result in a reduction of the prediction of the likelihood of ignition leading to an explosion in the tank vapor space.

6.1.3 Lessons Learned

Failures of the rotating machinery (e.g., ventilation fans) are not major contributors to either ignition or ventilation system failures in the proposed configurations.

Better understanding of propagation of the flame front from the sampling equipment and ventilation ducting back to the tank will provide better predictions of the likelihood of ignition.

Some routine monthly preventive maintenance activity could reduce ignition likelihood by about a factor of 10.

A more detailed study is needed to determine if instrumentation failures that effect power are capable of continuing to produce sparks after the initial failure.

6.2 SPECIFIC INSIGHTS

The specific insights gained from this analysis were gathered by researching possible ignition sources that dealt with the K1 primary ventilation system. The two types of ignition sources given below are not in the important ignition source list but are presented for consideration.

6.2.1 Dwyer Pressure Switches

Three Dwyer pressure switches are used to sense DP at various locations throughout the K1 ventilation system and activate alarms or shutdown relays: PS-2-1 senses low DP across the second HEPA filter; PS-3-1 senses high DP across the first HEPA filter; and PS-1-1 senses negative pressure across the entire unit. After a discussion with a Dwyer representative, the following observations were made.

- These pressure switches are not separated from the media.
- The armature pin which makes contact with the switch is exposed to the media.
- A caution is given in the Dwyer catalog which states the following, **CAUTION: FOR USE ONLY WITH AIR OR COMPATIBLE GASES.** Hydrogen gas is not one of the listed compatible gases.

6.2.2 "Pancake" Geiger-Mueller Tubes

The "Pancake" Geiger-Mueller (GM) tubes are versatile instruments designed for the detection and measurement of beta emitting airborne particulate matter. These tubes are part of the CAMs which detect radiation exiting from the K1 primary ventilation system through the exhaust stack. The only failure which needs to happen before a spark occurs is the mica glass (conductive coating) needs to rupture allowing the neon gas with boron to escape. Once this gas escapes, and air enters the GM tube, there is no prevention from obtaining a spark.

7.0 CONCLUSIONS

From a frequency point of view, cases 1 and 4, given in Table 6-1, have the lowest normalized frequency. But the difference between 0.984 (case 1) and 1.000 (case 5) (the configuration of the tanks as of January 1992), is not judged to be large enough to be considered significant, especially considering the data uncertainty.

Only three cases (3, 7, 11) are significantly worse than case 5; the other nine cases (1, 2, 4, 5, 6, 8, 9, 10, 12) do not differ significantly from one another.

The use of sparkless fans in the SY Tank Farm would reduce the integrated risk of hydrogen explosion following a large burp by less than 1 percent from the values reported above for the 12 cases. Accordingly, the present SY Tank Farm ventilation fans are not dominant contributors to the risk of hydrogen explosion following a large burp.

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APPENDIX A

**HANFORD NONREACTOR TYPE CODE FILE
REVISION D.1**

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A.1 TYPE CODE DESCRIPTIONS

ABBREVIATIONS:

- 1) NORMALLY CLOSED ----- N.C.
- 2) NORMALLY OPEN ----- N.O.
- 3) FAILS TO OPEN ON DEMAND ----- FTOD
- 4) FAILS TO CLOSE ON DEMAND ----- FTCD
- 5) FAILS TO REMAIN OPEN ----- FTRO
- 6) FAILS TO REMAIN CLOSED ----- FTRC
- 7) FAIL TO RESTORE TO CORRECT POSITION -- FTRTCP

TYPE	RATE	DESCRIPTION
AA 3	3.0E-06\H	ALARM @@@@ SOUNDS SPURIOUSLY
AA P	2.3E-06\D	ALARM @@@@ FAILS TO SOUND WHEN DEMANDED
AB P	3.5E-03\H	ANALYZER @@@@ FAILS TO PROVIDE OUTPUT
BA H	1.0E-06\H	ELECTRICAL BUS @@@@ SPURIOUSLY DEENERGIZED
CA 1	5.0E-06\H	ELECTRICAL CABLE @@@@ FAILS OPEN (OPEN CIRCUIT) (PER CIRCUIT)
CA 2	5.0E-06\H	ELECTRICAL CABLE @@@@ FAILS TO GROUND (SHORT CIRCUIT)(PER CIRCUIT
CB A	1.0E-03\D	CIRCUIT BREAKER @@@@ N.C., FTOD
CB B	1.0E-03\D	CIRCUIT BREAKER @@@@ N.O., FTCD
CB C	2.9E-06\H	CIRCUIT BREAKER @@@@ N.O., FTRO
CB D	2.9E-06\H	CIRCUIT BREAKER @@@@ N.C., FTRC
CC F	5.0E-03\D	MOTOR DRIVEN COMPRESSOR @@@@ FAILS TO START
CC G	1.0E-04\H	MOTOR DRIVEN COMPRESSOR @@@@ FAILS TO CONTINUE RUNNING
CD P	9.6E-06\H	COMPUTER (CPU) @@@@ FAILS TO PROCESS OR PROCESS CORRECTLY INFORMATION
CF A	3.0E-04\D	ELECTRICAL RELAY CONTACTS @@@@ N.C., FTOD
CF B	3.0E-04\D	ELECTRICAL RELAY CONTACTS @@@@ N.O., FTCD
CG A	3.0E-04\D	ELECTRICAL SWITCH CONTACTS @@@@ N.C., FTOD
CG B	3.0E-04\D	ELECTRICAL SWITCH CONTACTS @@@@ N.O., FTCD
CH 3	1.6E-05\H	CONTINUOUS AIR MONITOR (CAM) @@@@ SPURIOUSLY ALARMS
CH P	2.5E-05\H	CONTINUOUS AIR MONITOR (CAM) @@@@ FAILS TO DETECT & SEND SIGNAL
CI P	5.8E-07\H	COMPARATOR FAILS TO PROVIDE OUTPUT
CJ F	3.0E-02\D	DIESEL DRIVEN COMPRESSOR @@@@ FAILS TO START
CJ G	1.0E-04\H	DIESEL DRIVEN COMPRESSOR @@@@ FAILS TO CONTINUE RUNNING
CK P		COMMON CAUSE FAILURE
DA A	3.0E-03\D	AIR OPERATED DAMPER @@@@ N.C., FTOD
DA B	3.0E-03\D	AIR OPERATED DAMPER @@@@ N.O., FTCD
DA C	5.1E-06\H	AIR OPERATED DAMPER @@@@ N.O., FTRO
DA D	5.1E-06\H	AIR OPERATED DAMPER @@@@ N.C., FTRC
DB A	3.0E-03\D	MOTOR OPERATED DAMPER @@@@ N.C., FTOD
DB B	3.0E-03\D	MOTOR OPERATED DAMPER @@@@ N.O., FTCD
DB C	5.1E-06\H	MOTOR OPERATED DAMPER @@@@ N.O., FTRO
DB D	5.1E-06\H	MOTOR OPERATED DAMPER @@@@ N.C., FTRC
DC E	1.0E-05\H	DEENTRAINER @@@@ PLUGS

TYPE	RATE	DESCRIPTION
DC P	1.0E-06\H	DEENTRAINER @@@@ FAILS AND ALLOWS EXCESSIVE WATER THROUGH
DD L	1.5E-05\H	DRAIN PLUG @@@@ LEAKS
DE M		DRYER @@@@ FAILS HIGH BEYOND DESIGN TEMPERATURE .RATING
DE N		DRYER @@@@ FAILS LOW SO MATERIAL IS NOT DRIED SUFFICIENTLY
DF A	3.0E-03\D	MANUAL DAMPER @@@@ N.C., FTOD
DF B	3.0E-03\D	MANUAL DAMPER @@@@ N.O., FTCD
DF C	3.0E-07\H	MANUAL DAMPER @@@@ N.O., FTRJ
DF D	3.0E-07\H	MANUAL DAMPER @@@@ N.C., FTRC
DG A	5.0E-05\D	BACK DRAFT DAMPER @@@@ N.C., FTOD
DG B	1.0E-03\D	BACK DRAFT DAMPER @@@@ N.O., FTCD
DG C	1.8E-06\H	BACK DRAFT DAMPER @@@@ N.O., FTRO
DG D	1.2E-06\H	BACK DRAFT DAMPER @@@@ N.C., FTRC
EA M	1.0E-06\H	FLOW ELEMENT @@@@ FAILS HIGH, HIGH OUTPUT SIGNAL
EA N	1.0E-06\H	FLOW ELEMENT @@@@ FAILS LOW, LOW OUTPUT SIGNAL
EA O	1.0E-06\H	FLOW ELEMENT @@@@ FAILS, NO OUTPUT SIGNAL
EB O	2.7E-04\H	LEAK DETECTOR @@@@ FAILS, NO OUTPUT SIGNAL
EC M	2.5E-05\H	LEVEL ELEMENT @@@@ FAILS HIGH, HIGH OUTPUT SIGNAL
EC N	2.5E-05\H	LEVEL ELEMENT @@@@ FAILS LOW, LOW OUTPUT SIGNAL
EC O	2.5E-05\H	LEVEL ELEMENT @@@@ FAILS, NO OUTPUT SIGNAL
ED M	1.6E-04\H	PRESSURE ELEMENT @@@@ FAILS HIGH, HIGH OUTPUT SIGNAL
ED N	1.6E-04\H	PRESSURE ELEMENT @@@@ FAILS LOW, LOW OUTPUT SIGNAL
ED O	1.6E-04\H	PRESSURE ELEMENT @@@@ FAILS, NO OUTPUT SIGNAL
EE M	1.6E-05\H	RADIATION DETECTOR ELEMENT @@@@ FAILS HIGH, HIGH OUTPUT SIGNAL
EE N	1.6E-05\H	RADIATION DETECTOR ELEMENT @@@@ FAILS LOW, LOW OUTPUT SIGNAL
EE O	1.6E-05\H	RADIATION DETECTOR ELEMENT @@@@ FAILS, NO OUTPUT SIGNAL
EF O	6.7E-07\H	SEISMIC DETECTOR ELEMENT @@@@ FAILS, NO OUTPUT SIGNAL
EG M	4.0E-05\H	TEMPERATURE ELEMENT @@@@ FAILS HIGH, HIGH OUTPUT SIGNAL
EG N	4.0E-05\H	TEMPERATURE ELEMENT @@@@ FAILS LOW, LOW OUTPUT SIGNAL
EG O	4.0E-05\H	TEMPERATURE ELEMENT @@@@ FAILS, NO OUTPUT SIGNAL
FA F	5.0E-03\D	MOTOR DRIVEN FAN @@@@ FAILS TO START
FA G	3.0E-05\H	MOTOR DRIVEN FAN @@@@ FAILS TO CONTINUE RUNNING
FB E	1.0E-05\H	FILTER @@@@ PLUGS
FB L	1.0E-06\H	FILTER @@@@ LEAKS OR RUPTURES
FC E	1.4E-08\H	HEPA FILTER @@@@ PLUGS
FC L	1.4E-08\H	HEPA FILTER @@@@ LEAKS OR RUPTURES
FD D	1.0E-07\H	FUSE @@@@ N.C., FTRC (OPEN CIRCUIT)
FE F	3.0E-02\D	DIESEL DRIVEN FAN @@@@ FAILS TO START
FE G	3.0E-05\H	DIESEL DRIVEN FAN @@@@ FAILS TO CONTINUE RUNNING
GA L	3.0E-05\H	GASKET @@@@ LEAKS OR RUPTURES
GB F	3.0E-02\D	DIESEL GENERATOR @@@@ FAILS TO START
GB G	3.0E-03\H	DIESEL GENERATOR @@@@ FAILS TO CONTINUE RUNNING
HA 4	1.0E-06\H	HEAT EXCHANGER @@@@ LEAKS FROM THE TUBES
HA 5	3.0E-07\H	HEAT EXCHANGER @@@@ TUBES PLUG
HA L	3.0E-07\H	HEAT EXCHANGER @@@@ LEAKS FROM THE SHELL

TYPE	RATE	DESCRIPTION
HA P	2.0E-05\H	HEAT EXCHANGER @@@@ LOSS OF COOLABILITY (USE ONLY IF NO OTHER INFORMATION)
HB M	1.0E-06\H	HEATER @@@@ FAILS HIGH BEYOND DESIGN TEMPERATURE RATING
HB N	5.0E-06\H	HEATER @@@@ FAILS LOW SO MATERIAL IS NOT HEATED SUFFICIENTLY
IA M	1.4E-06\H	FLOW INDICATOR @@@@ FAILS HIGH, HIGH INDICATION
IA N	1.4E-06\H	FLOW INDICATOR @@@@ FAILS LOW, LOW INDICATION
IB M	1.4E-06\H	LEVEL INDICATOR @@@@ FAILS HIGH, HIGH INDICATION
IB N	1.4E-06\H	LEVEL INDICATOR @@@@ FAILS LOW, LOW INDICATION
IB O	1.4E-06\H	LEVEL INDICATOR @@@@ FAILS, NO INDICATION
IC M	1.4E-06\H	PRESSURE INDICATOR @@@@ FAILS HIGH, HIGH INDICATION
IC N	1.4E-06\H	PRESSURE INDICATOR @@@@ FAILS LOW, LOW INDICATION
IC O	1.4E-06\H	PRESSURE INDICATOR @@@@ FAILS, NO INDICATION
ID M	1.4E-06\H	TEMPERATURE INDICATOR @@@@ FAILS HIGH, HIGH INDICATION
ID N	1.4E-06\H	TEMPERATURE INDICATOR @@@@ FAILS LOW, LOW INDICATION
ID O	1.4E-06\H	TEMPERATURE INDICATOR @@@@ FAILS, NO INDICATION
LA P	1.0E-03\D	LAMP @@@@ FAILS TO ILLUMINATE (ENGINEERING JUDGEMENT)
MA 3	6.4E-07\H	CONTROL MODULE @@@@ FAILS SPURIOUSLY, GIVES SPURIOUS SIGNAL
MA P	6.4E-07\H	CONTROL MODULE @@@@ FAILS TO FUNCTION, NO SIGNAL
MB 3	3.9E-06\H	LOGIC MODULE @@@@ FAILS SPURIOUSLY, GIVES SPURIOUS SIGNAL
MB P	3.9E-06\H	LOGIC MODULE @@@@ FAILS TO FUNCTION, NO SIGNAL
MC P	5.0E-06\H	CATHODE RAY TUBE (CRT) MONITOR @@@@ FAILS TO FUNCTION, NO PICTURE
NA E	6.0E-06\H	NOZZLE @@@@ PLUGS
NA P	2.0E-07\H	NOZZLE @@@@ FAILS TO DISCHARGE FLOW AS DESIGNED
OA Q		HUMAN OPERATOR @@@@ FAILS TO PERFORM A KNOWN TASK
OA R		HUMAN OPERATOR @@@@ FAILS TO RECOVER A KNOWN PRE-EXISTING FAILURE
OA T		HUMAN OPERATOR @@@@ MISCALIBRATES EQUIPMENT
OA U		HUMAN OPERATOR @@@@ FTRTCP FOLLOWING TEST OR MAINTENANCE
PA E	5.0E-10\H	PIPING @@@@ PLUGS (PER FOOT OF < 3" PIPE)
PA L	1.0E-08\H	PIPING @@@@ LEAKS OR RUPTURES (PER FOOT OF < 3" PIPE)
PB L	1.2E-06\H	PIT STRUCTURE @@@@ LEAKS OR RUPTURES
PC N	2.4E-06\H	POWER SUPPLY @@@@ FAILS LOW, LOW POWER OUTPUT
PC O	2.4E-06\H	POWER SUPPLY @@@@ FAILS, NO POWER OUTPUT
PD F	3.0E-03\D	ELECTRIC MOTOR DRIVEN PUMP @@@@ FAILS TO START
PD G	3.0E-05\H	ELECTRIC MOTOR DRIVEN PUMP @@@@ FAILS TO CONTINUE RUNNING
PE E	5.0E-11\H	PIPING @@@@ PLUGS (PER FOOT OF > 3" PIPE)
PE L	1.0E-09\H	PIPING @@@@ LEAKS (PER FOOT OF > 3" PIPE)
RA H	3.9E-07\H	RELAY @@@@ SPURIOUSLY CHANGES STATE
RA I	7.6E-05\D	RELAY @@@@ FAILS TO CHANGE STATE
SA L	7.0E-06\H	SEAL @@@@ LEAKS OR RUPTURES

TYPE	RATE	DESCRIPTION
SC 3	1.0E-06\H	FLOW ALARM SWITCH @@@@ SPURIOUSLY TRANSFERS
SC I	3.0E-05\D	FLOW ALARM SWITCH @@@@ FAILS TO TRANSFER ON DEMAND
SD 3	1.0E-06\H	HAND SWITCH @@@@ SPURIOUSLY TRANSFERS
SD I	3.0E-05\D	HAND SWITCH @@@@ FAILS TO TRANSFER ON DEMAND
SE 3	1.0E-06\H	DIFFERENTIAL PRESSURE SWITCH @@@@ SPURIOUSLY TRANSFERS
SE I	3.0E-05\D	DIFFERENTIAL PRESSURE SWITCH @@@@ FAILS TO TRANSFER ON DEMAND
SF 3	1.0E-06\H	FLOW SWITCH @@@@ SPURIOUSLY TRANSFERS
SF I	3.0E-05\D	FLOW SWITCH @@@@ FAILS TO TRANSFER ON DEMAND
SG 3	1.0E-06\H	LEVEL SWITCH @@@@ SPURIOUSLY TRANSFERS
SG I	3.0E-05\D	LEVEL SWITCH @@@@ FAILS TO TRANSFER ON DEMAND
SH 3	1.0E-06\H	LIMIT SWITCH @@@@ SPURIOUSLY TRANSFERS
SH I	3.0E-05\D	LIMIT SWITCH @@@@ FAILS TO TRANSFER ON DEMAND
SI 3	1.0E-06\H	PRESSURE SWITCH @@@@ SPURIOUSLY TRANSFERS
SI I	3.0E-05\D	PRESSURE SWITCH @@@@ FAILS TO TRANSFER ON DEMAND
SJ 3	1.0E-06\H	TEMPERATURE SWITCH @@@@ SPURIOUSLY TRANSFERS
SJ I	3.0E-05\D	TEMPERATURE SWITCH @@@@ FAILS TO TRANSFER ON DEMAND
TA L	1.6E-06\H	TANK @@@@ LEAKS OR RUPTURES
TC P	1.0E-06\H	TRANSFORMER @@@@ FAILS TO FUNCTION
TD 3	3.0E-06\H	FLOW TRANSMITTER @@@@ FAILS SPURIOUSLY, SENDS SPURIOUS SIGNAL
TD P	3.0E-06\H	FLOW TRANSMITTER @@@@ FAILS TO TRANSMIT SIGNAL
TE 3	3.0E-06\H	LEVEL TRANSMITTER @@@@ FAILS SPURIOUSLY, SENDS SPURIOUS SIGNAL
TE P	3.0E-06\H	LEVEL TRANSMITTER @@@@ FAILS TO TRANSMIT SIGNAL
TF 3	3.0E-06\H	PRESSURE TRANSMITTER @@@@ FAILS SPURIOUSLY, SENDS SPURIOUS SIGNAL
TF P	3.0E-06\H	PRESSURE TRANSMITTER @@@@ FAILS TO TRANSMIT SIGNAL
TG 3	3.0E-06\H	TEMPERATURE TRANSMITTER @@@@ FAILS SPURIOUSLY, SENDS SPURIOUS SIG
TG P	3.0E-06\H	TEMPERATURE TRANSMITTER @@@@ FAILS TO TRANSMIT SIGNAL
TH P	4.3E-05\H	TIMER @@@@ FAILS TO FUNCTION, DOESN'T ALLOW EQUIPMENT TO WORK
UA N	1.3E-04\H	UNINTERRUPTIBLE POWER SUPPLY @@@@ FAILS LOW, LOW POWER OUTPUT
UA O	1.3E-04\H	UNINTERRUPTIBLE POWER SUPPLY @@@@ FAILS, NO POWER OUTPUT
VA A	1.4E-04\D	CHECK VALVE @@@@ N.C., FTOD
VA B	1.4E-03\D	CHECK VALVE @@@@ N.O., FTCD
VA C	1.8E-06\H	CHECK VALVE @@@@ N.O., FTRO
VA D	1.2E-06\H	CHECK VALVE @@@@ N.C., FTRC
VB C	1.1E-05\H	PRESSURE CONTROL VALVE FTRO (ASSUMED TO BE LIKE VB P)
VB P	1.1E-05\H	FLOW CONTROL (SELF-REGULATING) VALVE @@@@ FAILS TO TRANSFER
VC A	2.2E-03\D	GAS OPERATED VALVE @@@@ N.C., FTOD
VC B	2.2E-03\D	GAS OPERATED VALVE @@@@ N.O., FTCD
VC C	3.0E-06\H	GAS OPERATED VALVE @@@@ N.O., FTRO
VC D	3.0E-06\H	GAS OPERATED VALVE @@@@ N.C., FTRC
VD A	2.9E-04\D	HAND OPERATED (MANUAL) VALVE @@@@ N.C., FTOD
VD B	2.9E-04\D	HAND OPERATED (MANUAL) VALVE @@@@ N.O., FTCD

TYPE	RATE	DESCRIPTION
VD C	1.5E-07\H	HAND OPERATED (MANUAL) VALVE @@@@ N.O., FTRO
VD D	9.4E-08\H	HAND OPERATED (MANUAL) VALVE @@@@ N.C., FTRC
VE A	4.7E-03\D	MOTOR OPERATED VALVE @@@@ N.C., FTOD
VE B	5.6E-03\D	MOTOR OPERATED VALVE @@@@ N.O., FTCD
VE C	1.5E-06\H	MOTOR OPERATED VALVE @@@@ N.O., FTRO
VE D	1.4E-06\H	MOTOR OPERATED VALVE @@@@ N.C., FTRC
VF A	2.1E-04\D	RELIEF VALVE @@@@ N.C., FTOD
VF B	5.2E-03\D	RELIEF VALVE @@@@ N.O., FTCD
VF D	1.7E-06\H	RELIEF VALVE @@@@ N.C., FTRC
VG A	2.8E-03\D	SOLENOID OPERATED VALVE @@@@ N.C., FTOD
VG B	2.8E-03\D	SOLENOID OPERATED VALVE @@@@ N.O., FTCD
VG C	4.1E-07\H	SOLENOID OPERATED VALVE @@@@ N.O., FTRO
VG D	4.1E-07\H	SOLENOID OPERATED VALVE @@@@ N.C., FTRC
VH A	3.0E-03\D	FAN @@@@ VARIABLE VANES N.C., FTOD
VH B	3.0E-03\D	FAN @@@@ VARIABLE VANES N.O., FTCD
VH C	5.1E-06\H	FAN @@@@ VARIABLE VANES N.O., FTRO
VH D	5.1E-06\H	FAN @@@@ VARIABLE VANES N.C., FTRC
WA 1	3.0E-06\H	ELECTRICAL WIRE @@@@ FAILS OPEN (OPEN CIRCUIT) (PER 1000 FT)
WA 2	3.0E-07\H	ELECTRICAL WIRE @@@@ FAILS TO GROUND (SHORT CIRCUIT) (PER 1000 FT)

A.2 TYPE CODE SOURCES AND COMMENTS

<u>TC</u>	<u>RATE</u>	<u>SOURCE AND COMMENTS</u>
AA 3	3.0E-6/HR	"ALARMS, GENERAL, SPURIOUS OPERATION" (Eide et al. 1990, p. 21); RECOMMENDED VALUE; ERROR FACTOR-10; NUCLARR database, category 3 sources (IEEE, NPRD-3).
AA P	2.3E-6/D	assumed the failure rate was the same as for SAIC-GDB (SAIC 1989); "CONTACTS; CONTACT @@@@@ FAILS TO CLOSE OR FAILS TO OPEN"; (alarm failure on demand assumes no sensors involved).
AB P	3.5E-3/HR	conservative value chosen from DP-1633 (Dexter and Perkins 1982, p. 10); "ANALYZERS, GAS-LIQUID CHROMATOGRAPH"; from <i>Chemistry and Industry</i> (Lees 1976); use this component failure rate only if the type of analyzer is unknown; [use Hanford comparator, CI P, for a pulse height analyzer].
BA H	1E-6/HR	"BUS, OUTDOOR (BARE); FAILURE" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-10; IEEE Std-500 (IEEE 1984).
CA 1	5E-6/HR	"CABLES, JOINTS, AND TERMINATIONS: COPPER JOINTS OR COPPER TERMINATIONS (PER TERMINAL), OPEN CIRCUIT" (Eide et al. 1990, p. 24); RECOMMENDED VALUE; ERROR FACTOR-10; IEEE Std-500 (IEEE 1984); this rate is per circuit.
CA 2	5E-6/HR	"CABLES, JOINTS, AND TERMINATIONS: COPPER TERMINATIONS (PER TERMINAL), SHORT CIRCUIT" (Eide et al. 1990, p. 24); RECOMMENDED VALUE; ERROR FACTOR-10; IEEE Std-500 (IEEE 1984); this rate is per circuit.
CB A	1E-3/D	"CIRCUIT BREAKERS (FAILURE TO OPERATE)" (Dexter and Perkins 1982, p. 13); from WASH-1400 (NRC 1975).
CB B	1E-3/D	"CIRCUIT BREAKERS (FAILURE TO OPERATE)" (Dexter and Perkins 1982, p. 13); from WASH-1400 (NRC 1975).
CB C	2.9E-6/HR	"CIRCUIT BREAKERS, INDOOR, SPURIOUS OPERATION" (Eide et al. 1990, p. 21); IEEE Std-500 VALUE (IEEE 1984); ERROR FACTOR-45; from IEEE Std-500 (1984).
CB D	2.9E-6/HR	"CIRCUIT BREAKERS, INDOOR, SPURIOUS OPERATION" (Eide et al. 1990, p. 21); IEEE Std-500 VALUE (IEEE 1984); ERROR FACTOR-45; from IEEE Std-500.
CC F	5E-3/D	"COMPRESSORS/BLOWERS, FAIL TO START" (Eide et al. 1990, p. 19); RECOMMENDED VALUE; ERROR FACTOR-5; Value from NUCLARR category 1 sources.

<u>TC</u>	<u>RATE</u>	<u>SOURCE AND COMMENTS</u>
CC G	1E-4/HR	"COMPRESSORS/BLOWERS, FAIL TO RUN" (Eide et al. 1990, p. 19); RECOMMENDED VALUE; ERROR FACTOR-10; Value from NUCLARR category 1 sources.
CD P	9.6E-6/HR	MDR-21 (RAC 1985, p. 309).
CF A	3E-4/D	"4.7 RELAYS, 4.71 CONTACTS FAIL TO TRANSFER (OPEN OR CLOSE)" (Carlson 1983, p. 128); MEAN VALUE; ERROR FACTOR-10.
CF B	3E-4/D	"4.7 RELAYS, 4.71 CONTACTS FAIL TO TRANSFER (OPEN OR CLOSE)" (Carlson 1983, p. 128); MEAN VALUE; ERROR FACTOR-10.
CG A	3E-4/D	assumed that switch contacts FTOD or FTCD rates were the same as for relay contacts; "4.7 RELAYS, 4.71 CONTACTS FAIL TO TRANSFER (OPEN OR CLOSE)" (Carlson 1983, p. 128); MEAN VALUE; ERROR FACTOR-10.
CG B	3E-4/D	assumed that switch contacts FTOD or FTCD rates were the same as for relay contacts; "4.7 RELAYS, 4.71 CONTACTS FAIL TO TRANSFER (OPEN OR CLOSE)" (Carlson 1983, p. 128); MEAN VALUE; ERROR FACTOR-10.
CH 3	1.6E-5/HR	"SCINTILLATION DETECTOR" (Dexter and Perkins 1982, p. 24); from NUREG/CR-0942 (NRC 1979).
CH P	2.5E-5/HR	"RADIATION INSTRUMENT, FAILS HIGH/LOW" (SAIC 1990, p. 31); Ocone Probabilistic Risk Assessment.
CI P	5.8E-7/HR	IEEE-500-84 (IEEE 1984, p. 734); "8.25.9 COMPUTATION MODULE, ELECTRONIC ON/OFF"; assumed that this computation module was representative of a comparator.
CJ F	3E-2/D	assumed the values for emergency diesel (complete plant) would be conservatively assigned to diesel powered equipment; "4.6 EMERGENCY DIESEL (COMPLETE PLANT), 4.6.1 FAILURE TO START" (Carlson 1983, p. 128); MEAN VALUE; ERROR FACTOR-3.
CJ G	1E-4/HR	assumed the rate for failure to run was the same as for the comparable electrical motor driven component; "COMPRESSORS/BLOWERS, FAIL TO RUN" (Eide et al. 1990, p. 19); RECOMMENDED VALUE; ERROR FACTOR-10; Value from NUCLARR category 1 sources.
CK P	**Needs to be evaluated on case by case basis, probably using a Beta factor	
DA A	3E-3/D	"DAMPERS, FAIL TO OPEN/CLOSE" (Eide et al. 1990, p. 19); RECOMMENDED VALUE; ERROR FACTOR-5; Value from NUCLARR category 1 sources.

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TC	RATE	SOURCE AND COMMENTS
DA B	3E-3/D	"DAMPERS, FAIL TO OPEN/CLOSE" (Eide et al. 1990, p. 19); RECOMMENDED VALUE; ERROR FACTOR-5; Value from NUCLARR category 1 sources.
DA C	5.1E-6/HR	" BACKFLOW AIR DAMPERS; BACKFLOW AIR DAMPER @@@@ TRANSFERS CLOSED OR OPEN" (SAIC 1989).
DA D	5.1E-6/HR	" BACKFLOW AIR DAMPERS; BACKFLOW AIR DAMPER @@@@ TRANSFERS CLOSED OR OPEN" (SAIC 1989).
DB A	3E-3/D	"DAMPERS, FAIL TO OPEN/CLOSE" (Eide et al. 1990, p. 19); RECOMMENDED VALUE; ERROR FACTOR-5; Value from NUCLARR category 1 sources.
DA B	3E-3/D	"DAMPERS, FAIL TO OPEN/CLOSE" (Eide et al. 1990, p. 19); RECOMMENDED VALUE; ERROR FACTOR-5; Value from NUCLARR category 1 sources.
DA C	5.1E-6/HR	" BACKFLOW AIR DAMPERS; BACKFLOW AIR DAMPER @@@@ TRANSFERS CLOSED OR OPEN" (SAIC 1989).
DA D	5.1E-6/HR	" BACKFLOW AIR DAMPERS; BACKFLOW AIR DAMPER @@@@ TRANSFERS CLOSED OR OPEN" (SAIC 1989).
DC E	1E-5/HR	assumed that a deentrainer plug occurred at the same rate as a filter plug; "FILTERS, PLUG" (Eide et al. 1990, p. 19); RECOMMENDED VALUE; ERROR FACTOR-10; value from IEEE Std-500 (IEEE 1984).
DC P	1E-6/HR	assumed that a deentrainer fails and allows excessive water through occurred at the same rate as a filter leak; "FILTERS, LEAKAGE" (Dexter and Perkins 1982, p. 16); from <i>Safety Assessment with Reference to Automatic Protective Systems for Nuclear Reactors</i> (Green and Bourne 1966).
DD L	1.5E-5/HR	assumed a drain plug that leaks badly occurs at the same rate as a manual valve leaking through in closed position; "VALVE, HAND" (Dexter and Perkins 1982, p. 37); from <i>Chemistry and Industry</i> (Lees 1976).
DE M	**NLW will provide**	
DE N	**NLW will provide**	
DF A	3E-3/D	"DAMPERS, FAIL TO OPEN/CLOSE" (Eide et al. 1990, p. 19); RECOMMENDED VALUE; ERROR FACTOR-5; NUCLARR database, category 1 sources (PRAs).
DF B	3E-3/D	"DAMPERS, FAIL TO OPEN/CLOSE" (Eide et al. 1990, p. 19); RECOMMENDED VALUE; ERROR FACTOR-5; NUCLARR database, category 1 sources (PRAs).
DF C	3E-7/HR	"DAMPERS, SPURIOUS OPERATION" (Eide et al. 1990, p. 19); RECOMMENDED VALUE; ERROR FACTOR-10; Seabrook PRA.

<u>TC</u>	<u>RATE</u>	<u>SOURCE AND COMMENTS</u>
DF D	3E-7/HR	"DAMPERS, SPURIOUS OPERATION" (Eide et al. 1990, p. 19); RECOMMENDED VALUE; ERROR FACTOR-10; Seabrook PRA.
DG A	5E-5/D	"VALVES, CHECK, FAIL TO OPEN" (Eide et al. 1990, p. 11); RECOMMENDED VALUE; ERROR FACTOR-5; NUCLARR database, category 1 sources (PRAs).
DG B	1E-3/D	"VALVES, CHECK, FAIL TO CLOSE" (Eide et al. 1990, p. 11); RECOMMENDED VALUE; ERROR FACTOR-5; NUCLARR database, category 1 sources (PRAs).
DG C	1.8E-6/HR	"CHECK VALVES:, CHECK VALVE @@@@ TRANSFERS CLOSED" (SAIC 1989).
DG D	1.2E-6/HR	"CHECK VALVES:, CHECK VALVE @@@@ TRANSFERS OPEN" (SAIC 1989).
EA M	1E-6/HR	"INSTRUMENT CONTROL AND SENSORS, FLOW ELEMENT, FAILURE" (Eide et al. 1990, p. 23); RECOMMENDED VALUE; ERROR FACTOR-10; NUCLARR database, category 1 sources (PRAs).
EA N	1E-6/HR	"INSTRUMENT CONTROL AND SENSORS, FLOW ELEMENT, FAILURE" (Eide et al. 1990, p. 23); RECOMMENDED VALUE; ERROR FACTOR-10; NUCLARR database, category 1 sources (PRAs).
EA O	1E-6/HR	"INSTRUMENT CONTROL AND SENSORS, FLOW ELEMENT, FAILURE" (Eide et al. 1990, p. 23); RECOMMENDED VALUE; ERROR FACTOR-10; NUCLARR database, category 1 sources (PRAs).
EB O	2.7E-4/HR	assumed Hanford's leak detection elements were essentially electrical conductivity probes; "LEVEL MEASUREMENTS (LIQUIDS), ELECTRICAL CONDUCTIVITY PROBES" (Dexter and Perkins 1982, p. 19); from <i>Chemistry and Industry</i> (Lees 1976).
EC M	2.5E-5/HR	"LEVEL MEASUREMENTS (LIQUIDS), CAPACITANCE-TYPE LEVEL TRANSDUCER" (Dexter and Perkins 1982, p. 19); from <i>Chemistry and Industry</i> (Lees 1976).
EC N	2.5E-5/HR	"LEVEL MEASUREMENTS (LIQUIDS), CAPACITANCE-TYPE LEVEL TRANSDUCER" (Dexter and Perkins 1982, p. 19); from <i>Chemistry and Industry</i> (Lees 1976).
EC O	2.5E-5/HR	"LEVEL MEASUREMENTS (LIQUIDS), CAPACITANCE-TYPE LEVEL TRANSDUCER" (Dexter and Perkins 1982, p. 19); from <i>Chemistry and Industry</i> (Lees 1976).
ED M	1.6E-4/HR	"PRESSURE MEASUREMENTS" (Dexter and Perkins 1982, p. 21); from <i>Chemistry and Industry</i> (Lees 1976).
ED N	1.6E-4/HR	"PRESSURE MEASUREMENTS" (Dexter and Perkins 1982, p. 21); from <i>Chemistry and Industry</i> (Lees 1976).

<u>TC</u>	<u>RATE</u>	<u>SOURCE AND COMMENTS</u>
ED O	1.6E-4/HR	"PRESSURE MEASUREMENTS" (Dexter and Perkins 1982, p. 21); from <i>Chemistry and Industry</i> (Lees 1976).
EE M	1.6E-5/HR	"SCINTILLATION DETECTOR" (Dexter and Perkins 1982, p. 24); from NUREG/CR-0942 (NRC 1979).
EE N	1.6E-5/HR	"SCINTILLATION DETECTOR" (Dexter and Perkins 1982, p. 24); from NUREG/CR-0942 (NRC 1979).
EE O	1.6E-5/HR	"SCINTILLATION DETECTOR" (Dexter and Perkins 1982, p. 24); from NUREG/CR-0942 (NRC 1979).
EF O	6.7E-7/HR	IEEE-500-84 (IEEE 1984, p. 614); "8.10 SEISMIC INSTRUMENTATION, CATASTROPHIC, NO CHANGE OF OUTPUT WITH CHANGE OF INPUT".
EG M	4E-5/HR	"TEMPERATURE MEASUREMENTS (EXCLUDING PYROMETERS)" (Dexter and Perkins 1982, p. 28); from <i>Chemistry and Industry</i> (Lees 1976).
EG N	4E-5/HR	"TEMPERATURE MEASUREMENTS (EXCLUDING PYROMETERS)" (Dexter and Perkins 1982, p. 28); from <i>Chemistry and Industry</i> (Lees 1976).
EG O	4E-5/HR	"TEMPERATURE MEASUREMENTS (EXCLUDING PYROMETERS)" (Dexter and Perkins 1982, p. 28); from <i>Chemistry and Industry</i> (Lees 1976).
FA F	5E-3/D	"FANS, VENTILATORS, FAIL TO START" (Eide et al. 1990, p. 19); RECOMMENDED VALUE; ERROR FACTOR-5; Value from NUCLARR category 1 sources.
FA G	3E-5/HR	"FANS, VENTILATORS, FAIL TO RUN" (Eide et al. 1990, p. 19); RECOMMENDED VALUE; ERROR FACTOR-10; Value from NUCLARR category 1 sources.
FB E	1E-5/HR	"FILTERS, PLUG" (Eide et al. 1990, p. 19); RECOMMENDED VALUE; ERROR FACTOR-10; value from IEEE Std-500 (IEEE 1984).
FB L	1E-6/HR	"FILTERS, LEAKAGE" (Dexter and Perkins 1982, p. 16); from <i>Safety Assessment with Reference to Automatic Protective Systems for Nuclear Reactors</i> (Green and Bourne 1966).
FC E	1.4E-8/HR	"HEPA FILTERS, FUEL FABRICATION FACILITY" (Dexter and Perkins 1982, p. 18); from source EPRI NP-1128. <i>Status Report on the EPRI Fuel Cycle Accident Risk Assessment</i> (July 1979).
FC L	1.4E-8/HR	"HEPA FILTERS, FUEL FABRICATION FACILITY" (Dexter and Perkins 1982, p. 18); from source EPRI NP-1128. <i>Status Report on the EPRI Fuel Cycle Accident Risk Assessment</i> (July 1979).

<u>TC</u>	<u>RATE</u>	<u>SOURCE AND COMMENTS</u>
FD D	1E-7/HR	"FUSES, PREMATURE OPENING" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-10; NUCLARR database, category 3 sources (IEEE, NPRD-3).
FE F	3E-2/D	assumed the values for emergency diesel (complete plant) would be conservatively assigned to diesel powered equipment; "4.6 EMERGENCY DIESEL (COMPLETE PLANT), 4.6.1 FAILURE TO START" (Carlson 1983, p. 128); MEAN VALUE; ERROR FACTOR-3.
FE G	3E-5/HR	assumed the rate for failure to run was the same as for the comparable electrical motor-driven component; "FANS, VENTILATORS, FAIL TO RUN" (Eide et al. 1990, p. 19); RECOMMENDED VALUE; ERROR FACTOR-10; Value from NUCLARR category 1 sources.
GA L	3E-5/HR	"GASKETS, EXTERNAL LEAKAGE" (Eide et al. 1990, p. 13); RECOMMENDED VALUE; ERROR FACTOR-30; From WASH-1400 (NRC 1975).
GB F	3E-2/D	"4.6 EMERGENCY DIESEL (COMPLETE PLANT), 4.6.1 FAILURE TO START" (Carlson 1983, p. 128); MEAN VALUE; ERROR FACTOR-3.
GB G	3E-3/HR	"4.6 EMERGENCY DIESEL (COMPLETE PLANT), 4.6.2 FAILURE TO RUN, GIVEN START (EMERGENCY CONDITIONS)" (Carlson 1983, p. 128); MEAN VALUE; ERROR FACTOR-10.
HA 4	1E-6/HR	"HEAT EXCHANGERS, TUBE (PER UNIT), LEAKAGE" (Eide et al. 1990, p. 12); RECOMMENDED VALUE; ERROR FACTOR-10; From NUCLARR category 1 sources. Based on no failures.
HA 5	3E-7/HR	"HEAT EXCHANGERS, TUBE (PER UNIT), PLUG" (Eide et al. 1990, p. 12); RECOMMENDED VALUE; ERROR FACTOR-10; From NUCLARR category 1 sources. Based on no failures.
HA L	3E-7/HR	"HEAT EXCHANGERS, SHELL, EXTERNAL LEAKAGE" (Eide et al. 1990, p. 12); RECOMMENDED VALUE; ERROR FACTOR-10; From NUCLARR category 1 sources. Based on no failures.
HA P	2E-5/HR	" HEAT EXCHANGER @@@@ COOLING CAPABILITY FAILS" (SAIC 1989); failure assumed to be due to corrosion.
HB M	1E-6/HR	"HEATERS, AIR, OVERHEAT" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-10; IEEE Std-500 (IEEE 1984).
HB N	5E-6/HR	"HEATERS, AIR, FAIL TO HEAT" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-10; IEEE Std-500 (IEEE 1984).

<u>TC</u>	<u>RATE</u>	<u>SOURCE AND COMMENTS</u>
IA M	1.4E-6/HR	"INSTRUMENT CONTROL AND SENSORS, INDICATOR, FAILURE" (Eide et al. 1990, p. 23); IEEE Std-500 VALUE (IEEE 1984); ERROR FACTOR-2.
IA N	1.4E-6/HR	"INSTRUMENT CONTROL AND SENSORS, INDICATOR, FAILURE" (Eide et al. 1990, p. 23); IEEE Std-500 VALUE (IEEE 1984); ERROR FACTOR-2.
IB M	1.4E-6/HR	"INSTRUMENT CONTROL AND SENSORS, INDICATOR, FAILURE" (Eide et al. 1990, p. 23); IEEE Std-500 VALUE (IEEE 1984); ERROR FACTOR-2.
IB N	1.4E-6/HR	"INSTRUMENT CONTROL AND SENSORS, INDICATOR, FAILURE" (Eide et al. 1990, p. 23); IEEE Std-500 VALUE (IEEE 1984); ERROR FACTOR-2.
IB O	1.4E-6/HR	"INSTRUMENT CONTROL AND SENSORS, INDICATOR, FAILURE" (Eide et al. 1990, p. 23); IEEE Std-500 VALUE (IEEE 1984); ERROR FACTOR-2.
IC M	1.4E-6/HR	"INSTRUMENT CONTROL AND SENSORS, INDICATOR, FAILURE" (Eide et al. 1990, p. 23); IEEE Std-500 VALUE (IEEE 1984); ERROR FACTOR-2.
IC N	1.4E-6/HR	"INSTRUMENT CONTROL AND SENSORS, INDICATOR, FAILURE" (Eide et al. 1990, p. 23); IEEE Std-500 VALUE (IEEE 1984); ERROR FACTOR-2.
IC O	1.4E-6/HR	"INSTRUMENT CONTROL AND SENSORS, INDICATOR, FAILURE" (Eide et al. 1990, p. 23); IEEE Std-500 VALUE (IEEE 1984); ERROR FACTOR-2.
ID M	1.4E-6/HR	"INSTRUMENT CONTROL AND SENSORS, INDICATOR, FAILURE" (Eide et al. 1990, p. 23); IEEE Std-500 VALUE (IEEE 1984); ERROR FACTOR-2.
ID N	1.4E-6/HR	"INSTRUMENT CONTROL AND SENSORS, INDICATOR, FAILURE" (Eide et al. 1990, p. 23); IEEE Std-500 VALUE (IEEE 1984); ERROR FACTOR-2.
ID O	1.4E-6/HR	"INSTRUMENT CONTROL AND SENSORS, INDICATOR, FAILURE" (Eide et al. 1990, p. 23); IEEE Std-500 VALUE (IEEE 1984); ERROR FACTOR-2.
LA P	1E-3/D	RISK ASSESSMENT TECHNOLOGY SECTION, ENGINEERING JUDGEMENT.
MA 3	6.4E-7/HR	" LEVEL SWITCHES, TRANSMITTERS:, SIGNAL PROCESSOR MODULE @@@@@ FAILS LOW" (SAIC 1989); assumed a signal processor module was equivalent to a control module & assumed that 'fails low' is equivalent to 'gives spurious signal'.

<u>TC</u>	<u>RATE</u>	<u>SOURCE AND COMMENTS</u>
MA P	6.4E-7/HR	" LEVEL SWITCHES, TRANSMITTERS:, SIGNAL PROCESSOR MODULE @@@@@ FAILS LOW" (SAIC 1989); assumed a signal processor module was equivalent to a control module.
MB 3	3.9E-6/HR	" LOGIC CIRCUITS:, LOGIC CIRCUIT @@@@@ GENERATES FALSE HI OR LOW OUTPUT" (SAIC 1989); assumed a logic circuit was equivalent to a logic module & assumed that 'generates false hi or low output' is equivalent to 'gives spurious signal'.
MB P	3.9E-6/HR	" LOGIC CIRCUITS:, LOGIC CIRCUIT @@@@@ FAILS TO GENERATE SIGNAL" (SAIC 1989); assumed a logic circuit was equivalent to a logic module.
MC P	5E-6/HR	assumed that an amplifier failure rate was representative of a CRT monitor; "AMPLIFIER, FAILURE" (Eide et al. 1990, p. 23); RECOMMENDED VALUE; ERROR FACTOR-10; Seabrook PRA.
NA E	6E-6/HR	"NOZZLE AND FLAPPER ASSEMBLIES, BLOCKAGE" (Dexter and Perkins 1982, p. 21); from <i>Safety Assessment with Reference to Automatic Protective Systems for Nuclear Reactors</i> (Green and Bourne 1966).
NA P	2E-7/HR	assumed 'nozzle breakage' would cause a nozzle to 'fail to discharge as designed'; "NOZZLES AND FLAPPER ASSEMBLIES, BREAKAGE" (Dexter and Perkins 1982, p. 21); from <i>Safety Assessment with Reference to Automatic Protective Systems for Nuclear Reactors</i> (Green and Bourne 1966).
OA Q	**SEL will provide on a case by case basis**	
OA R	**SEL will provide on a case by case basis**	
OA T	**SEL will provide on a case by case basis**	
OA U	**SEL will provide on a case by case basis**	
PA E	5E-10/HR-FT	"PIPES, 1-3 INCH (PER FOOT), PLUG" (Eide et al. 1990, p. 12); RECOMMENDED VALUE; ERROR FACTOR-30; From WASH-1400 (NRC 1975).
PA L	1E-8/HR-FT	"PIPES, 1-3 INCH (PER FOOT), LEAKAGE" (Eide et al. 1990, p. 12); RECOMMENDED VALUE; ERROR FACTOR-30; From WASH-1400 (NRC 1975).
PB L	1.2E-6/HR	assumed this referenced failure rate was representative of pit structure leak or rupture; "-STRUCTURAL FUNCTION ITEMS, EXTERNAL LEAKAGE" (Eide et al. 1990, p. 27); CATEGORY 3 (OTHER) VALUE.
PC N	2.4E-6/HR	conservatively took the high failure rate for power supplies from SRP reference (Dexter and Perkins 1982, p. 21); "POWER SUPPLIES, ELECTRONIC-OTHER"; from NUREG/CR-0942 (NRC 1979).

<u>TC</u>	<u>RATE</u>	<u>SOURCE AND COMMENTS</u>
PC O	2.4E-6/HR	conservatively took the high failure rate for power supplies from SRP reference (Dexter and Perkins 1982, p. 21); "POWER SUPPLIES, ELECTRONIC-OTHER"; from NUREG/CR-0942 (NRC 1979)..
PD F	3E-3/D	"PUMPS, MOTOR-DRIVEN, FAIL TO START" (Eide et al. 1990, p. 12); RECOMMENDED VALUE; ERROR FACTOR-5; From NUCLARR category 1 sources.
PD G	3E-5/HR	"PUMPS, MOTOR-DRIVEN, FAIL TO RUN" (Eide et al. 1990, p. 12); RECOMMENDED VALUE; ERROR FACTOR-10; From NUCLARR category 1 sources.
PE E	5E-11/HR-FT	"PIPES, > 3 INCH (PER FOOT), PLUG" (Eide et al. 1990, p. 12); RECOMMENDED VALUE; ERROR FACTOR-30; From WASH-1400 (NRC 1975).
PE L	1E-9/HR-FT	"PIPES, > 3 INCH (PER FOOT), LEAKAGE" (Eide et al. 1990, p. 12); RECOMMENDED VALUE; ERROR FACTOR-30; From WASH-1400 (NRC 1975).
RA H	3.9E-7/HR	"RELAYS:, DEENERGIZED RELAY @@@@ TRANSFERS TO ENERGIZED POSITION OR ENERGIZED RELAY @@@@ TRANSFERS TO DEENERGIZED POSITION" (SAIC 1989); assumed the above failure modes were equivalent to 'relay spuriously changes state'.
RA I	7.6E-5/D	"RELAYS:, RELAY @@@@ FAILS TO DEENERGIZE OR ENERGIZE" (SAIC 1989); assumed the above failure modes are equivalent to 'relay fails to change state on demand'.
SA L	7E-6/HR	conservatively took the high failure rate for seals from the SRP reference (Dexter and Perkins 1982); "SEALS, ROTATING"; from <i>Safety Assessment with Reference to Automatic Protective Systems for Nuclear Reactors</i> (Green and Bourne 1966).
SC 3	1E-6/HR	applied the recommended value for switches from EG&G to all types of switches; "SWITCHES, GENERAL, SPURIOUS OPERATION" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-10; IEEE Std-500 (IEEE 1984).
SC I	3E-5/D	applied the most conservative value for switches from EG&G to all types of switches; "SWITCHES, LIMIT, FAIL TO OPEN OR CLOSE" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-5; NUCLARR database, category 1 sources (PRAs).
SD 3	1E-6/HR	applied the recommended value for switches from EG&G to all types of switches; "SWITCHES, GENERAL, SPURIOUS OPERATION" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-10; IEEE Std-500 (IEEE 1984).

<u>TC</u>	<u>RATE</u>	<u>SOURCE AND COMMENTS</u>
SD I	3E-5/D	applied the most conservative value for switches from EG&G to all types of switches; "SWITCHES, LIMIT, FAIL TO OPEN OR CLOSE" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-5; NUCLARR database, category 1 sources (PRAs).
SE 3	1E-6/HR	applied the recommended value for switches from EG&G to all types of switches; "SWITCHES, GENERAL, SPURIOUS OPERATION" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-10; IEEE Std-500 (IEEE 1984).
SE I	3E-5/D	applied the most conservative value for switches from EG&G to all types of switches; "SWITCHES, LIMIT, FAIL TO OPEN OR CLOSE" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-5; NUCLARR database, category 1 sources (PRAs).
SF 3	1E-6/HR	applied the recommended value for switches from EG&G to all types of switches; "SWITCHES, GENERAL, SPURIOUS OPERATION" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-10; IEEE Std-500 (IEEE 1984).
SF I	3E-5/D	applied the most conservative value for switches from EG&G to all types of switches; "SWITCHES, LIMIT, FAIL TO OPEN OR CLOSE" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-5; NUCLARR database, category 1 sources (PRAs).
SG 3	1E-6/HR	applied the recommended value for switches from EG&G to all types of switches; "SWITCHES, GENERAL, SPURIOUS OPERATION" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-10; IEEE Std-500 (IEEE 1984).
SG I	3E-5/D	applied the most conservative value for switches from EG&G to all types of switches; "SWITCHES, LIMIT, FAIL TO OPEN OR CLOSE" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-5; NUCLARR database, category 1 sources (PRAs).
SH 3	1E-6/HR	applied the recommended value for switches from EG&G to all types of switches; "SWITCHES, GENERAL, SPURIOUS OPERATION" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-10; IEEE Std-500 (IEEE 1984).
SH I	3E-5/D	applied the most conservative value for switches from EG&G to all types of switches; "SWITCHES, LIMIT, FAIL TO OPEN OR CLOSE" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-5; NUCLARR database, category 1 sources (PRAs).
SI 3	1E-6/HR	applied the recommended value for switches from EG&G to all types of switches; "SWITCHES, GENERAL, SPURIOUS

<u>TC</u>	<u>RATE</u>	<u>SOURCE AND COMMENTS</u>
		OPERATION" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-10; IEEE Std-500 (IEEE 1984).
SI I	3E-5/D	applied the most conservative value for switches from EG&G to all types of switches; "SWITCHES, LIMIT, FAIL TO OPEN OR CLOSE" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-5; NUCLARR database, category 1 sources (PRAs).
SJ 3	1E-6/HR	applied the recommended value for switches from EG&G to all types of switches; "SWITCHES, GENERAL, SPURIOUS OPERATION" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-10; IEEE Std-500 (IEEE 1984).
SJ I	3E-5/D	applied the most conservative value for switches from EG&G to all types of switches; "SWITCHES, LIMIT, FAIL TO OPEN OR CLOSE" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-5; NUCLARR database, category 1 sources (PRAs).
TA L	1.6E-6/HR	"TANKS, STORAGE" (Dexter and Perkins 1982, p. 28); from <i>Nonelectronic Parts Reliability Data</i> (Fulton 1978).
TC P	1E-6/HR	"TRANSFORMERS, STATION SERVICE or MAIN POWER or INSTRUMENT, FAILURE" (Eide et al. 1990, p. 22); RECOMMENDED VALUE; ERROR FACTOR-10; NUCLARR database, category 1 sources (PRAs).
TD 3	3E-6/HR	"INSTRUMENT CONTROL AND SENSORS, FLOW TRANSMITTER, FAILURE" (Eide et al. 1990, p. 23); RECOMMENDED VALUE; ERROR FACTOR-10; NUCLARR database, category 1 sources (PRAs).
TD P	3E-6/HR	"INSTRUMENT CONTROL AND SENSORS, FLOW TRANSMITTER, FAILURE" (Eide et al. 1990, p. 23); RECOMMENDED VALUE; ERROR FACTOR-10; NUCLARR database, category 1 sources (PRAs).
TE 3	3E-6/HR	"INSTRUMENT CONTROL AND SENSORS, LEVEL TRANSMITTER, FAILURE" (Eide et al. 1990, p. 23); RECOMMENDED VALUE; ERROR FACTOR-10; NUCLARR database, category 1 sources (PRAs).
TE P	3E-6/HR	"INSTRUMENT CONTROL AND SENSORS, LEVEL TRANSMITTER, FAILURE" (Eide et al. 1990, p. 23); RECOMMENDED VALUE; ERROR FACTOR-10; NUCLARR database, category 1 sources (PRAs).
TF 3	3E-6/HR	"INSTRUMENT CONTROL AND SENSORS, PRESSURE TRANSMITTER, FAILURE" (Eide et al. 1990, p. 23); RECOMMENDED VALUE; ERROR FACTOR-10; NUCLARR database, category 1 sources (PRAs).

<u>TC</u> <u>RATE</u>	<u>SOURCE AND COMMENTS</u>
TF P 3E-6/HR	"INSTRUMENT CONTROL AND SENSORS, PRESSURE TRANSMITTER, FAILURE" (Eide et al. 1990, p. 23); RECOMMENDED VALUE; ERROR FACTOR-10; NUCLARR database, category 1 sources (PRAs).
TG 3 3E-6/HR	"INSTRUMENT CONTROL AND SENSORS, TEMPERATURE TRANSMITTER, FAILURE" (Eide et al. 1990, p. 23); RECOMMENDED VALUE; ERROR FACTOR-10; NUCLARR database, category 1 sources (PRAs).
TG P 3E-6/HR	"INSTRUMENT CONTROL AND SENSORS, TEMPERATURE TRANSMITTER, FAILURE" (Eide et al. 1990, p. 23); RECOMMENDED VALUE; ERROR FACTOR-10; NUCLARR database, category 1 sources (PRAs).
TH P 4.3E-5/HR	"TIMER, ELECTRO-MECHANICAL, TIME TOTALIZING" (Dexter and Perkins 1982, p. 28); <i>Nonelectronic Parts Reliability Data</i> (Fulton 1978).
UA N 1.3E-4/HR	assumed 'no output' failure rate would be appropriate for 'low power output' also; "UNINTERRUPTIBLE POWER SUPPLY, NO OUTPUT (SAIC 1990, p. 32); Seabrook Probabilistic Risk Assessment.
UA O 1.3E-4/HR	"UNINTERRUPTIBLE POWER SUPPLY, NO OUTPUT" (SAIC 1990, p. 32); Seabrook Probabilistic Risk Assessment.
VA A 1.4E-4/D	"CHECK VALVES:, CHECK VALVE @@@@@ FAILS TO OPEN" (SAIC 1989).
VA B 1.4E-3/D	"CHECK VALVES:, CHECK VALVE @@@@@ FAILS TO CLOSE" (SAIC 1989).
VA C 1.8E-6/HR	"CHECK VALVES:, CHECK VALVE @@@@@ TRANSFERS CLOSED" (SAIC 1989).
VA D 1.2E-6/HR	"CHECK VALVES:, CHECK VALVE @@@@@ TRANSFERS OPEN" (SAIC 1989).
VB P 1.1E-5/HR	assumed that a flow control (self-regulating) valve is constantly opening and closing to adjust flow and is thus represented by a failure to transfer, also assumed that the SAIC-GDB value for a pressure control valve would be appropriate for a flow control (self-regulating) valve (SAIC 1989); "PRESSURE CONTROL VALVES:, PRESSURE CONTROL VALVE @@@@@ TRANSFERS OPEN".
VC A 2.2E-3/D	"AIR-OPERATED VALVES:, AIR-OPERATED VALVE @@@@@ FAILS TO OPEN" (SAIC 1989).
VC B 2.2E-3/D	"AIR-OPERATED VALVES:, AIR-OPERATED VALVE @@@@@ FAILS TO CLOSE" (SAIC 1989).

<u>TC</u> <u>RATE</u>	<u>SOURCE AND COMMENTS</u>
VC C 3.0E-6/HR	" AIR-OPERATED VALVES:, AIR-OPERATED VALVE @@@@@@ TRANSFERS CLOSED" (SAIC 1989).
VC D 3.0E-6/HR	" AIR-OPERATED VALVES:, AIR-OPERATED VALVE @@@@@@ TRANSFERS OPEN" (SAIC 1989).
VD A 2.9E-4/D	" MANUAL VALVES:, MANUAL VALVE @@@@@@ FAILS TO OPEN" (SAIC 1989).
VD B 2.9E-4/D	" MANUAL VALVES:, MANUAL VALVE @@@@@@ FAILS TO CLOSE" (SAIC 1989).
VD C 1.5E-7/HR	" MANUAL VALVES:, MANUAL VALVE @@@@@@ TRANSFERS CLOSED" (SAIC 1989).
VD D 9.4E-8/HR	" MANUAL VALVES:, MANUAL VALVE @@@@@@ TRANSFERS OPEN" (SAIC 1989).
VE A 4.7E-3/D	" MOTOR-OPERATED VALVES:, MOTOR-OPERATED VALVE @@@@@@ FAILS TO OPEN" (SAIC 1989).
VE B 5.6E-3/D	" MOTOR-OPERATED VALVES:, MOTOR-OPERATED VALVE @@@@@@ FAILS TO CLOSE" (SAIC 1989).
VE C 1.5E-6/HR	" MOTOR-OPERATED VALVES:, MOTOR-OPERATED VALVE @@@@@@ TRANSFERS CLOSED" (SAIC 1989).
VE D 1.4E-6/HR	" MOTOR-OPERATED VALVES:, MOTOR-OPERATED VALVE @@@@@@ TRANSFERS OPEN" (SAIC 1989).
VF A 2.1E-4/D	" RELIEF, SAFETY VALVES:, RELIEF VALVE @@@@@@ FAILS TO OPEN" (SAIC 1989).
VF B 5.2E-3/D	" RELIEF, SAFETY VALVES:, RELIEF VALVE @@@@@@ FAILS TO CLOSE" (SAIC 1989).
VF D 1.7E-6/HR	" RELIEF, SAFETY VALVES:, RELIEF VALVE @@@@@@ TRANSFERS OPEN" (SAIC 1989).
VG A 2.8E-3/D	" SOLENOID VALVES:, SOLENOID VALVE @@@@@@ FAILS TO OPEN" (SAIC 1989).
VG B 2.8E-3/D	" SOLENOID VALVES:, SOLENOID VALVE @@@@@@ FAILS TO CLOSE" (SAIC 1989).
VG C 4.1E-7/HR	" SOLENOID VALVES:, SOLENOID VALVE @@@@@@ TRANSFERS CLOSED" (SAIC 1989).
VG D 4.1E-7/HR	" SOLENOID VALVES:, SOLENOID VALVE @@@@@@ TRANSFERS OPEN" (SAIC 1989).

<u>TC</u>	<u>RATE</u>	<u>SOURCE AND COMMENTS</u>
VH A	3E-3/D	"DAMPERS, FAIL TO OPEN/CLOSE" (Eide et al. 1990, p. 19); RECOMMENDED VALUE; ERROR FACTOR-5; Value from NUCLARR category 1 sources.
VH B	3E-3/D	"DAMPERS, FAIL TO OPEN/CLOSE" (Eide et al. 1990, p. 19); RECOMMENDED VALUE; ERROR FACTOR-5; Value from NUCLARR category 1 sources.
VH C	5.1E-6/HR	" BACKFLOW AIR DAMPERS; BACKFLOW AIR DAMPER @@@@ TRANSFERS CLOSED OR OPEN" (SAIC 1989).
VH D	5.1E-6/HR	" BACKFLOW AIR DAMPERS; BACKFLOW AIR DAMPER @@@@ TRANSFERS CLOSED OR OPEN" (SAIC 1989).
WA 1	3E-6/HR	"WIRING, OPEN CIRCUIT" (Dexter and Perkins 1982, p. 39); from WASH-1400 (NRC 1975).
WA 2	3E-7/HR	"WIRING, SHORT GROUND" (Dexter and Perkins 1982, p. 39); from WASH-1400 (NRC 1975).

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APPENDIX B

**FAILURE RATE ASSUMPTIONS,
UNAVAILABILITY AND UNRELIABILITY TIME ASSUMPTIONS,
AND DATA JUSTIFICATION**

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B.1 CASE SY1A - H₂ EXPLOSION IN TANK 101-SY WITH VENTILATION FLOW

KEY: T = 101-SY

CAFTA formula 3 = $1 - e^{-\lambda t}$ [approximation= λt]CAFTA formula 4 = $\lambda \tau / (\lambda \tau + 1) = 1 - (\text{MTBF}) / (\text{MTBF} + \text{MTTR})$ [approximation= $\lambda \tau$]CAFTA formula 5 = $1 + (1/\lambda \tau)(e^{-\lambda \tau} - 1)$ [approximation= $\lambda \tau / 2$]MTBF = Mean Time Between Failure = $1/\lambda$

MTTR = Mean Time to Repair

<u>BASIC EVENT</u>	<u>λ OR PROB.</u>	<u>τ (tau) or t</u>	<u>DISCUSSION</u>
IE-101	3.65/YR	NONE	BURPS PER YEAR IN 101-SY.
T1153A	0.00001	NONE	ELECTROSTATIC SPARKS FROM LESS-THAN-SUFFICIENT BONDING/GROUNDING OF TANK RISERS; Operators performing approved actions at 101-SY will assume that all exposed tank risers/riser covers will be naturally bonded to ground. Operator action in the SY Tank Farm is assumed to have a probability of 1.0. Thus, for electrostatic sparks to occur, the natural bonding/grounding mechanism must fail due to insulating properties of dry soil or riser cover gasket materials. Since the exact mechanism is not known as to the failure of the natural bonding/grounding pathways, a probability of failure is assumed to be 0.00001.
T1155A	0.0001	DEMAND	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE; Assumed a probability of 1/1000 for each burp that a metal support will break during a burp. Also assume a probability of 1/10 given a break that a mechanical spark will be produced. The concern with the existence of mechanical sparks before a burp is not considered possible because mechanical sparks are momentary. Failures on demand do not require a tau or t value.
T1155B	0.0001	DEMAND	MECHANICAL SPARKS FROM SLUDGE WEIGHT/CABLE STRIKING SAMPLING TUBES; Assumed a probability of 1/10 for each burp that the sludge weight and/or cable will strike the sampling tubes in 101-SY once during a burp. Assumed a probability of 1/1000 that mechanical sparks will be produced when the sludge weight/cable strikes the sampling tubes. A concern with the existence of mechanical sparks before a burp is not considered possible because

mechanical sparks are momentary and the burp is the mechanism for interaction of the sludge weight/cable and the sampling tubes. Failures on demand do not require a tau or t value.

T1156A 5E-8/H 2400H

ELECTRICAL SPARKS FROM FOOD INSTRUMENT CORPORATION (FIC) LEVEL PROBE; At least three failures are required to cause a spark. WHC-SD-WM-ES-176 reports that failure of both 50,000-ohm resistors could result in enough energy in the system to be an ignition source. Subsequent communications with the author of WHC-SD-WM-ES-176 resulted in the conclusion that a third failure must occur to create enough current for a sufficient spark. It is assumed that a spark is a normally occurring event as the probe approaches the waste level and retracts on 1-min intervals. Using the Military Handbook MIL-HDBK-217 and conservative assumptions it is estimated that the failure of one 50,000-ohm resistor occurs at 5E-7/H (this would be a failure that shorts across the resistor; some resistor types are not prone to this kind of failure). If it is assumed that the 1,000-ohm resistor or the transformer must fail shorted in conjunction with the two 50,000-ohm resistors, then a common cause failure results in the three resistors failing or the two 50,000-ohm resistors and the transformer failing. A Beta factor of 0.1 was estimated for the common cause failure of either all three resistors or both 50,000-ohm resistors and the transformer, since the failures would be highly correlated. This results in an estimate of 5E-8/H. The FIC will continue to function given the above failures. It is assumed that the tau for time between tests (thus detection) is 100 days (2,400 hours), average time between burps. Thus, Computer-Aided Fault Tree Analysis (CAFTA) formula 5 will be used. This type of failure is detectable only if the low or high liquid level setpoints are reached. However, if an arc were to occur, it would go undetected. The fact that the FIC could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

T1156B 8E-10/H 2400H

ELECTRICAL SPARKS FROM SLACK TAPE DETECTOR FAULT; WHC-SD-WM-ES-176 reports that at least two single component failures exist that would make this device capable of ignition. However, since that document was initially written, an isolating device has been installed in the system. It is assumed that the microswitch associated with the slack tape detector system and located in the tank would become a spark source if the power was high enough. The failure of a 1,000-ohm resistor or the transformer (either one) and the failure of the isolating device would cause this condition. Since the functional element in the isolating device is a transformer, it is assumed that common cause failure of both transformers is the most likely failure. IEEE-500 reports a frequency of $8.3E-8/H$ (on page 316) for transformers with catastrophic failures (shorts). Using a Beta factor of 0.01, because the isolating device has some enhancements, results in an estimate $8.3E-10/H$. The slack tape detector will continue to function undetected given the above failures. It is assumed that the tau for time between failure detection is 100 days (2,400 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the slack tape detector could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

T1156C 5E-7/H 24H

ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE; WHC-SD-WM-ES-176 reports that the worst single fault in this system is shorting of a 4,300-ohm resistor in the portable EMCO VOM-Multitester. It is assumed that a spark normally occurs as the probe approaches the waste. A frequency of $5E-7/H$ is estimated as the failure rate for this resistor. Accordingly, the estimated frequency of electrical sparks from the manual level probe is $5E-7/H$. A daily reading is made using the manual level probe. A 4,300-ohm resistor failure scenario would be detected almost immediately because the ohmmeter would "peg." The faulty ohmmeter would be replaced with a new ohmmeter. It is assumed that the tau for time between

failure detection is 24 hours, time between manual tape readings. Thus, CAFTA formula 5 will be used. The fact that the 4,300-ohm resistor could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

T1156D 1E-6/H 720H

ELECTRICAL SPARKS FROM EXPLOSION-PROOF LIGHT OR LIGHT LEAD FAULTS; Since sparks from either explosion-proof lights or light leads require two failures that are not well understood, a frequency of failure for this event is assumed at 1E-6/H. Because the failure modes are not well understood, it is assumed that the lights continue to operate and produce sparks; the tau for time between failure detection is 30 days (720 hours), time before burp camera is used. Thus, CAFTA formula 5 will be used. The fact that the lights or light leads could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

T1156F1 1E-6/H 720H

ELECTRICAL SPARKS FROM VIDEO CAMERA; The starting point assumption is the same failure rate as for type code CA 2 in the HANF-TC.TC database for Electrical Cable Short Circuits to Ground (5E-6/H). The cable short to ground assumes that the positive lead insulation breaks down and the wire shorts to a bare ground wire. For the component to fail such that a spark occurs the CA 2 failure rate is assumed to be reduced to 1.0E-6/H. The camera is turned on for a couple of hours every week but prior to a burp the camera is to be turned on for about a month preceding the burp. Because the failure modes are not well understood, it is assumed that the lights continue to operate and produce sparks; the tau for time between failure detection is 30 days (720 hours), time before burp that the camera is used. Thus, CAFTA formula 5 will be used. The fact that the video camera could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

T1156G	1E-8/H	24H	<p>ELECTRICAL SPARKS FROM RADAR GAUGE FAULT; Since sufficient sparks from the radar gauge antenna head would require a short in the antenna head and at least three unknown failures in the radar field interface unit (per Factory Mutual testing), then a failure rate of 1E-8/H is assumed. Given a couple of the postulated failures mentioned above, the radar gauge will produce bad or no readings. The tau for time between failure detection is 24 hours, time before bad or no readings are noticed. Thus, CAFTA formula 5 will be used. The fact that the radar gauge could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.</p>
T1156H	1E-8/H	24H	<p>ELECTRICAL SPARKS FROM THERMOCOUPLES; WHC-SD-WM-ES-176 reports that it would require at least two failures to make this device capable (enough energy) of ignition. In addition to being capable of ignition, some degradation of the thermocouple wire or a leak in the pipe containing the thermocouple would be required to produce a spark. One of three thermocouple monitoring subsystems could have multiple failures resulting in sufficient energy for ignition. One of the subsystems involves the Auto-Guard circuit. The Auto-Guard circuit is connected to the Computer-Automated Surveillance System (CASS) monitoring of the thermocouples. If the Auto-Guard Circuit fails allowing the voltage with respect to ground to increase and one of the thermocouple leads becomes shorted to the guard shield then enough energy is present for ignition. The other two subsystems, Wavetek and manual 115-V powered ohmmeter, could have multiple failures of similar failure frequency. A common cause failure related to both the Auto-Guard Circuit and the shorting of the thermocouple wire is credible. Short circuits for electrical wire (WA2) and electrical cable (CA2) vary from 3E-7/H to 5E-6/H, respectively, in the Hanford Type Code Database. The value chosen for this analysis was 1E-6/H. Calculations using a Beta factor of 0.1 result in a frequency of 1E-7/H that the thermocouple becomes</p>

capable of ignition. Since the thermocouples are not sheathed, it is conservatively estimated that the pipe or thermocouple physically degrade to the point of failure at the time of the common cause failure with a probability of 0.1. Accordingly, the frequency of electrical sparks from thermocouples is estimated at $1E-8/H$. The thermocouples will continue to function given the above failures. It is assumed that the tau for time between failure detection is 24 hours, average time to notice bad readings. Thus, CAFTA formula 5 will be used. The fact that the thermocouples could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

T1160A	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO_2 IN THE 101-SY VENTILATION HEADER; Given there is a flammable mixture in the tank dome space, it is assumed there is a flammable mixture in the 101-SY ventilation header with a probability of 1.0 when the ventilation is working.
T1160C	0.01	NONE	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101-SY VENT HEADER; Assumed that a flame could propagate through the sample line to the 101-SY vent header with a probability of 0.01.
T1161B2	$2E-8/H$	2400H	ELECTRICAL SPARK FROM FAULT IN TELEDYNE H_2 ANALYZER; A double failure is required to create a spark; failure of the 10-V power supply that results in >10 V and a short to ground in the analyzer (per discussions with an electrical engineer). DP-1633 lists $1.49E-6/H$ for failure of an E-E conversion power supply (page 21). Only a subset of these failures would result in too much power, but this rate can be chosen as conservative. A common cause failure of the power supply and short to ground can be postulated. Beta factors for common cause failure of electrical equipment range between 0.1 and 0.01. A factor of 0.01 is chosen because the components are not similar. This results in a total estimate of $1.5E-8/H$ for an electrical fault in the H_2 analyzer. The analyzer will continue to function undetected given the above failures. It

is assumed that the tau for time between failure detection is 100 days (2,400 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the analyzer could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

T1161B3 1E-6/H 1.6H

IGNITION SOURCE FROM CATASTROPHIC FAILURE OF TELEDYNE VACUUM PUMP (BEARINGS); DP-1633 lists failure of vacuum pumps at $2.7E-5/H$ on page 22. However, not all vacuum pump failures would be severe enough to produce sparks. IEEE-500 reports that for pumps in general, about 10 percent of all failures are classified catastrophic. It is assumed that only catastrophic failures are severe enough to produce sparks. Since these are carbon-vaned vacuum pumps, assume the catastrophic failure rate of producing sparks is reduced by a factor of 2. Accordingly, it is estimated that an ignition source from catastrophic failure of the a vacuum pump could occur at a frequency of $1.4E-6/H$. Given a catastrophic failure of the vacuum pump produces an ignition source, the vacuum pump would not continue operating. From a safety standpoint, the vacuum pump failing to pump is not a problem. Therefore, the only time this event is of concern is after a burp when a flammable mixture is in the tank ($t=1.6$ hours). Thus, CAFTA formula 3 will be used.

T1161B4 3E-5/H 2400H

ELECTRICAL SPARK FROM THE TELEDYNE VACUUM PUMP FAILURE (SEAL AND MOTOR); Based on WHC-SD-WM-ES-176, Rev. 0, page 21, "It can generally be assumed that all single phase motors are sources of ignition under all conditions." The probability of an electrical spark from the motor on the Teledyne vacuum pump is assumed to be 1.0. If a shaft seal on the vacuum pump should fail, then hydrogen could diffuse past the shaft seal to the electrical motor. The failure frequency of the sealing function of this equipment due to degradation is assumed to be $2.6E-5/H$ (which is the failure frequency for seals used in WASH-1400). The vacuum pump will continue

to function undetected given the above failure. It is assumed that the tau for time between failure detection is 100 days (2,400 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the vacuum pump seal could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

T1161B7A	1.0	NONE	ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR); Based on WHC-SD-WM-ES-176, Rev. 0, page 21, "It can generally be assumed that all single phase motors are sources of ignition under all conditions." The probability of an electrical spark from the motor on the Teledyne system vacuum pump is assumed to be 1.0.
T1162B3	1E-6/H	1.6H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CRYOGENIC VACUUM PUMP (BEARINGS); Used the same frequency value and reasoning as for T1161B3. Since the cryogenic system vacuum pump is not operated until after a burp has started, the only time this event is of concern is after a burp when a flammable mixture is in the tank ($t=1.6$ hours). Thus, CAFTA formula 3 will be used.
T1162B4	3E-5/H	4.0H	ELECTRICAL SPARK FROM THE CRYOGENIC VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same frequency value and reasoning as for T1161B4 but considered the following related to tau and t. Since the cryogenic vacuum pump is only used for 4 hours after a burp starts (according to the pump's shutdown procedure), the time that affects this event is the time the pump operated during the last burp after the flammable mixture was eliminated and the time a flammable mixture is present during the present burp. Thus, to approximate the unavailability and unreliability the time of concern is $\tau=4.0$ hours and CAFTA formula 5 will be used.
T1163B7A	1.0	NONE	ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR); Based on WHC-SD-WM-ES-176, Rev. 0, page 21, "It can generally be assumed that all single phase motors are sources of ignition under all

conditions." The probability of an electrical spark from the motor on the ammonia bubbler system vacuum pump is assumed to be 1.0.

T1163B7B	1E-6/H	1.6H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF AMMONIA BUBBLER VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1161B3.
T1163B7C	3E-5/H	8H	ELECTRICAL SPARK FROM THE AMMONIA BUBBLER VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning related to frequency of failure as for T1162B4 but consider the following related to tau and t. Since the ammonia vacuum pump is only used for 8 hours after a burp starts (according to the pump's shutdown procedure), the time that affects this event is the time the pump operated during the last burp after the flammable mixture was eliminated and the time a flammable mixture is present during the present burp. Thus, to approximate the unavailability and unreliability the time of concern is tau=8.0 hours and CAFTA formula 5 will be used.
T1170A	1E-8/H	2400H	ELECTRICAL SPARKS FROM VENT HEADER THERMOCOUPLE; Used the same frequency value and reasoning as for T1156H. The vent header thermocouple is an analytical tool not an operations tool; therefore, it is checked as desired by engineering. The thermocouples will continue to function given the failures described in T1156H. It is assumed that the tau for time between failure detection is 2,400 hours, average time between burps. CAFTA formula 5 will be used. The fact that the thermocouple could fail during time t=1.6 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.
T1170B	1E-8/H	2400H	ELECTRICAL SPARKS FROM VENT HEADER RELATIVE HUMIDITY DEVICE; Assume a value similar to T1170A.
T1173A	5E-8/H	2400H	ELECTRICAL SPARK FROM FAULT IN THE (WHITTAKER) CHEMICAL CELL H ₂ ANALYZER; It is assumed that the semi-permeable membrane on the Whittaker chemical cell ruptures and allows the electrolyte to

drain out of the cell. It is also assumed that a spark is continuously produced between the electrodes of the cell. Assume a value of $5E-8/H$ for the rate at which a semi-permeable membrane ruptures based on rate for phenolic gaskets from DP-1633, page 17. It is assumed that the tau for time between failure detection is 100 days (2,400 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the analyzer could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

T1173B $1E-6/H$ 1.6H

IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CHEMICAL CELL VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1161B3.

T1173C $5E-7/H$ 2400H

ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (BELLOWS AND MOTOR); Based on WHC-SD-WM-ES-176, Rev. 0, page 21, "It can generally be assumed that all single phase motors are sources of ignition under all conditions." The probability of an electrical spark from the motor on the chemical cell vacuum pump is assumed to be 1.0. If the bellows on the vacuum pump should fail, then hydrogen could diffuse past the shaft to the electrical motor. The failure frequency of the bellows is assumed to be $5E-7/H$. This frequency is based on a failure rate for expansion bellows in DP-1633 (page 11) of $5E-6/H$. Since the bellows on the vacuum pump are assumed to be more reliable than expansion bellows, the value from DP-1633 was reduced by a factor of ten to $5E-7/H$. Given the leak in the bellows is small, the vacuum pump could continue to function undetected given the above failure. It is assumed that the tau for time between failure detection is 100 days (2,400 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the vacuum pump bellows could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

T1180A	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO ₂ IN THE MAIN SY VENTILATION SYSTEM; Assume a probability of 1.0 that there is a flammable mixture in the main SY ventilation system given there is a flammable mixture in tank 101-SY.
T1182-1A	1E-6/H	1.6H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CONTINUOUS AIR MONITOR (CAM) VP-EXH-K1-1 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1161B3.
T1182-1B	1E-6/H	1.6H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-2 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1182-1A.
T1182-1C	3E-5/H	2400H	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for T1161B4.
T1182-1D	3E-5/H	2400H	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for T1182-1C.
T1182-3A	6E-5/H	2400H	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS; Assume piping is tubing or hose and use value from AICHE-1989, page 187, for hose ruptures at 5.7E-5/H. It is assumed that the tau for time between failure detection is 100 days (2,400 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the piping could fail during time t=1.6 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.
T1182-3C	1E-6/H	2400H	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP; Assume the value of 1E-6/H, which is the same as for T1161B3 but recognizing that some failures of vacuum pumps to operate could be from leaks. It is assumed that the tau for time between failure detection is 100 days (2,400 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the pump could fail during time t=1.6 hours (time flammable mixture is in the tank after a

burp) is disregarded because it is dominated by the tau above.

T1182-3D	1E-6/H	2400H	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP; Used the same values and reasoning as for T1182-3C.
T1182-4A	1.0	NONE	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR); Based on WHC-SD-WM-ES-176, Rev. 0, page 21, "It can generally be assumed that all single phase motors are sources of ignition under all conditions." The probability of an electrical spark from the motor on the CAM system vacuum pump is assumed to be 1.0.
T1182B	3E-7/H	2400H	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYSTEM); A flammable mixture could exist at the switch contacts anytime there is a flammable mixture in the main ventilation ductwork because no seal exists between the high-pressure side of the diaphragm and the switch. The power wires attached to the back of the snap switch are assumed to fail shorted to produce a continuous spark at a rate of 3E-7/H (WA 2 from Hanford Type Code Database). It is assumed that the tau for time between failure detection is 100 days (2,400 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the wiring could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.
T1182C	3E-7/H	2400H	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYSTEM); Used the same values and reasoning as for T1182B.
T1182D	1E-7/H	12H	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM RADIATION DET GM TUBE RM-EXH-K1-1; Based on DP-1633, page 17, the failure rate for a Geiger-Mueller (GM) detector is $1.39E-5/H$. Assume that only 1/100 of these failures are structural failures of the GM detector tube. Therefore, the rate of producing electrical sparks from structural failure of GM tube is assumed to be 1E-7/H. It is assumed that the tau

for time to repair is 12 hours, average time between CAM checks. Thus, CAFTA formula 4 will be used. The fact that the detector could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

T1183 1E-6/H 2400H

IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM; It is assumed that the OVM system can have a fault or multiple faults that produce an ignition source at a rate of 1E-6/H. It is assumed that the tau for time between failure detection is 100 days (2,400 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the OVM could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

T1183A-1 1E-6/H 168H

IGNITION SOURCE FROM K1-4-1 FAN (IN P-23 VENTILATION SYSTEM) (FAN RUNNING); The ignition source is assumed to be from fan blades contacting the fan housing due to an imbalanced system that does not cause the fan to shut down catastrophically. This failure rate is assumed to be 1E-6/H. It is assumed that the tau for time between failure detection is 1 week (168 hours), the time the fan blades could continue striking the fan housing before it was shut down for correction. Thus, CAFTA formula 5 will be used. The fact that the fan blades could contact the fan housing during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

T1184A 1E-6/H 2400H

ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING AROUND THE DUCTWORK JOINTS; For electrostatic sparks to occur, the bonding must fail. Assumed the same failure rate as for type code CA 1 in the HANF-TC.TC database for Electrical Cable Fails Open (Open Circuit) [5E-6/H]. Bonding electrical cable is assumed to fail with a factor of 5 lower frequency than an electrical cable normally carrying current. So CA one failure rate is reduced to 1E-6/H. Since no checking of bonding has occurred since installation,

it is assumed that the tau for time between failure detection is 100 days (2,400 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the bonding could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

TCFIRELA	3E-4	DEMAND	ELECTRICAL RELAY CONTACTS, IR, NORMALLY ENERGIZED., FTOD; Hanford Type Code Database, CF A. Failures on demand do not require a tau or t value.
TCFLO-XA	3E-4	DEMAND	ELECTRICAL RELAY CONTACTS, LO-X, NORMALLY ENERGIZED., FTOD; Hanford Type Code Database, CF A. Failures on demand do not require a tau or t value.
TFLVENTP	0.01	NONE	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM; Assumed probability of 0.01 with ventilation.
TOAN2COQ	1E-3	DEMAND	HUMAN OPERATOR FAILS TO FILL NITROGEN BOTTLE (VIDEO CAMERA PURGE SYSTEM); Preliminary estimate. Failures on demand do not require a tau or t value.
TOAPS-1T	0.01	DEMAND	HUMAN OPERATOR MISCALIBRATES PRESSURE SWITCH (VIDEO CAMERA PURGE SYSTEM); Preliminary estimate. Failures on demand do not require a tau or t value.
TPAAMMOL	6E-5/H	2400H	AMMONIA BUBBLER PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP; Assume the same reasoning for failure rate as T1182-3A. It is assumed that the tau for time between failure detection is 100 days (2,400 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the piping could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.
TPALEAKL	1E-8/H-FT	6570H*100FT	VIDEO CAMERA PURGE PIPING LEAKS (PER FOOT OF <3-IN. PIPE); Hanford Type Code Database, PA L. It is estimated there is 100 ft of this piping. It is assumed that the time between failure detection is 9 months (6,570 hours), (leak tested when installed 9 months ago). This value is

used rather than 2,400 hours because the purge piping leakage would only be detected during a burp if a camera ignition source also existed. The tau used is 6,570 hours times 100 ft. Thus, CAFTA formula 5 will be used. The fact that the piping could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

TPATELEL 6E-5/H 2400H

TELEDYNE H₂ SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP; Assume the same reasoning for failure rate as T1182-3A. It is assumed that the tau for time between failure detection is 100 days (2,400 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the piping could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

TPDAVACL 1E-6/H 2400H

AMMONIA BUBBLER VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABINET; DP-1633 lists failure of vacuum pumps at $2.7E-5/H$ on page 22. A small number of vacuum pump failures would be leaks on the outlet side of the pump. It is assumed that only 5 percent are leaks. Thus, the frequency of leaking vacuum pumps is $1.3E-6/H$. It is assumed that the tau for time between failure detection is 100 days (2,400 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the pump could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

TPDTVACL 1E-6/H 2400H

TELEDYNE H₂ SAMPLING SYSTEM VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABINET; Assume same failure rate value as for TPDTVACL. It is assumed that the tau for time between failure detection is 100 days (2,400 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the pump could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

TSIPS-11	3E-5	DEMAND	PS FAILS TO OPEN WHEN REQUIRED (VIDEO CAMERA PURGE SYSTEM); Hanford Type Code Database, SI I. If the pressure in the nitrogen purge system for the video camera fails, electrical power to the camera will be cut off. This pressure switch operates on demand. Failures on demand do not require a tau or t value.
TVBPR-1C	3E-6/H	720H	FLOW CONTROL (SELF-REGULATING) VALVE PR-1 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM); Assumed same as VC C from Hanford Type Code Database. This event fails nitrogen purge gas flow. It is assumed that this failure is not detectable by other than the power interlocks (which are explicitly modeled). Since the camera is turned on for about a month preceding the burp, the tau for time between failure detection, given interlocks have failed, is 30 days (720 hours). Accordingly, CAFTA formula 5 with time, $t=720$ hours, is used. The $\tau=720$ hours dominates the time after a burp ($t=1.6$ hours) that the nitrogen purge could fail and be a problem.
TVBPR-2C	3E-6/H	720H	FLOW CONTROL (SELF-REGULATING) VALVE PR-2 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM); Assumed same as VC C from Hanford Type Code Database. Used the same reasoning as for TVBPR-1C.
TVDAMMOL	2E-8/H	2400H	EITHER OF THE (2) DOWNSTREAM VALVES IN THE AMMONIA BUBBLER CABINET LEAK; Assume same as PA L per valve instead per foot from Hanford Type Code Database. Therefore, $1E-8/H\text{-valve} \times 2 \text{ valves} = 2E-8/H$. It is assumed that the tau for time between failure detection is 100 days (2,400 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the valves could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

B.2 CASE SY1B - H₂ EXPLOSION IN TANK 101-SY WITHOUT VENTILATION FLOW

KEY: T = 101-SY

CAFTA formula 3 = $1 - e^{-\lambda t}$ [approximation= λt]CAFTA formula 4 = $\lambda \tau / (\lambda \tau + 1) = 1 - (MTBF) / (MTBF + MTTR)$ [approximation= $\lambda \tau$]CAFTA formula 5 = $1 + (1/\lambda \tau)(e^{-\lambda \tau} - 1)$ [approximation= $\lambda \tau / 2$]MTBF = Mean Time Between Failure = $1/\lambda$

MTTR = Mean Time to Repair

<u>BASIC EVENT</u>	<u>λ OR PROB.</u>	<u>τ (tau) or t</u>	<u>DISCUSSION</u>
IE-101	3.65/YR	NONE	BURPS PER YEAR IN 101-SY.
PWR2	1E-5/H	45H	LOSS OF POWER TO SY TANK FARM; Assumed one loss-of-power incident every 10 years and converted to hourly rate by dividing by 8760 hours/year (1.14E-5/H). Alternating current (AC) Power System Notebook for N Reactor used significant outage data from UNI-3642 of one per 23 years/4,400 hours operation per year [9.88E-6/H]. According to the Event Fact Sheets collected from the 200 Area, the majority of the power outages are typically momentary and last no longer than a few minutes. Accordingly, unavailability of main power at the time of the event is assumed to be dominated by loss of power during the burp. The time for the burp (combustible concentrations) is t=45 hours. CAFTA equation 3 is used.
PWR3	3E-6/H	24H	LOSS OF 120-V POWER TO P-23 CAM CAUSES P-23 EXHAUST FAN TO SHUT DOWN); Assumed loss of power is due to circuit breaker failure to remain closed. Use Hanford Type Code Database, CD D value of 3E-6/H. It is assumed that the tau for mean time to repair is 24 hours. Thus, CAFTA formula 4 will be used. The fact that the circuit breaker could fail during time t=1.6 hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below lower flammability limit (LFL) is disregarded because it is dominated by the tau above.
SEASON	0.17	NONE	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATURE; Estimated that 2 months out of 12, the humidity is high enough and the temperature is cold enough to yield

filters plugged due to moisture if the moisture is not removed or heated.

ST1	1E-8	168H*100FT	STEAM LINE TO HEATER RUPTURES; Hanford Type Code Database for PA L. It is estimated there is 100 ft of this piping. It is assumed that the tau for mean time to repair is 1 week (168 hours). Thus, CAFTA formula 4 will be used. The fact that the piping could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL) is disregarded because it is dominated by the tau above.
ST2	2E-6	24H	LOSS OF STEAM FROM 200 AREA POWER PLANT FACILITY; Based on the January 13, 1992 Hanford Reach article on the 200 Area Powerhouse, the facility has never totally lost steam in 48 years of operation. Assuming one failure in 50 years and converting to an hourly rate results in a rate of $2.28E-6/H$. It is assumed to take 24 hours to repair the failure and get the powerhouse back in operation. Thus, CAFTA formula 4 will be used. The fact that the power house could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL) is disregarded because it is dominated by the tau above.
T1153A	0.00001	NONE	ELECTROSTATIC SPARKS FROM LESS-THAN-SUFFICIENT BONDING/GROUNDING OF TANK RISERS; Refer to description in case SY1A.
T1153B	6E-9/H	1.6H	ELECTROSTATIC SPARKS CAUSED BY LIGHTNING STRIKE; FAILS VENTILATION AND IGNITES; Lightning Assessment Letter 39220-90-TBP-079 (One lightning strike, with present lightning protection assumed to be 99.5 percent effective, per 18,000 years converted to an hourly rate [$6.34E-9/H$]). Since this event is a common cause event (fails ventilation and produces ignition source), CAFTA formula 3 is used with $t=1.6$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL). A one-time electrostatic spark occurring before the burp is not considered an ignition source of concern.

T1155A	0.0001	DEMAND	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE; Refer to description in case SY1A. Failures on demand do not require a tau or t value.
T1155B	0.0001	DEMAND	MECHANICAL SPARKS FROM SLUDGE WEIGHT/CABLE STRIKING SAMPLING TUBES; Refer to description in case SY1A. Failures on demand do not require a tau or t value.
T1156A	5E-8/H	2400H	ELECTRICAL SPARKS FROM FIC LEVEL PROBE; Refer to description in case SY1A. The fact that the FIC could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
T1156B	8E-10/H	2400H	ELECTRICAL SPARKS FROM SLACK TAPE DETECTOR FAULT; Refer to description in case SY1A. The fact that the slack tape detector could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
T1156C	5E-7/H	45H	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE; Refer to description in case SY1A related to frequency. The dominant time this event is of concern is after a burp when a flammable mixture is in the tank ($t=45$ hours). Thus, CAFTA formula 3 will be used. It is recognized that the manual level probe could be unavailable before the burp with a tau of 24 hours but the time of concern is dominated by the 45 hours mentioned above.
T1156D	1E-6/H	720H	ELECTRICAL SPARKS FROM EXPLOSION PROOF LIGHT OR LIGHT LEAD FAULTS; Refer to description in case SY1A. The fact that the explosion proof lights and light leads could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=720$ hours described in case SY1A.
T1156F1	1E-6/H	720H	ELECTRICAL SPARKS FROM VIDEO CAMERA; Refer to description in case SY1A. The fact

that the video camera could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=720$ hours described in case SY1A.

T1156G 1E-8/H 45H

ELECTRICAL SPARKS FROM RADAR GAUGE FAULT; Refer to description in case SY1A related to frequency. The dominant time this event is of concern is after a burp when a flammable mixture is in the tank ($t=45$ hours). Thus, CAFTA formula 3 will be used. It is recognized that the radar gauge could be unavailable before the burp with a τ of 24 hours but the time of concern is dominated by the 45 hours mentioned above.

T1156H 1E-8/H 45H

ELECTRICAL SPARKS FROM THERMOCOUPLES; Refer to description in case SY1A related to frequency. The dominant time this event is of concern is after a burp when a flammable mixture is in the tank ($t=45$ hours). Thus, CAFTA formula 3 will be used. It is recognized that the thermocouples could be unavailable before the burp with a τ of 24 hours but the time of concern is dominated by the 45 hours mentioned above.

T1157J 4E-9/H 1.6H

BURNING GASOLINE SPILLS INTO TANK, FAILS VENT AND IGNITES LEAKING H_2 ; One gasoline engine fire has occurred on the Hanford Site in 26 years, and an assumed 1/1000 chance of the fire existing in the SY Tank Farm and spilling into tank is converted to an hourly rate ($4.39E-9/H$). It is assumed that burning or red-hot debris could exist for up to 2 hours. The fire could occur just before a burp, or it could occur just after a burp. If it occurs just before a burp and ignites leaking H_2 , then on average it occurs one hour before the burp. If it occurs after the burp, then H_2 is ignitable for 1.6 hours because this is a common cause event (fails ventilation and produces ignition source). It is judged that the $t=1.6$ hours dominates the time of concern for this event. Thus, CAFTA formula 3 will be used.

T1157K 4E-7/H 1.6H

RANGE FIRE PRODUCES SPARKS THAT FAIL VENT AND IGNITE LEAKING H_2 ; Based on

information from the Hanford Fire Department, there are range fires of about 5,000 acres once every 5 years. The frequency of a range fire occurring somewhere on the Hanford Site is $2.3E-5/H$. The Site is roughly 500 mi^2 in area (320,000 acres). So the frequency that the fire occurs in a 5000-acre section that includes the SY Tank Farm is $3.6E-7/H$ ($2.3E-5/H \times [5,000 \text{ acres}/320,000 \text{ acres}]$). It is assumed that burning or red-hot debris could exist for up to 2 hours. The fire could occur just before a burp, or it could occur just after a burp. If it occurs just before a burp and ignites leaking H_2 , then on average it occurs one hour before the burp. If it occurs after the burp, then H_2 is ignitable for 1.6 hours because this is a common cause event (fails ventilation and produces ignition source). It is judged that the $t=1.6$ hours dominates the time of concern for this event. Thus, CAFTA formula 3 will be used.

T1160A	1.0	NCNE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO_2 IN THE 101-SY VENTILATION HEADER; Given there is a flammable mixture in the tank dome space, it is assumed there is a flammable mixture in the 101-SY ventilation header with a probability of 1.0 even when the ventilation is not functioning.
T1160C	0.01	NONE	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101-SY VENT HEADER; Refer to description in case SY1A.
T1161B2	$2E-8/H$	2400H	ELECTRICAL SPARK FROM FAULT IN TELEDYNE H_2 ANALYZER; Refer to description in case SY1A. The fact that the Teledyne H_2 analyzer could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A.
T1161B3	$1E-6/H$	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF TELEDYNE VACUUM PUMP (BEARINGS); This event is like the one for case SY1A, except time is $t=45$ hours.
T1161B4	$3E-5/H$	2400H	ELECTRICAL SPARK FROM THE TELEDYNE VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to

			description in case SY1A. The fact that the Teledyne vacuum pump seal could fail during time t=45 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau=2,400 hours described in case SY1A.
T1161B7A	1.0	NONE	ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1A.
T1162B3	1E-6/H	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CRYOGENIC VACUUM PUMP (BEARINGS); This event is like the one for case SY1A, except time is t=45 hours.
T1162B4	3E-5/H	45H	ELECTRICAL SPARK FROM THE CRYOGENIC VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to description in case SY1A related to frequency. The cryogenic vacuum pump is only used for 4 hours after a burp starts given the ventilation is functioning (according to the pump's shutdown procedure). But if the ventilation system were to fail, it is assumed the cryogenic vacuum pump would be used for at least 45 hours. Thus, the dominant time this event is of concern is after a burp when a flammable mixture is in the tank (t=45 hours). Thus, CAFTA formula 3 will be used.
T1163B7A	1.0	NONE	ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1A.
T1163B7B	1E-6/H	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF AMMONIA BUBBLER VACUUM PUMP (BEARINGS); This event is like the one for case SY1A, except time is t=45 hours.
T1163B7C	3E-5/H	45H	ELECTRICAL SPARK FROM THE AMMONIA BUBBLER VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to description in case SY1A related to frequency. The ammonia bubbler vacuum pump is only used for 8 hours after a burp starts given the ventilation is functioning (according to the pump's shutdown procedure). But if the ventilation system were to fail, it is assumed the ammonia bubbler vacuum pump would be used for at least 45 hours. Thus, the dominant time this event is of concern is after a burp when a flammable

			mixture is in the tank (t=45 hours). Thus, CAFTA formula 3 will be used.
T1170A	1E-8/H	2400H	ELECTRICAL SPARKS FROM VENT HEADER THERMOCOUPLE; Refer to description in case SY1A. The fact that the vent header thermocouple could fail during time t=45 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau=2,400 hours described in case SY1A.
T1170B	1E-8/H	2400H	ELECTRICAL SPARKS FROM VENT HEADER RELATIVE HUMIDITY DEVICE; Refer to description in case SY1A. The fact that the vent header relative humidity device could fail during time t=45 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau=2,400 hours described in case SY1A.
T1173A	5E-8/H	2400H	ELECTRICAL SPARK FROM FAULT IN THE (WHITTAKER) CHEMICAL CELL H ₂ ANALYZER; Refer to description in case SY1A. The fact that the chemical cell analyzer could fail during time t=45 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau=2,400 hours described in case SY1A.
T1173B	1E-6/H	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CHEMICAL CELL VACUUM PUMP (BEARINGS); This event is like the one for case SY1A, except time is t=45 hours.
T1173C	5E-7/H	2400H	ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (BELLOWS AND MOTOR); This event is like the one for case SY1A.
T1180A	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO ₂ IN THE MAIN SY VENTILATION SYSTEM; Refer to description in case SY1A.
T1182-1A	1E-6/H	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-1 VACUUM PUMP (BEARINGS); This event is like the one for case SY1A, except time is t=45 hours.
T1182-1B	1E-6/H	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-2 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1182-1A.

T1182-1C	3E-5/H	2400H	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to description in case SY1A. The fact that the vacuum pump seal could fail during time t=45 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau=2,400 hours described in case SY1A.
T1182-1D	3E-5/H	2400H	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for T1182-1C.
T1182-3A	6E-5/H	2400H	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS; Refer to description in case SY1A.
T1182-3C	1E-6/H	2400H	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP; Refer to description in case SY1A.
T1182-3D	1E-6/H	2400H	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP; Used the same values and reasoning as for T1182-3C.
T1182-4A	1.0	NONE	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1A.
T1182A	3E-7/H	4H	FAILURE OF PRESSURE SWITCH K1-PS-1-1 FAILS VENT AND CREATES SPARKS; One potential failure mode of the pressure switch shuts down the ventilation system and at the same time produces a spark source. Hydrogen can enter the switch contacts area because no seal exists between the high-pressure side (ventilation side) of the diaphragm and the switch. If the power wires attached to the back of the snap switch short then a continuous spark could be created. This is assumed to happen at a rate of 3E-7/H (WA 2 from Hanford Type Code Database). It is also assumed that the switch failure causes a spurious trip on the low setpoint (-6 in. water gauge [WG]) and shuts down the fan. Shutdown of the fan would be immediately detectable, but sparking in the pressure switch may not be detected at all. It is assumed that special authorization to start the backup fan will take 4 hours on average. Thus, CAFTA

formula 4 is be used with time, $t=4$ hours to represent the unavailability of the P-23 ventilation and presence of an ignition source before the startup of the backup fan. Failure during the burp (time=1.6 hours) is dominated by this failure. Another concern is that even though the backup fan is started, sparks continue to be produced. However, this case (SY1B) includes only situations in which the vent is failed. Other cases consider possibilities in which the vent works. This is a unique common cause event because the ventilation failure part of the common cause event will be detected quickly but the ignition source part may not be detected until ignition occurs.

T1182B	3E-7/H	2400H	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYSTEM); Refer to description in case SY1B. The fact that the pressure switch could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A.
T1182C	3E-7/H	2400H	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYSTEM); Used the same values and reasoning as for T1182B.
T1182D	1E-7/H	45H	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM RADIATION DET GM TUBE RM-EXH-K1-1; Refer to description in case SY1A for frequency value. The fact that the detector could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) [unreliability] dominates the mean time to repair [unavailability] of $\tau=12$ hours as discussed in SY1A. Thus, CAFTA formula 3 is used.
T1183	1E-6/H	2400H	IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM; Refer to description in case SY1A.
T1183A	1E-5/H	1.6H	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF K1-4-1 (P-23) FAN (IN VENTILATION SYSTEM) (FAN BLADES COME OFF); The ignition source is assumed to be from fan blades contacting the fan housing due to catastrophic failure of the fan blades from the shaft. This failure rate is

assumed to be $1E-5/H$. This is based on Hanford Type Code Database for fan failing to continue running, FA G ($3E-5/H$). It is assumed that only $1/3$ of these failures to run are due to fan blades braking off, thus a failure rate for fan blades coming off of $1E-5/H$. Catastrophic failure of the vent fan can fail the ventilation system as well as creating an ignition source, common cause event. It is assumed that a spark source for a failure of this nature would exist only briefly, since the fan stops running. Therefore, the time an ignition source could occur after a burp dominates the time an ignition source could exist prior to a burp. So CAFTA formula 3 is used with time, $t=1.6$ hours.

T1183D 0.0001 DEMAND

MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAILURE; Assume a probability of $1/10,000$ or 0.0001 . This is a demand failure that occurs at the time of the burp due to the pressure pulse. It provides both a spark source and a mechanism for failing the fan (piece of metal flies into fan), common cause event. Failures on demand do not require a tau or t value.

T1184A $1E-6/H$ 2400H

ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING AROUND THE DUCTWORK JOINTS; Refer to description in case SY1A. The fact that the bonding could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A.

TATMOSPH $4E-9/H$ 1.6H

ATMOSPHERIC CONDITIONS (TORNADO) THAT PRODUCE NEGATIVE PRESSURE <-6 IN. WG; The design basis tornado frequency is $3.4E-5/YR$ or $4E-9/H$ (SDC-4.1). It is assumed that a tornado could catastrophically fail the ventilation system and at the same time create spark sources (flying debris or disturbed electrical system), common cause event. Since passage of a tornado is over quickly, failure after a burp occurs dominates a fault duration event. Accordingly, CAFTA formula 3 with time, $t=1.6$ hours is used.

TCFIRELA	3E-4	DEMAND	ELECTRICAL RELAY CONTACTS, IR, NORMALLY ENERGIZED, FTOD; Refer to description in case SY1A. Failures on demand do not require a tau or t value.
TCFLO-XA	3E-4	DEMAND	ELECTRICAL RELAY CONTACTS, LO-X, NORMALLY ENERGIZED, FTOD; Refer to description in case SY1A. Failures on demand do not require a tau or t value.
TCHCAM13	1.6E-5/H	12H	CAM1 SPURIOUSLY ALARMS; Hanford Type Code Database, CH 3. This event fails ventilation since the CAM is interlocked to shut down the fan given high radiation detection. It is assumed that the CAM could be repaired or replaced in 12 hours from the time of the failure (immediately replaceable upon detection). Therefore, CAFTA formula 4 with time, t=12 hours is used. The tau=12 hours dominates the time after a burp (t=1.6 hours) that the ventilation could fail and be a problem.
TDC-1-1E	1.0E-5/H	168H	DEENTRAINER K1-1-1 PLUGS; Hanford Type Code Database, DC E. This event fails ventilation. It is estimated that repairs could take a week from the time of the failure (immediately detectable). Accordingly, CAFTA formula 4 with time, t=168 hours is used. The tau=168 hours dominates the time after a burp (t=1.6 hours) that the ventilation could fail and be a problem.
TDC-1-1P	1.0E-6/H	168H	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH; Hanford Type Code Database, DC P. This event fails ventilation by plugging the high-efficiency particulate air (HEPA) filters due to excessive moisture. The deentrainer and the filters will need to be replaced. This repair is estimated to take one week from the time of the failure. Accordingly, CAFTA formula 4 with time, t=168 hours is used. The tau=168 hours dominates the time after a burp (t=1.6 hours) that the ventilation could fail and be a problem.
TDFK1VTC	3.0E-7/H	168H	MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO; Hanford Type Code Database, DF C. The event defeats ventilation flow. Since mechanical failure of the valve to remain open

indicates catastrophic damage, the repair time is estimated to be one week from the time of the failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours is used. The $\tau=168$ hours dominates the time after a burp ($t=1.6$ hours) that the ventilation could fail and be a problem.

TFAK1-4G 3.0E-5/H 168H

K1-4-1 FAILS TO CONTINUE RUNNING (NONCATASTROPHIC (e.g., FAN BELT BREAKS), NO SPARKS); Hanford Type Code Database, FA G. This failure is noncatastrophic and produces no sparks, but does fail the ventilation flow. The repair time is estimated to be one week from the time of the failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours is used. The $\tau=168$ hours dominates the time after a burp ($t=1.6$ hours) that the ventilation could fail and be a problem.

TFAP-28F 5E-3 DEMAND

BACKUP EXHAUST FAN P-28 FAILS TO START; Hanford Type Code Database, FA F. Failures on demand do not require a τ or t value.

TFAP-28G 3.0E-5/H 168H

P-28 FAILS TO CONTINUE RUNNING (NONCATASTROPHIC (e.g., FAN BELT BREAKS), NO SPARKS); Hanford Type Code Database, FA G. This failure is noncatastrophic and produces no sparks, but does fail the ventilation flow. Because the P-28 is the backup fan, it must run until the P-23 [K1-4-1] is repaired, so mission time is 168 hours. Accordingly, CAFTA formula 3 with time, $t=168$ hours is used. The $\tau=168$ hours dominates the time after a burp ($t=1.6$ hours) that the ventilation could fail and be a problem.

TFB-5-1E 1.0E-5/H 168H

NATIONAL BUREAU OF STANDARDS (NBS) PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FB E. This event defeats ventilation flow. It is estimated that replacement or repairs would take one week from the time of the failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours is used. The $\tau=168$ hours dominates the time after a burp ($t=1.6$ hours) that the ventilation could fail and be a problem.

TFC-3-1E 1.4E-8/H 168H

HEPA FILTER K1-3-1 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database,

			FC E. Used the same reasoning as for TFB-5-1E.
TFC-3-1L	1.4E-8/H	168H	HEPA FILTER K1-3-1 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for TFB-5-1E.
TFC-3-2E	1.4E-8/H	168H	HEPA FILTER K1-3-2 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FC E. Used the same reasoning as for TFB-5-1E.
TFC-3-2L	1.4E-8/H	168H	HEPA FILTER K1-3-2 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for TFB-5-1E.
TFLVENTP	1.0	NONE	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM; Assumed probability of 1.0 (without ventilation).
TGB-4-1F	3.0E-1	DEMAND	DIESEL GENERATOR FOR EXHAUST FANS P-23 AND P-28 FAILS TO START; Started with the Hanford Type Code Database, GD F (3E-2), for starting of diesel generator. Since the diesel generator is not regularly tested, the probability of failure to start on demand was increased to 3E-1. Failures on demand do not require a tau or t value.
THA-2-14	1.0E-6/H	168H	STEAM HEATER K1-2-1 LEAKS FROM THE TUBES; Hanford Type Code Database, HA 4. This event fails ventilation flow by plugging the HEPA filters due to moisture. It is estimated that replacement or repairs would take one week from the time of the failure. Accordingly, CAFTA formula 4 with time, t=168 hours is used. The tau=168 hours dominates the time after a burp (t=1.6 hours) that the ventilation could fail and be a problem.
THOUSE1	.01	DEMAND	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL; Assumed a probability of 1/100 that during a release that enough radioactive material is released through the ventilation system to cause high reading at the CAM. This results in shutdown of the vent fan via a high rad interlock. Failures on demand do not require a tau or t value.
THOUSE2	.1	DEMAND	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCALIBRATED

			CAM; Assumed a probability of 1/10 that during a release that enough radioactive material is released to the ventilation system to produce a high radiation signal on a miscalibrated exhaust stack CAM. Again, this results in shutdown of the vent fan. Failures on demand do not require a tau or t value.
TOACAM1T	1E-3	DEMAND	HUMAN OPERATOR CAM1 MISCALIBRATES CAM SETPOINT LOW; Preliminary estimate. Failures on demand do not require a tau or t value.
TOAN2COQ	1E-3	DEMAND	HUMAN OPERATOR FAILS TO FILL NITROGEN BOTTLE (VIDEO CAMERA PURGE SYSTEM); Preliminary estimate. Failures on demand do not require a tau or t value.
TOAP-28Q	1E-3	DEMAND	HUMAN OPERATOR FAILS TO START BACKUP FAN P-28; Preliminary estimate. Failures on demand do not require a tau or t value.
TOAPS-1T	0.01	DEMAND	HUMAN OPERATOR MISCALIBRATES PRESSURE SWITCH (VIDEO CAMERA PURGE SYSTEM); Preliminary estimate. Failures on demand do not require a tau or t value.
TOAT1-2Q	1E-3	DEMAND	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE TI-1-2 READING; Preliminary estimate. Failures on demand do not require a tau or t value.
TOATRANQ	1E-3	DEMAND	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, TRANSFER TO BACKUP POWER SOURCE; Preliminary estimate. Failures on demand do not require a tau or t value.
TOAUCV1U	1E-2	DEMAND	HUMAN OPERATOR FTRTCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VALVE; Preliminary estimate. Failures on demand do not require a tau or t value.
TPAAMMOL	6E-5/H	2400H	AMMONIA BUBBLER PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP; Refer to description in case SY1A. The fact that the piping could fail during time t=45 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau=2,400 hours described in case SY1A.
TPALEAKL	1E-8/H-FT	6570H*100FT	VIDEO CAMERA PURGE PIPING LEAKS (PER FOOT OF <3-IN. PIPE); Refer to description in

			case SY1A. The fact that the piping could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=6,570$ hours times 100 ft described in case SY1A.
TPATELEL	6E-5/H	2400H	TELEDYNE H ₂ SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP; Refer to description in case SY1A. The fact that the piping could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A.
TPDAVACL	1E-6/H	2400H	AMMONIA BUBBLER VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABINET; Refer to description in case SY1A. The fact that the pump could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A.
TPDTVACL	1E-6/H	2400	TELEDYNE H ₂ SAMPLING SYSTEM VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABINET; Refer to description in case SY1A. The fact that the pump could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A.
TRAKP11H	3.9E-7/H	168H	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. This event causes loss of the ventilation fan. It is estimated that replacement or repair of this relay would take one week from the time of the failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, is used. The $\tau=168$ hours dominates the time after a burp ($t=1.6$ hours) that the ventilation could fail and be a problem.
TRAORLYH	3.9E-7/H	168H	OVERLOAD RELAY ORLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. This event causes loss of the ventilation fan. It is estimated that replacement or repair of this relay would take one week from the time of the failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, is used.

The tau=168 hours dominates the time after a burp (t=1.6 hours) that the ventilation could fail and be a problem.

TSA-3-1L 7.0E-6/H 2400H

HEPA FILTER K1-3-1 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. This failure allows bypassing of HEPA filter K1-3-1 but leads to overloading the other HEPA filter. Since this failure is assumed to be undetectable, CAFTA formula 5 with time, tau=2,400 hours, is used. The tau=2,400 hours dominates the time after a burp (t=1.6 hours) that the ventilation could fail and be a problem.

TSA-3-2L 7.0E-6/H 2400H

HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. This failure allows bypassing of HEPA filter K1-3-1 but leads to overloading the other HEPA filter. Since this failure is assumed to be undetectable, CAFTA formula 5 with time, tau=2,400 hours, is used. The tau=2,400 hours dominates the time after a burp (t=1.6 hours) that the ventilation could fail and be a problem.

TSIPS-1I 3E-5 DEMAND

PS FAILS TO OPEN WHEN REQUIRED (VIDEO CAMERA PURGE SYSTEM); Hanford Type Code Database, SI I. Refer to description in case SY1A.

TSJ-1-13 1.0E-6/H 168H

TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOSES; Hanford Type Code Database, SJ 3. This event results in the failure to dry the air in the ventilation flow path, which leads to plugging of the HEPA filters. It is assumed that situation could be remedied in one week from the time of the failure. Therefore, CAFTA formula 4 with time, t=168 hours is used. The tau=168 hours dominates the time after a burp (t=1.6 hours) that the ventilation could fail and be a problem.

TVB-1-1P 1.1E-5/H 168H

TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER; Hanford Type Code Database, VB P. This event results in the failure to dry the air in the ventilation flow path, which leads to plugging of the HEPA filters. It is assumed that situation could be remedied

			<p>in 1 week from the time of the failure. Therefore, CAFTA formula 4 with time, $t=168$ hours is used. The $\tau=168$ hours dominates the time after a burp ($t=1.6$ hours) that the ventilation could fail and be a problem.</p>
TVBPR-1C	$3E-6/H$	720H	<p>FLOW CONTROL (SELF-REGULATING) VALVE PR-1 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM); Assumed same as VC C from Hanford Type Code Database. Refer to description in case SY1A. The $\tau=720$ hours dominates the time after a burp ($t=45$ hours) that the nitrogen purge could fail and be a problem.</p>
TVBPR-2C	$3E-6/H$	720H	<p>FLOW CONTROL (SELF-REGULATING) VALVE PR-2 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM); Assumed same as VC C from Hanford Type Code Database. Used the same reasoning as for TVBPR-1C.</p>
TVD4501C	$1.5E-7/H$	168H	<p>HAND-OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.T., FTRO; Hanford Type Code Database, VD C. If this valve fails closed, pressure will build up in the tank. This will trip a pressure switch which will energize an alarm. It is assumed that repairs on the valve take one week from the time of failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, will be used. The $\tau=168$ hours dominates the time after a burp ($t=45$ hours) that the valve could fail and be a problem.</p>
TVD4501D	0	NONE	<p>HAND-OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.T., FTRO; Normally fully open.</p>
TVD4501S	$1E-2$	DEMAND	<p>MANUAL VALVE 4501 FROM TANK 101-SY ERRONEOUSLY LEFT CLOSED; If this valve were left closed following maintenance or mistakenly closed when it was supposed to be opened, pressure will build up in the tank. This will trip a pressure switch which will energize an alarm. It is assumed that recovery from this event could occur in within an hour assuming the cause of the pressure buildup is determined quickly. The recovery should be taken into account in the accident sequence cutsets.</p>

TVD4502C	1.5E-7/H	0H	HAND-OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTR0; Hanford Type Code Database, VD C. For this case this failure will not affect the results.
TVD4502D	9.4E-8/H	168H	HAND-OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTRC; Hanford Type Code Database, VD D. Failure of this valve to remain open will have a impact on the mass balance of the ventilation system. It is assumed that this event would trip the fan off due to low pressure (-6 in. WG). It is assumed that repairs on the valve take one week from the time of failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, will be used. The $\tau=168$ hours dominates the time after a burp ($t=1.6$ hours) that the valve could fail and be a problem.
TVD4503C	1.5E-7/H	0H	HAND-OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTR0; Hanford Type Code Database, VD C. For this case this failure will not affect the results.
TVD4503D	9.4E-8/H	168H	HAND-OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRC; Hanford Type Code Database, VD D. See the earlier discussion for event TVD4502D.
TVDAMMOL	2E-8/H	2400H	EITHER OF THE 2 DOWNSTREAM VALVES IN THE AMMONIA BUBBLER CABINET LEAK; Refer to description in case SY1A. The fact that the valves could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A.
TVDUCV1C	1.5E-7/H	168H	HAND-OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTR0; Hanford Type Code Database, VD C. This event results in the failure to dry the air in the ventilation flow path, which leads to plugging of the HEPA filters. It is assumed that situation could be remedied in one week from the time of the failure. Therefore, CAFTA formula 4 with time, $t=168$ hours is used. The $\tau=168$ hours dominates the time after a burp ($t=1.6$ hours) that the ventilation could fail and be a problem.

B.3 CASE SY1C - H₂ EXPLOSION IN TANK 103-SY WITH VENTILATION FLOW

KEY: B = 103-SY

T = 101-SY

CAFTA formula 3 = $1 - e^{-\lambda t}$ [approximation= λt]CAFTA formula 4 = $\lambda \tau / (\lambda \tau + 1) = 1 - (MTBF) / (MTBF + MTTR)$ [approximation= $\lambda \tau$]CAFTA formula 5 = $1 + (1/\lambda \tau)(e^{-\lambda \tau} - 1)$ [approximation= $\lambda \tau / 2$]MTBF = Mean Time Between Failure = $1/\lambda$

MTTR = Mean Time to Repair

BASIC EVENT	λ OR PROB.	τ (tau) or t
B1153A	0.00001	NONE

DISCUSSION

ELECTROSTATIC SPARKS FROM LESS-THAN-SUFFICIENT BONDING/GROUNDING OF TANK RISERS; Operators performing approved actions at 103-SY will assume that all exposed tank risers/riser covers will be naturally bonded to ground. Operator action in the SY Tank Farm is assumed to have a probability of 1.0. Thus, for electrostatic sparks to occur, the natural bonding/grounding mechanism must fail due to insulating properties of dry soil or riser cover gasket materials. Since the exact mechanism is not known as to the failure of the natural bonding/grounding pathways, a probability of failure is assumed to be 0.00001.

B1153C	0.01	NONE
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ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7); Procedures will exist to bond the sludge weight and cable to ground. It is assumed that electrostatic charge could build up during the sludge weight removal process. An electrostatic spark will only occur if operators fail to perform the bonding procedures correctly and that probability is assumed to be 0.01.

B1155A	0.00001	DEMAND
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MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE; Assumed a probability of 1/10,000 for each 103-SY burp that a metal support will break during a burp. (103-SY burps are assumed not as violent as 101-SY burps.) Also assume a probability of 1/10 given a break that a mechanical spark will be produced. The concern with the existence of mechanical sparks before a burp is not considered possible because mechanical sparks are momentary. Failures on demand do not require a tau or t value.

B1156A	5E-8/H	4380H	<p>ELECTRICAL SPARKS FROM FIC LEVEL PROBE; Refer to description in case SY1A for basic event T1156A related to frequency. It is assumed that the tau for time between tests (thus detection) is 6 months (4,380 hours), average time between burps. Thus, CAFTA formula 5 will be used. This type of failure is detectable only if the low or high liquid level setpoints are reached. However, if an arc were to occur it would go undetected. The fact that the FIC could fail during time $t=0.1$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.</p>
B1156C	5E-7/H	24H	<p>ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE; Refer to description in case SY1A for basic event T1156C related to frequency. It is assumed that the tau for time between failure detection is 24 hours, time between manual tape readings. Thus, CAFTA formula 5 will be used. The fact that the 4,300-ohm resistor could fail during time $t=0.1$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.</p>
B1156H	1E-8/H	24H	<p>ELECTRICAL SPARKS FROM THERMOCOUPLES; Refer to description in case SY1A for basic event T1156H related to frequency. It is assumed that the tau for time between failure detection is 24 hours, average time to notice bad readings. Thus, CAFTA formula 5 will be used. The fact that the thermocouples could fail during time $t=0.1$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.</p>
B1178	1.0	NONE	<p>FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO_2 IN THE PUMP PIT; Assume probability of 1.0 because the pump pit is directly connected to tank dome, so any gases in tank dome should also be in pump pit.</p>
B1179A	5E-4	NONE	<p>ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103-SY PUMP PIT; WHC-SD-WM-ES-176 reports that shorting or grounding of the field wiring provides enough energy to make the leak detector capable of igniting hydrogen. It is</p>

assumed that 20 days out of a year it rains in the SY Tank Farm, and only one out of 100 times it rains does the water drain into the pump pit to a level that will set off the leak detector. Therefore, the probability of sparks from the leak detector is (20 days/365 days) $\times$ (1 rain/100 rains) = $5.48E-4$.

B1179B	0	NONE	ELECTRICAL SPARK FROM PUMP P-103-1 IN THE 103-SY PUMP PIT; If pump is running, probability is 1, but not normally operated. Probability is zero at the present time because the pump is disconnected from power.
B1180A	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO_2 IN THE MAIN SY VENTILATION SYSTEM; Assume a probability of 1.0 that there is a flammable mixture in the main SY ventilation system given there is a flammable mixture in the 103-SY Tank.
IE-103	2/YR	NONE	BURPS PER YEAR IN 103-SY.
T1182-1A	1E-6/H	0.1H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-1 VACUUM PUMP (BEARINGS); Refer to description in case SY1A. The time flammable mixture is in the tank after a burp is used ($t=0.1$ hours).
T1182-1B	1E-6/H	0.1H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-2 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1182-1A.
T1182-1C	3E-5/H	4380H	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to description in case SY1A for the frequency value. It is assumed that the tau for time between failure detection is 6 months (4,380 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the pump could fail during time $t=0.1$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.
T1182-1D	3E-5/H	4380H	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for T1182-1C.

T1182-3A	6E-5/H	4380H	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS; Refer to description in case SY1A for the frequency value. It is assumed that the tau for time between failure detection is 6 months (4,380 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the piping could fail during time $t=0.1$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.
T1182-3C	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP; Refer to description in case SY1A for the frequency value. Refer to T1182-3A above for the reasoning for the tau value.
T1182-3D	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP; Used the same values and reasoning as for T1182-3C.
T1182-4A	1.0	NONE	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1A.
T1182B	3E-7/H	4380H	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYSTEM); Refer to description in case SY1A for the frequency value. It is assumed that the tau for time between failure detection is 6 months (4,380 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the wiring could fail during time $t=0.1$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.
T1182C	3E-7/H	4380H	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYSTEM); Used the same values and reasoning as for T1182B.
T1182D	1E-7/H	12H	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM RADIATION DET GM TUBE RM-EXH-K1-1; Refer to description in case SY1A. The fact that the detector could fail during time $t=0.1$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau=12 hours described in case SY1A.

T1183	1E-6/H	4380H	IGNITION FROM THE OVM SYSTEM; Refer to description in case SY1A for the frequency value. It is assumed that the tau for time between failure detection is 6 months (4,380 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the OVM could fail during time $t=0.1$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.
T1183A-1	1E-6/H	168H	IGNITION SOURCE FROM K1-4-1 FAN (IN P-23 VENTILATION SYSTEM) (FAN RUNNING); Refer to description in case SY1A. The fact that the fan blades could contact the fan housing during time $t=0.1$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau=168 hours described in case SY1A.
T1184A	1E-6/H	4380H	ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING AROUND THE DUCTWORK JOINTS; Refer to description in case SY1A for the frequency value. It is assumed that the tau for time between failure detection is 6 months (4,380 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the bonding could fail during time $t=0.1$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.
TFLVENTP	0.01	NONE	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM; Refer to description in case SY1A.

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B.4 CASE SY1D - H₂ EXPLOSION IN TANK 103-SY WITHOUT VENTILATION FLOW

KEY: B = 103-SY

T = 101-SY

CAFTA formula 3 = $1 - e^{-\lambda t}$ [approximation= λt]CAFTA formula 4 = $\lambda \tau / (\lambda \tau + 1) = 1 - (\text{MTBF}) / (\text{MTBF} + \text{MTTR})$ [approximation= $\lambda \tau$]CAFTA formula 5 = $1 + (1/\lambda \tau)(e^{-\lambda \tau} - 1)$ [approximation= $\lambda \tau / 2$]MTBF = Mean Time Between Failure = $1/\lambda$

MTTR = Mean Time to Repair

BASIC EVENT	λ OR PROB.	τ (tau) or t	DISCUSSION
B1153A	0.00001	NONE	ELECTROSTATIC SPARKS FROM LESS THAN SUFFICIENT BONDING/GROUNDING OF TANK RISERS; Refer to description in case SY1C.
B1153C	0.01	NONE	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7); Refer to description in case SY1C.
B1155A	0.00001	DEMAND	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE; Refer to description in case SY1C. Failures on demand do not require a tau or t value.
B1156A	5E-8/H	4380H	ELECTRICAL SPARKS FROM FIC LEVEL PROBE; Refer to description in case SY1C. The fact that the FIC could fail during time $t=2.8$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=4,380$ hours described in case SY1C.
B1156C	5E-7/H	24H	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE; Refer to description in case SY1C related to frequency. It is assumed that the tau for time between failure detection is 24 hours, time between manual tape readings. Thus, CAFTA formula 5 will be used. The fact that the 4,300-ohm resistor could fail during time $t=2.8$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.
B1156H	1E-8/H	24H	ELECTRICAL SPARKS FROM THERMOCOUPLES; Refer to description in case SY1C related to frequency. It is assumed that the tau for time between failure detection is 24 hours, average time to notice bad readings. Thus, CAFTA formula 5 will be used. The fact that the thermocouples

could fail during time $t=2.8$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the τ above.

B1178	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO_2 IN THE PUMP PIT; Refer to description in case SY1C.
B1179A	5E-4	NONE	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103-SY PUMP PIT; Refer to description in case SY1C related to probability.
B1179B	0	NONE	ELECTRICAL SPARK FROM PUMP P-103-1 IN THE 103-SY PUMP PIT; Refer to description in case SY1C.
B1180A	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO_2 IN THE MAIN SY VENTILATION SYSTEM; Refer to description in case SY1C.
IE-103	2/YR	NONE	BURPS PER YEAR IN 103-SY.
PWR2	1E-5/H	2.8H	LOSS OF POWER TO SY TANK FARM; Refer to the description in case SY1B related to frequency. According to the Event Fact Sheets collected from the 200 Area, the majority of the power outages are typically momentary and last no longer than a few minutes. Accordingly, unavailability of main power at the time of the event is assumed to be dominated by loss of power during the burp. The time for the burp (combustible concentrations) is $t=2.8$ hours. CAFTA equation 3 is used.
PWR3	3E-6/H	24H	LOSS OF 120-V POWER TO P-23 CAM CAUSES P-23 EXHAUST FAN TO SHUT DOWN); Assumed loss of power is due to circuit breaker failure to remain closed. Use Hanford Type Code Database, CD D value of 3E-6/H. It is assumed that the τ for mean time to repair is 24 hours. Thus, CAFTA formula 4 will be used. The fact that the piping could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL) is disregarded because it is dominated by the τ above.
SEASON	0.17	NONE	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATURE;

Estimated that 2 months out of 12, the humidity is high enough and the temperature is cold enough to yield filters plugged due to moisture if the moisture is not removed or heated.

ST1	1E-8	168H*100FT	STEAM LINE TO HEATER RUPTURES; Hanford Type Code Database for PA L. It is estimated there is 100 ft of this piping. It is assumed that the tau for mean time to repair is 1 week (168 hours). Thus, CAFTA formula 4 will be used. The fact that the piping could fail during time $t=0.1$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL) is disregarded because it is dominated by the tau above.
ST2	2E-6	24H	LOSS OF STEAM FROM 200 AREA POWER PLANT FACILITY; Refer to the description in case SY1B related to frequency. It is assumed to take 24 hours to repair the failure and get the powerhouse back in operation. Thus, CAFTA formula 4 will be used. The fact that the power house could fail during time $t=0.1$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL) is disregarded because it is dominated by the tau above.
T1153B	6E-9/H	0.1H	ELECTROSTATIC SPARKS CAUSED BY LIGHTNING STRIKE; FAILS VENTILATION AND IGNITES; Refer to the description in case SY1B related to frequency. Since this event is a common cause event (fails ventilation and produces ignition source), CAFTA formula 3 is used with $t=0.1$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL). A one-time electrostatic spark occurring before the burp is not considered an ignition source of concern.
T1157J	4E-9/H	1.0H	BURNING GASOLINE SPILLS INTO TANK, FAILS VENT AND IGNITES LEAKING H_2 ; Refer to the description in case SY1B related to frequency. It is assumed that burning or red-hot debris could exist for up to 2 hours. The fire could occur just before a burp, or it could occur just after a burp. If it occurs just before a burp and

ignites leaking H_2 , then on average it occurs one hour before the burp. If it occurs after the burp, then H_2 is ignitable for 0.1 hours because this is a common cause event (fails ventilation and produces ignition source). It is judged that the $\tau=1$ hour (mean time to either put fire out or let it burn out) dominates the time of concern for this event. Thus, CAFTA formula 4 will be used.

T1157K	4E-7/H	1.0H	RANGE FIRE PRODUCES SPARKS THAT FAIL VENT AND IGNITE LEAKING H_2 ; Refer to the description in case SY1B related to frequency. It is assumed that burning or red-hot debris could exist for up to 2 hours. The fire could occur just before a burp, or it could occur just after a burp. If it occurs just before a burp and ignites leaking H_2 , then on average it occurs one hour before the burp. If it occurs after the burp, then H_2 is ignitable for 0.1 hours because this is a common cause event (fails ventilation and produces ignition source). It is judged that the $\tau=1$ hour (mean time to either put fire out or let it burn out) dominates the time of concern for this event. Thus, CAFTA formula 4 will be used.
T1182-1A	1E-6/H	2.8H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-1 VACUUM PUMP (BEARINGS); Refer to description in case SY1A. The time flammable mixture is in the tank after a burp without ventilation operating is used ($t=2.8$ hours).
T1182-1B	1E-6/H	2.8H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-2 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1182-1A.
T1182-1C	3E-5/H	4380H	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to description in case SY1A for the frequency value. It is assumed that the τ for time between failure detection is 6 months (4,380 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the pump could fail during time $t=2.8$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the τ above.

T1182-1D	3E-5/H	4380H	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for T1182-1C.
T1182-3A	6E-5/H	4380H	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS; Refer to description in case SY1A for the frequency value. It is assumed that the tau for time between failure detection is 6 months (4,380 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the piping could fail during time t=2.8 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.
T1182-3C	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP; Refer to description in case SY1A for the frequency value. Refer to T1182-3A above for the reasoning for the tau value.
T1182-3D	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP; Used the same value and reasoning as for T1182-3C.
T1182-4A	1.0	NONE	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1A.
T1182A	3E-7/H	4H	FAILURE OF PRESSURE SWITCH K1-PS-1-1 FAILS VENT AND CREATES SPARKS; Used the same value and reasoning as for SY1B.
T1182B	3E-7/H	4380H	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYSTEM); Refer to description in case SY1A for the frequency value. It is assumed that the tau for time between failure detection is 6 months (4,380 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the wiring could fail during time t=2.8 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.
T1182C	3E-7/H	4380H	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYSTEM); Used the same value and reasoning as for T1182B.

T1182D	1E-7/H	12H	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM RADIATION DET GM TUBE RM-EXH-K1-1; Refer to description in case SY1A. The fact that the detector could fail during time $t=2.8$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=12$ hours as discussed in SY1A.
T1183	1E-6/H	4380H	IGNITION FROM THE OVM SYSTEM; Refer to description in case SY1A for the frequency value. It is assumed that the τ for time between failure detection is 6 months (4,380 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the OVM could fail during time $t=2.8$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the τ above.
T1183A	1E-5/H	0.1H	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF K1-4-1 (P-23) FAN (IN VENTILATION SYSTEM) (FAN BLADES COME OFF); Refer to description in case SY1B, except CAFTA formula 3 is used with time, $t=0.1$ hours.
T1183D	0.0001	DEMAND	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAILURE; Refer to description in case SY1B.
T1184A	1E-6/H	4380H	ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING AROUND THE DUCTWORK JOINTS; Refer to description in case SY1A for the frequency value. Refer to description in case SY1C for $\tau=4,380$ hours. The fact that the bonding could fail during time $t=2.8$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=4,380$ in case SY1C.
TATMOSPH	4E-9/H	0.1H	ATMOSPHERIC CONDITIONS (TORNADO) THAT PRODUCE NEGATIVE PRESSURE <-6 IN. WG; This event is like the one for case SY1B, except time is $t=0.1$ hours.
TCHCAM13	1.6E-5/H	12H	CAM1 SPURIOUSLY ALARMS; Hanford Type Code Database, CH 3. Refer to description in case SY1B. The $\tau=12$ hours from case SY1B dominates the time after a burp ($t=0.1$ hours) that the ventilation could fail and be a problem.

TDC-1-1E	1.0E-5/H	168H	DEENTRAINER K1-1-1 PLUGS; Hanford Type Code Database, DC E. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TDC-1-1P	1.0E-6/H	168H	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH; Hanford Type Code Database, DC P. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TDFK1VTC	3.0E-7/H	168H	MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO; Hanford Type Code Database, DF C. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TFAK1-4G	3.0E-5/H	168H	K1-4-1 FAILS TO CONTINUE RUNNING (NONCATASTROPHIC (e.g., FAN BELT BREAKS), NO SPARKS); Hanford Type Code Database, FA G. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TFAP-28F	5E-3	DEMAND	BACKUP EXHAUST FAN P-28 FAILS TO START; Hanford Type Code Database, FA F. Failures on demand do not require a tau or t value.
TFAP-28G	3.0E-5/H	168H	P-28 FAILS TO CONTINUE RUNNING (NONCATASTROPHIC (e.g., FAN BELT BREAKS), NO SPARKS); Hanford Type Code Database, FA G. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TFB-5-1E	1.0E-5/H	168H	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FB E. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.

TFC-3-1E	1.4E-8/H	168H	HEPA FILTER K1-3-1 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FC E. Used the same reasoning as for TFB-5-1E.
TFC-3-1L	1.4E-8/H	168H.	HEPA FILTER K1-3-1 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for TFB-5-1E.
TFC-3-2E	1.4E-8/H	168H	HEPA FILTER K1-3-2 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FC E. Used the same reasoning as for TFB-5-1E.
TFC-3-2L	1.4E-8/H	168H	HEPA FILTER K1-3-2 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for TFB-5-1E.
TFLVENTP	1.0	NONE	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM; Assumed probability of 1.0 (without ventilation).
TGB-4-1F	3.0E-1	DEMAND	DIESEL GENERATOR FOR EXHAUST FANS P-23 AND P-28 FAILS TO START; Started with the Hanford Type Code Database, GB F (3E-2), for starting of diesel generator. Since the diesel generator is not regularly tested, the probability of failure to start on demand was increased to 3E-1. Failures on demand do not require a tau or t value.
THA-2-14	1.0E-6/H	168H	STEAM HEATER K1-2-1 LEAKS FROM THE TUBES; Hanford Type Code Database, HA 4. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
THOUSE1	.01	DEMAND	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL; Refer to description in case SY1B.
THOUSE2	.1	DEMAND	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCALIBRATED CAM; Refer to description in case SY1B.
TOACAM1T	1E-3	DEMAND	HUMAN OPERATOR CAM1 MISCALIBRATES CAM SETPOINT LOW; Preliminary estimate. Failures on demand do not require a tau or t value.

TOAP-28Q	1E-3	DEMAND	HUMAN OPERATOR FAILS TO START BACKUP FAN P-28; Preliminary estimate. Failures on demand do not require a tau or t value.
TOAT1-2Q	1E-3	DEMAND	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE TI-1-2 READING; Preliminary estimate. Failures on demand do not require a tau or t value.
TOATRANQ	1E-3	DEMAND	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, TRANSFER TO BACKUP POWER SOURCE; Preliminary estimate. Failures on demand do not require a tau or t value.
TOAUCV1U	1E-2	DEMAND	HUMAN OPERATOR FAILS TO TRTCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VALVE; Preliminary estimate. Failures on demand do not require a tau or t value.
TRAKP11H	3.9E-7/H	168H	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TRAORLYH	3.9E-7/H	168H	OVERLOAD RELAY ORLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TSA-3-1L	7.0E-6/H	4380H	HEPA FILTER K1-3-1 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. This failure allows bypassing of HEPA filter K1-3-1 but leads to overloading the other HEPA filter. Since this failure is assumed to be undetectable, CAFTA formula 5 with time, tau=4,380 hours, is used. The tau=4,380 hours dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TSA-3-2L	7.0E-6/H	4380H	HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. Used the same reasoning as for TSA-3-1L.
TSJ-1-13	1.0E-6/H	168H	TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOSES;

			Hanford Type Code Database, SJ 3. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TVB-1-1P	1.1E-5/H	168H	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER; Hanford Type Code Database, VB P. Used the same reasoning as for case SY1B.
TVD4501D	0	NONE	HAND-OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.T., FTRC; Normally fully open.
TVD4502D	9.4E-8/H	168H	HAND-OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTRC; Hanford Type Code Database, VD D. Refer to description in case SY1B. The tau=168 hours dominates the time after a burp (t=0.1 hours) that the valve could fail and be a problem.
TVD4503C	1.5E-7/H	168H	HAND-OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRC; Hanford Type Code Database, VD C. If this valve fails closed, pressure will build up in the tank. This will trip a pressure switch which will energize an alarm. It is assumed that repairs on the valve take one week from the time of failure. Accordingly, CAFTA formula 4 with time, t=168 hours, will be used. The tau=168 hours dominates the time after a burp (t=0.1 hours) that the valve could fail and be a problem.
TVD4503D	9.4E-8/H	168H	HAND-OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRC; Hanford Type Code Database, VD D. See the earlier discussion for event TVD4502D.
TVD4503S	1E-2	DEMAND	MANUAL VALVE 4503 FROM TANK 103-SY ERRONEOUSLY LEFT CLOSED; If this valve were left closed following maintenance or mistakenly closed when it was supposed to be opened, pressure will build up in the tank. This will trip a pressure switch which will energize an alarm. It is assumed that recovery from this event could occur in within an hour assuming the cause of the pressure buildup is determined quickly. The recovery should be taken into account in the accident sequence cutsets.

TVDUCV1C 1.5E-7/H 168H

HAND-OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO; Hanford Type Code Database, VD C. Refer to description in case SY1B. The tau=168 hours dominates the time after a burp (t=0.1 hours) that the valve could fail and be a problem.

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B.5 CASE SY2C - H₂ EXPLOSION IN TANK 103-SY WITH VENTILATION FLOW - USING THE P-29 PORTABLE EXHAUSTER

KEY: B = 103-SY

T = 101-SY

CAFTA formula 3 = $1 - e^{-\lambda t}$

[approximation= λt]

CAFTA formula 4 = $\lambda \tau / (\lambda \tau + 1) = 1 - (\text{MTBF}) / (\text{MTBF} + \text{MTTR})$

[approximation= $\lambda \tau$]

CAFTA formula 5 = $1 + (1/\lambda \tau)(e^{-\lambda \tau} - 1)$

[approximation= $\lambda \tau / 2$]

MTBF = Mean Time Between Failure = $1/\lambda$

MTTR = Mean Time to Repair

BASIC EVENT	λ OR PROB.	τ (tau) or t	DISCUSSION
B1153A	0.00001	NONE	ELECTROSTATIC SPARKS FROM LESS-THAN-SUFFICIENT BONDING/GROUNDING OF TANK RISERS; Refer to description in case SY1C.
B1153C	0.01	NONE	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7); Refer to description in case SY1C.
B1155A	0.00001	DEMAND	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE; Refer to description in case SY1C.
B1156A	5E-8/H	4380H	ELECTRICAL SPARKS FROM FIC LEVEL PROBE; Refer to description in case SY1A for basic event T1156A related to frequency. Refer to description in case SY1C for the tau value.
B1156C	5E-7/H	24H	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE; Refer to description in case SY1A for basic event T1156C related to frequency. Refer to description in case SY1C for the tau value.
B1156H	1E-8/H	24H	ELECTRICAL SPARKS FROM THERMOCOUPLES; Refer to description in case SY1A for basic event T1156H related to frequency. Refer to description in case SY1C for the tau value.
B1178	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO ₂ IN THE PUMP PIT; Refer to description in case SY1C.
B1179A	5E-4	NONE	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103-SY PUMP PIT; Refer to description in case SY1C.

B1179B	0	NONE	ELECTRICAL SPARK FROM PUMP P-103-1 IN THE 103-SY PUMP PIT; Refer to description in case SY1C.
B1180A	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO ₂ IN THE MAIN SY VENTILATION SYSTEM; Refer to description in case SY1C.
IE-103	2/YR	NONE	BURPS PER YEAR IN 103-SY.
B1182-1A	1E-6/H	0.1H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-1 VACUUM PUMP (BEARINGS); Refer to description in case SY1A. Refer to description in case SY1C for the tau value.
B1182-1B	1E-6/H	0.1H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-2 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for B1182-1A.
B1182-1C	1E-6/H	0.1H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-3 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for B1182-1A.
B1182-1D	3E-5/H	4380H	ELECTRICAL SPARK FROM CAM VP-1 VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to description in case SY1A for the frequency value. Refer to description in case SY1C for the tau value.
B1182-1E	3E-5/H	4380H	ELECTRICAL SPARK FROM CAM VP-2 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for B1182-1D.
B1182-1F	3E-5/H	4380H	ELECTRICAL SPARK FROM CAM VP-3 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for B1182-1D.
B1182-3A	6E-5/H	4380H	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS; Refer to description in case SY1A for the frequency value. Refer to description in case SY1C for the tau value.
B1182-3C	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-1 LEAKS ON OUTLET SIDE OF PUMP; Refer to description in case SY1A for the frequency value. Refer to B1182-3A above for the reasoning of the tau value.

B1182-3D	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-2 LEAKS ON OUTLET SIDE OF PUMP; Used the same values and reasoning as for B1182-3C.
B1182-3E	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-3 LEAKS ON OUTLET SIDE OF PUMP; Used the same values and reasoning as for B1182-3C.
B1182-4A	1.0	NONE	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1C.
B1182A-A	3E-7/H	4380H	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-1 (IN P-29 VENTILATION SYSTEM); Refer to description in case SY1A for the frequency value. Refer to description in SY1C for tau value.
B1182B-B	3E-7/H	4380H	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-2 (IN P-29 VENTILATION SYSTEM); Used same values and reasoning as for B1182A-A.
B1182C-C	3E-7/H	4380H	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-3 (IN P-29 VENTILATION SYSTEM); Used same values and reasoning as for B1182A-A.
B1182D	1E-7/H	12H	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM BETA/GAMMA DETECTOR; Refer to description in case SY1A. Refer to description in SY1C for tau value.
B1182E	1E-7/H	12H	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM ALPHA DETECTOR RAN-EXH-K1-1; Refer to description in SY2D.
B1183A-1	1E-6/H	168H	IGNITION SOURCE FROM P-29 FAN (IN P-29 VENTILATION SYSTEM) (FAN RUNNING); Refer to description in case SY1A. Refer to description in SY1C for tau value.
B1184A	1E-6/H	4380H	ELECTROSTATIC SPARKS IN THE P-29 VENTILATION DUCTWORK DUE TO FAILED BONDING AROUND THE DUCTWORK JOINTS; Refer to description in case SY1A for the frequency value. Refer to description in SY1C for tau value.
TFLVENTP	0.01	NONE	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM; Refer to description in case SY1A.

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B.6 CASE SY2D - H₂ EXPLOSION IN TANK 103-SY WITHOUT VENTILATION FLOW - USING P-29 PORTABLE EXHAUSTER

KEY: B = 103-SY

T = 101-SY

CAFTA formula 3 = $1 - e^{-\lambda t}$

[approximation= λt]

CAFTA formula 4 = $\lambda \tau / (\lambda \tau + 1) = 1 - (MTBF) / (MTBF + MTTR)$

[approximation= $\lambda \tau$]

CAFTA formula 5 = $1 + (1/\lambda \tau)(e^{-\lambda \tau} - 1)$

[approximation= $\lambda \tau / 2$]

MTBF = Mean Time Between Failure = $1/\lambda$

MTTR = Mean Time to Repair

<u>BASIC EVENT</u>	<u>λ OR PROB.</u>	<u>τ (tau) or t</u>	<u>DISCUSSION</u>
B1153A	0.00001	NONE	ELECTROSTATIC SPARKS FROM LESS-THAN-SUFFICIENT BONDING/GROUNDING OF TANK RISERS; Refer to description in case SY1C.
B1153C	0.01	NONE	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS; Refer to description in case SY1D.
B1155A	0.00001	DEMAND	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE; Refer to description in case SY1C. Failures on demand do not require a tau or t value.
B1156A	5E-8/H	4380H	ELECTRICAL SPARKS FROM FIC LEVEL PROBE; Refer to description in case SY1C. Refer to description in case SY1D for the tau value.
B1156C	5E-7/H	24H	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE; Refer to description in case SY1C related to frequency. Refer to description in case SY1C. Refer to description in case SY1D for the tau value.
B1156H	1E-8/H	24H	ELECTRICAL SPARKS FROM THERMOCOUPLES; Refer to description in case SY1C related to frequency. Refer to description in case SY1D for the tau value.
B1178	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO ₂ IN THE PUMP PIT; Refer to description in case SY1C.
B1179A	5E-4	NONE	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103-SY PUMP PIT; Refer to description in case SY1C related to probability.

B1179B	0	NONE	ELECTRICAL SPARK FROM PUMP P-103-1 IN THE 103-SY PUMP PIT; Refer to description in case SY1C.
B1180A	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO ₂ IN THE MAIN SY VENTILATION SYSTEM; Refer to description in case SY1C.
IE-103	2/YR	NONE	BURPS PER YEAR IN 103-SY.
PWR2	1E-5/H	2.8H	LOSS OF POWER TO SY TANK FARM FROM MAIN POWER SOURCE (MCC); Refer to the description in case SY1B related to frequency. Refer to description in case SY1D for the tau value.
PWR3	3E-6/H	24H	LOSS OF 120-V POWER TO P-29 CAM CAUSES P-29 EXHAUST FAN TO SHUT DOWN); Refer to the description in case SY1D.
SEASON	0.17	NONE	FRACTION OF THE YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATURE; Estimated that 2 months out of 12, the humidity is high enough and the temperature is cold enough to yield filters plugging due to moisture if the moisture is not removed or heated.
T1153B	6E-9/H	0.1H	ELECTROSTATIC SPARKS CAUSED BY LIGHTNING STRIKE; FAILS VENTILATION AND IGNITES; Refer to the description in case SY1B related to frequency. Refer to case SY1D for the tau value.
T1157J	4E-9/H	1.0H	BURNING GASOLINE SPILLS INTO TANK, FAILS VENT AND IGNITES LEAKING H ₂ ; Refer to the description in case SY1B related to frequency. Refer to case SY1D for the tau value.
T1157K	4E-7/H	1.0H	RANGE FIRE PRODUCES SPARKS THAT FAIL VENT AND IGNITE LEAKING H ₂ ; Refer to the description in case SY1B related to frequency. Refer to case SY1D for the tau value.
B1182-1A	1E-6/H	2.8H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-1 VACUUM PUMP (BEARINGS); Refer to description in case SY1A. Refer to case SY1D for the tau value.
B1182-1B	1E-6/H	2.8H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-2 VACUUM PUMP (BEARINGS); Used

			the same value and reasoning as for B1182-1A.
B1182-1C	1E-6/H	2.8H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-3 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for 1182-1A
B1182-1D	3E-5/H	4380H	ELECTRICAL SPARK FROM CAM VP-1 VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to description in case SY1A for the frequency value. Refer to case SY1D for the tau value.
B1182-1E	3E-5/H	4380H	ELECTRICAL SPARK FROM CAM VP-2 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for B1182-1D.
B1182-1F	3E-5	4380H	ELECTRICAL SPARK FROM CAM VP-3 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for B1182-1D.
B1182-3A	6E-5/H	4380H	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS; Refer to description in case SY1A for the frequency value. Refer to case SY1D for the tau value.
B1182-3C	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-1 LEAKS ON OUTLET SIDE OF PUMP; Refer to description in case SY1A for the frequency value. Refer to B1182-3A above for the reasoning for the tau value.
B1182-3D	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-2 LEAKS ON OUTLET SIDE OF PUMP; Used the same value and reasoning as for B1182-3C.
B1182-3E	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-3 LEAKS ON OUTLET SIDE OF PUMP; Used the same value and reasoning as for B1182-3C.
B1182-4A	1.0	NONE	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1A.
B1182A	3E-7/H	4H	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-1 FAILS VENT AND CREATES SPARKS; Used the same value and reasoning as for SY1B.
B1182B	3E-7/H	4H	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-2 FAILS VENT AND CREATES SPARK; Used the same value and reasoning as for SY1B.

B1182C	3E-7/H	4380H	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-4 IN P-29 VENTILATION SYSTEM); Refer to description in case SY1A for the frequency value. Refer to case SY1D for the tau value.
B1182D	1E-7/H	12H	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM BETA/GAMMA DETECTOR; Refer to description in case SY1A. Refer to case SY1D for the tau value.
B1182D	1E-7/H	12	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM ALPHA DETECTOR RAN-EXH-K1-1; Refer to description in case SY1A. The fact that the detector could fail during time $t=2.8$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=12$ hours as discussed in SY1A.
B1183A	1E-5/H	0.1H	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF P-29) FAN (IN VENTILATION SYSTEM) (FAN BLADES COME OFF); Refer to description in case SY1B, except CAFTA formula 3 is used with time, $t=0.1$ hours.
B1183D	0.0001	DEMAND	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAILURE; Refer to description in case SY1B.
B1184A	1E-6/H	4380H	ELECTRICAL SPARKS IN THE P-29 VENTILATION DUCTWORK DUE TO FAILED BONDING AROUND THE DUCTWORK JOINTS; Refer to description in case SY1A for the frequency value. Refer to description in case SY1C for $\tau=4,380$ hours. The fact that the bonding could fail during time $t=2.8$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=4,380$ in case SY1C.
TATMOSPH	4E-9/H	0.1H	ATMOSPHERIC CONDITIONS (TORNADO) THAT PRODUCE NEGATIVE PRESSURE <-6 IN. WG; This event is like the one for case SY1B, except time is $t=0.1$ hours.
BCHCAM13	1.6E-5/H	12H	CAM1 SPURIOUSLY ALARMS (P29); Hanford Type Code Database, CH 3. Refer to description in case SY1B. Refer to case SY1D for the tau value.
BDC-1-1E	1.0E-5/H	168H	DEENTRAINER (P29) PLUGS; Hanford Type Code Database, DC E. Refer to description in case SY1B. The $\tau=168$ hours from

			case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
BDC-1-1P	1.0E-6/H	168H	DEENTRAINER (P29) FAILS AND ALLOWS EXCESSIVE WATER THROUGH; Hanford Type Code Database, DC P. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
BFAK1-4G	3.0E-5/H	168H	P29 EXHAUSTER FAILS TO CONTINUE RUNNING (NONCATASTROPHIC (e.g., FAN BELT BREAKS), NO SPARKS); Hanford Type Code Database, FA G. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
BFC-3-1E	1.4E-8/H	168H	HEPA FILTER P29-1 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FC E. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation system could fail and be a problem.
BFC-3-1L	1.4E-8/H	168H	HEPA FILTER P29-1 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for BFC-3-1E.
BFC-3-2E	1.4E-8/H	168H	HEPA FILTER P29-2 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FC E. Used the same reasoning as for BFC-3-1E.
BFC-3-2L	1.4E-8/H	168H	HEPA FILTER P29-2 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for BFC-3-1E.
BFLVENTP	1.0	NONE	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM; Assumed probability of 1.0 (without ventilation).
BHOUSE1	.01	DEMAND	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL; Refer to description in case SY1B.
BHOUSE2	.1	DEMAND	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCALIBRATED CAM; Refer to description in case SY1B.

BHTS1&2L	1.0	NONE	ELECTRICAL HEATERS HTS-1 AND HTS-2 LOCKED OUT; According to Tank Farm Production Control (TFPC) the heaters are locked out because they are not rated as an intrinsically safe piece of equipment.
BOACAM2T	1E-3	DEMAND	HUMAN OPERATOR CAM1 MISCALIBRATES CAM SETPOINT LOW; Preliminary estimate. Failures on demand do not require a tau or t value.
BOATRANQ	1E-3	DEMAND	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, TRANSFER TO BACKUP POWER SOURCE; Preliminary estimate. Failures on demand do not require a tau or t value.
BRAKP11H	3.9E-7/H	168H	RELAY P29-PS-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. Refer to description in case SY1B. Refer to case SY1D for the tau values.
BRAKP12H	3.9E-7/H	168H	RELAY P29-PS-2 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN, RAH. Used the same reasoning as for BRAKP11H.
BRAKP14H	3.9E-7/H	168H	RELAY P29-PS-4 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN, RAH. Used the same reasoning as for BRAKP11H.
BRAORLYH	3.9E-7/H	168H	OVERLOAD RELAY ONLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. Refer to description in case SY1D.
BSTACKE	1E-10/H	24H	P29 EXHAUST STACK PLUGS; Assumed less likely than piping plugs failure rate (PA E = 5E-10/H from Hanford Type Code Database), therefore, assumed 1E-10/H. A stack plug would be detected after shutdown of the P-29 fan. Assumed average time to diagnose and repair is 24 hours. Therefore, tau = 24 hours and CAFTA formula 4 will be used.
BSA-3-1L	7.0E-6/H	4380H	HEPA FILTER P29-1 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. This failure allows bypassing of HEPA filter P29-1 but leads to overloading the other HEPA filter. Since this failure is assumed to be undetectable, CAFTA formula 5 with time, tau=4,380 hours, is used. The tau=4,380 hours dominates the

			time after a burp ($t=0.1$ hours) that the ventilation could fail and be a problem.
BSA-3-2L	7.0E-6/H	4380H	HEPA FILTER P29-2 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. Used the same reasoning as for BSA-3-1L.
BVD450XC	2E-7	168H	HAND-OPERATED (MANUAL) VALVE FROM P29 EXHAUSTER N.O. FTRO; Hanford Type Code Database, VD C. If this valve fails closed, pressure will build up in the tank. This will trip a pressure switch which will energize an alarm. It is assumed that repairs on the valve take one week from the time of failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, will be used. The $\tau=168$ hours dominates the time after a burp ($t=2.8$ hours) that the valve could fail and be a problem.
BVD450XS	1E-2	DEMAND	HAND-OPERATED (MANUAL) VALVE TEED INTO LINE TO THE P29 EXHAUSTER ERRONOUSLY CLOSED; If this valve were left closed following maintenance or mistakenly closed when it was supposed to be opened, pressure will build up in the tank. It is assumed that recovery from this event could occur in within an hour assuming the cause of the pressure buildup is determined quickly.
BVDP29ZC	2E-7	168	HAND-OPERATED (MANUAL) VALVE FROM THE P29 EXHAUSTER N.O. FTRO; Hanford Type Code Database, VD C. If this valve fails closed, pressure will build up in the tank. It is assumed that repairs on the valve take one week from the time of failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, will be used. The $\tau=168$ hours dominates the time after a burp ($t=2.8$ hours) that the valve could fail and be a problem.
BVDP29ZS	1E-2	DEMAND	HAND-OPERATED (MANUAL) VALVE FROM THE P-29 EXHAUSTER ERRONOUSLY CLOSED; If this valve were left closed following maintenance or mistakenly closed when it was supposed to be opened, pressure will build up in the tank. It is assumed that recovery from this event could occur in within an hour assuming the cause of the pressure buildup is determined quickly.

TGB-4-1F	3.0E-1	DEMAND	DIESEL GENERATOR FOR EXHAUST FAN P-29 FAILS TO START; Hanford Type Code Database, GB F (3E-2), for starting of diesel generator. Since the diesel generator is not regularly tested the probability of failure to start on demand was increased to 3E-1. Failures on demand do not require a tau or t value.
TVD4502C	2E-7/H	168H	HAND-OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.O. FTRO; Hanford Type Code Database, VD C.
TVD4502D	9.4E-8/H	168H	HAND-OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTFC; Hanford Type Code Database, VD D. Refer to description in case SY1B. The tau=168 hours dominates the time after a burp (t=0.1 hours) that the valve could fail and be a problem.
TVD4502S	1E-2	DEMAND	HAND-OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY ERRONOUSLY LEFT CLOSED; If this valve were left closed following maintenance or mistakenly closed when it was supposed to be opened, pressure will build up in the tank. This will trip a pressure switch which will energize an alarm. It is assumed that recovery from this event could occur in within an hour assuming the cause of the pressure buildup is determined quickly. The recovery should be taken into account in the accident sequence cutsets.
TVD4503C	2E-7/H	168H	HAND-OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRO; Hanford Type Code Database, VD C. If this valve fails closed, pressure will build up in the tank. This will trip a pressure switch which will energize an alarm. It is assumed that repairs on the valve take one week from the time of failure. Accordingly, CAFTA formula 4 with time, t=168 hours, will be used. The tau=168 hours dominates the time after a burp (t=2.8 hours) that the valve could fail and be a problem.
TVD4503D	9.4E-8/H	168H	HAND-OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTFC; Hanford Type Code Database, VD D. See the earlier discussion for event TVD4502D.

TVD4503S	1E-2	DEMAND	<p>MANUAL VALVE 4503 FROM TANK 103-SY ERRONEOUSLY LEFT CLOSED; If this valve were left closed following maintenance or mistakenly closed when it was supposed to be opened, pressure will build up in the tank. This will trip a pressure switch which will energize an alarm. It is assumed that recovery from this event could occur in within an hour assuming the cause of the pressure buildup is determined quickly. The recovery should be taken into account in the accident sequence cutsets.</p>
TVD4503C	2E-7	168H	<p>MANUAL VALVE 4503 FROM TANK 103-SY N.O. FTR0; Hanford Type Code Database, VD C. If this valve fails closed, pressure will build up in the tank. It is assumed that repairs on the valve take one week from the time of failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, will be used. The $\tau=168$ hours dominates the time after a burp ($t=2.8$ hours) that the valve could fail and be a problem.</p>

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B.7 CASE SY3C - H₂ EXPLOSION IN TANK 103-SY WITH VENTILATION FLOW-WITH P29 ON TOP OF 103-SY

KEY: B = 103-SY

T = 101-SY

CAFTA formula 3 = $1 - e^{-\lambda t}$

[approximation= λt]

CAFTA formula 4 = $\lambda \tau / (\lambda \tau + 1) = 1 - (\text{MTBF}) / (\text{MTBF} + \text{MTTR})$

[approximation= $\lambda \tau$]

CAFTA formula 5 = $1 + (1/\lambda \tau)(e^{-\lambda \tau} - 1)$

[approximation= $\lambda \tau / 2$]

MTBF = Mean Time Between Failure = $1/\lambda$

MTTR = Mean Time to Repair

<u>BASIC EVENT</u>	<u>λ OR PROB.</u>	<u>τ (tau) or t</u>	<u>DISCUSSION</u>
B1153A	0.00001	NONE	ELECTROSTATIC SPARKS FROM LESS-THAN-SUFFICIENT BONDING/GROUNDING OF TANK RISERS; Refer to description in case SY1C.
B1153C	0.01	NONE	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7); Refer to description in case SY1C.
B1155A	0.00001	DEMAND	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE; Refer to description in case SY1C.
B1156A	5E-8/H	4380H	ELECTRICAL SPARKS FROM FIC LEVEL PROBE; Refer to description in case SY1A for basic event T1156A related to frequency. Refer to description in case SY1C for the tau value.
B1156C	5E-7/H	24H	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE; Refer to description in case SY1A for basic event T1156C related to frequency. Refer to description in case SY1C for the tau value.
B1156H	1E-8/H	24H	ELECTRICAL SPARKS FROM THERMOCOUPLES; Refer to description in case SY1A for basic event T1156H related to frequency. Refer to description in case SY1C for the tau value.
B1178	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO ₂ IN THE PUMP PIT; Refer to description in case SY1C.
B1179A	5E-4	NONE	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103-SY PUMP PIT; Refer to description in case SY1C.

B1179B	0	NONE	ELECTRICAL SPARK FROM PUMP P-103-1 IN THE 103-SY PUMP PIT; Refer to description in case SY1C.
B1180A	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO ₂ IN THE MAIN SY VENTILATION SYSTEM; Refer to description in case SY1C.
IE-103	2/YR	NONE	BURPS PER YEAR IN 103-SY.
B1182-1A	1E-6/H	0.1H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-1 VACUUM PUMP (BEARINGS); Refer to description in case SY1A. Refer to description in case SY1C for the tau value.
B1182-1B	1E-6/H	0.1H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-2 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for B1182-1A.
B1182-1C	1E-6/H	0.1H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-3 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for B1182-1A.
B1182-1D	3E-5/H	4380H	ELECTRICAL SPARK FROM CAM VP-1 VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to description in case SY1A for the frequency value. Refer to description in case SY1C for the tau value.
B1182-1E	3E-5/H	4380H	ELECTRICAL SPARK FROM CAM VP-2 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for B1182-1D.
B1182-1F	3E-5/H	4380H	ELECTRICAL SPARK FROM CAM VP-3 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for B1182-1D.
B1182-3A	6E-5/H	4380H	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS; Refer to description in case SY1A for the frequency value. Refer to description in case SY1C for the tau value.
B1182-3C	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-1 LEAKS ON OUTLET SIDE OF PUMP; Refer to description in case SY1A for the frequency value. Refer to B1182-3A above for the reasoning of the tau value.

B1182-3D	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-2 LEAKS ON OUTLET SIDE OF PUMP; Used the same values and reasoning as for B1182-3C.
B1182-3E	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-3 LEAKS ON OUTLET SIDE OF PUMP; Used the same values and reasoning as for B1182-3C.
B1182-4A	1.0	NONE	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1C.
B1182A-A	3E-7/H	4380H	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-1 (IN P-29 VENTILATION SYSTEM); Refer to description in case SY1A for the frequency value. Refer to description in SY1C for tau value.
B1182B-B	3E-7/H	4380H	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-2 (IN P-29 VENTILATION SYSTEM); Used same values and reasoning as for B1182A-A.
B1182C-C	3E-7/H	4380H	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-3 (IN P-29 VENTILATION SYSTEM); Used same values and reasoning as for B1182A-A.
B1182D	1E-7/H	12H	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM BETA/GAMMA DETECTOR; Refer to description in case SY1A. Refer to description in SY1C for tau value.
B1182E	1E-7/H	12H	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM ALPHA DETECTOR RAN-EXH-K1-1; Refer to description in SY2D.
B1183A-1	1E-6/H	168H	IGNITION SOURCE FROM P-29 FAN (IN P-29 VENTILATION SYSTEM) (FAN RUNNING); Refer to description in case SY1A. Refer to description in SY1C for tau value.
B1184A	1E-6/H	4380H	ELECTROSTATIC SPARKS IN THE P-29 VENTILATION DUCTWORK DUE TO FAILED BONDING AROUND THE DUCTWORK JOINTS; Refer to description in case SY1A for the frequency value. Refer to description in SY1C for tau value.
TFLVENTP	1.0	NONE	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM; A Probability of 1.0 is used since the P-29 sits on top of tank 103-SY thus the flame has a very short distance to propagate back to the tank.

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B.8 CASE SY3D - H₂ EXPLOSION IN TANK 103-SY WITHOUT VENTILATION FLOW - USING P-29 PORTABLE EXHAUSTER

KEY: B = 103-SY
T = 101-SY

CAFTA formula 3 = $1 - e^{-\lambda t}$

[approximation= λt]

CAFTA formula 4 = $\lambda \tau / (\lambda \tau + 1) = 1 - (MTBF) / (MTBF + MTTR)$

[approximation= $\lambda \tau$]

CAFTA formula 5 = $1 + (1/\lambda \tau)(e^{-\lambda \tau} - 1)$

[approximation= $\lambda \tau / 2$]

MTBF = Mean Time Between Failure = $1/\lambda$

MTTR = Mean Time to Repair

<u>BASIC EVENT</u>	<u>λ OR PROB.</u>	<u>τ (tau) or t</u>	<u>DISCUSSION</u>
B1153A	0.00001	NONE	ELECTROSTATIC SPARKS FROM LESS-THAN-SUFFICIENT BONDING/GROUNDING OF TANK RISERS; Refer to description in case SY1C.
B1153C	0.01	NONE	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS; Refer to description in case SY1D.
B1155A	0.00001	DEMAND	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE; Refer to description in case SY1C. Failures on demand do not require a tau or t value.
B1156A	5E-8/H	4380H	ELECTRICAL SPARKS FROM FIC LEVEL PROBE; Refer to description in case SY1C. Refer to description in case SY1D for the tau value.
B1156C	5E-7/H	24H	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE; Refer to description in case SY1C related to frequency. Refer to description in case SY1C. Refer to description in case SY1D for the tau value.
B1156H	1E-8/H	24H	ELECTRICAL SPARKS FROM THERMOCOUPLES; Refer to description in case SY1C related to frequency. Refer to description in case SY1D for the tau value.
B1178	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO ₂ IN THE PUMP PIT; Refer to description in case SY1C.
B1179A	5E-4	NONE	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103-SY PUMP PIT; Refer to description in case SY1C related to probability.

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B1179B	0	NONE	ELECTRICAL SPARK FROM PUMP P-103-1 IN THE 103-SY PUMP PIT; Refer to description in case SY1C.
B1180A	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO ₂ IN THE MAIN SY VENTILATION SYSTEM; Refer to description in case SY1C.
IE-103	2/YR	NONE	BURPS PER YEAR IN 103-SY.
PWR2	1E-5/H	2.8H	LOSS OF POWER TO SY TANK FARM FROM MAIN POWER SOURCE (MCC); Refer to the description in case SY1B related to frequency. Refer to description in case SY1D for the tau value.
PWR3	3E-6/H	24H	LOSS OF 120-V POWER TO P-29 CAM CAUSES P-29 EXHAUST FAN TO SHUT DOWN); Refer to the description in case SY1D.
SEASON	0.17	NONE	FRACTION OF THE YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATURE; Estimated that 2 months out of 12, the humidity is high enough and the temperature is cold enough to yield filters plugging due to moisture if the moisture is not removed or heated.
T1153B	6E-9/H	0.1H	ELECTROSTATIC SPARKS CAUSED BY LIGHTNING STRIKE; FAILS VENTILATION AND IGNITES; Refer to the description in case SY1B related to frequency. Refer to case SY1D for the tau value.
T1157J	4E-9/H	1.0H	BURNING GASOLINE SPILLS INTO TANK, FAILS VENT AND IGNITES LEAKING H ₂ ; Refer to the description in case SY1B related to frequency. Refer to case SY1D for the tau value.
T1157K	4E-7/H	1.0H	RANGE FIRE PRODUCES SPARKS THAT FAIL VENT AND IGNITE LEAKING H ₂ ; Refer to the description in case SY1B related to frequency. Refer to case SY1D for the tau value.
B1182-1A	1E-6/H	2.8H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-1 VACUUM PUMP (BEARINGS); Refer to description in case SY1A. Refer to case SY1D for the tau value.
B1182-1B	1E-6/H	2.8H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-2 VACUUM PUMP (BEARINGS); Used

			the same value and reasoning as for B1182-1A.
B1182-1C	1E-6/H	2.8H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-3 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for B1182-1A
B1182-1D	3E-5/H	4380H	ELECTRICAL SPARK FROM CAM VP-1 VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to description in case SY1A for the frequency value. Refer to case SY1D for the tau value.
B1182-1E	3E-5/H	4380H	ELECTRICAL SPARK FROM CAM VP-2 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for B1182-1D.
B1182-1F	3E-5	4380H	ELECTRICAL SPARK FROM CAM VP-3 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for B1182-1D.
B1182-3A	6E-5/H	4380H	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS; Refer to description in case SY1A for the frequency value. Refer to case SY1D for the tau value.
B1182-3C	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-1 LEAKS ON OUTLET SIDE OF PUMP; Refer to description in case SY1A for the frequency value. Refer to B1182-3A above for the reasoning for the tau value.
B1182-3D	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-2 LEAKS ON OUTLET SIDE OF PUMP; Used the same value and reasoning as for B1182-3C.
B1182-3E	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-3 LEAKS ON OUTLET SIDE OF PUMP; Used the same value and reasoning as for B1182-3C.
B1182-4A	1.0	NONE	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1A.
B1182A	3E-7/H	4H	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-1 FAILS VENT AND CREATES SPARKS; Used the same value and reasoning as for SY1B.
B1182B	3E-7/H	4H	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-2 FAILS VENT AND CREATES SPARK; Used the same value and reasoning as for SY1B.

B1182C	3E-7/H	4380H	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-4 IN P-29 VENTILATION SYSTEM); Refer to description in case SY1A for the frequency value. Refer to case SY1D for the tau value.
B1182D	1E-7/H	12H	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM BETA/GAMMA DETECTOR; Refer to description in case SY1A. Refer to case SY1D for the tau value.
B1182D	1E-7/H	12	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM ALPHA DETECTOR RAN-EXH-K1-1; Refer to description in case SY1A. The fact that the detector could fail during time $t=2.8$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=12$ hours as discussed in SY1A.
B1183A	1E-5/H	0.1H	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF P-29) FAN (IN VENTILATION SYSTEM) (FAN BLADES COME OFF); Refer to description in case SY1B, except CAFTA formula 3 is used with time, $t=0.1$ hours.
B1183D	0.0001	DEMAND	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAILURE; Refer to description in case SY1B.
B1184A	1E-6/H	4380H	ELECTRICAL SPARKS IN THE P-29 VENTILATION DUCTWORK DUE TO FAILED BONDING AROUND THE DUCTWORK JOINTS; Refer to description in case SY1A for the frequency value. Refer to description in case SY1C for $\tau=4,380$ hours. The fact that the bonding could fail during time $t=2.8$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=4,380$ in case SY1C.
TATMOSPH	4E-9/H	0.1H	ATMOSPHERIC CONDITIONS (TORNADO) THAT PRODUCE NEGATIVE PRESSURE <-6 IN. WG; This event is like the one for case SY1B, except time is $t=0.1$ hours.
BCHCAM13	1.6E-5/H	12H	CAM1 SPURIOUSLY ALARMS (P29); Hanford Type Code Database, CH 3. Refer to description in case SY1B. Refer to case SY1D for the tau value.
BDC-1-1E	1.0E-5/H	168H	DEENTRAINER (P29) PLUGS; Hanford Type Code Database, DC E. Refer to description in case SY1B. The $\tau=168$ hours from

			case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
BDC-1-1P	1.0E-6/H	168H	DEENTRAINER (P29) FAILS AND ALLOWS EXCESSIVE WATER THROUGH; Hanford Type Code Database, DC P. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
BFAK1-4G	3.0E-5/H	168H	P29 EXHAUSTER FAILS TO CONTINUE RUNNING (NONCATASTROPHIC (e.g., FAN BELT BREAKS), NO SPARKS); Hanford Type Code Database, FA G. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
BFC-3-1E	1.4E-8/H	168H	HEPA FILTER P29-1 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FC E. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation system could fail and be a problem
BFC-3-1L	1.4E-8/H	168H	HEPA FILTER P29-1 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for BFC-3-1E.
BFC-3-2E	1.4E-8/H	168H	HEPA FILTER P29-2 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FC E. Used the same reasoning as for BFC-3-1E.
BFC-3-2L	1.4E-8/H	168H	HEPA FILTER P29-2 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for BFC-3-1E.
BFLVENTP	1.0	NONE	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM; Assumed probability of 1.0 (without ventilation).
BHOUSE1	.01	DEMAND	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL; Refer to description in case SY1B.
BHOUSE2	.1	DEMAND	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCALIBRATED CAM; Refer to description in case SY1B.

BHTS1&2L	1.0	NONE	ELECTRICAL HEATERS HTS-1 AND HTS-2 LOCKED OUT; According to TFPC the heaters are locked out because they are not rated as an intrinsically safe piece of equipment.
BOACAM2T	1E-3	DEMAND	HUMAN OPERATOR CAM1 MISCALIBRATES CAM SETPOINT LOW; Preliminary estimate. Failures on demand do not require a tau or t value.
BOATRANQ	1E-3	DEMAND	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, TRANSFER TO BACKUP POWER SOURCE; Preliminary estimate. Failures on demand do not require a tau or t value.
BRAKP11H	3.9E-7/H	168H	RELAY P29-PS-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. Refer to description in case SY1B. Refer to case SY1D for the tau values.
BRAKP12H	3.9E-7/H	168H	RELAY P29-PS-2 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN, RAH. Used the same reasoning as for BRAKP11H.
BRAKP14H	3.9E-7/H	168H	RELAY P29-PS-4 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN, RAH. Used the same reasoning as for BRAKP11H.
BRAORLYH	3.9E-7/H	168H	OVERLOAD RELAY ORLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. Refer to description in case SY1D.
BSTACKE	1E-10/H	24H	P29 EXHAUST STACK PLUGS; Assumed less likely than piping plugs failure rate (PA E = 5E-10/H from Hanford Type Code Database), therefore, assumed 1E-10/H. A stack plug would be detected after shutdown of the P-29 fan. Assumed average time to diagnose and repair is 24 hours. Therefore, tau = 24 hours and CAFTA formula 4 will be used.
BSA-3-1L	7.0E-6/H	4380H	HEPA FILTER P29-1 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. This failure allows bypassing of HEPA filter P29-1 but leads to overloading the other HEPA filter. Since this failure is assumed to be undetectable, CAFTA formula 5 with time, tau=4,380 hours, is used. The tau=4,380 hours dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.

BSA-3-2L	7.0E-6/H	4380H	HEPA FILTER P29-2 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. Used the same reasoning as for BSA-3-1L.
BVDP29ZC	2E-7	168	HAND-OPERATED (MANUAL) VALVE FROM THE P29 EXHAUSTER N.O. FTRO; Hanford Type Code Database, VD C. If this valve fails closed, pressure will build up in the tank. It is assumed that repairs on the valve take one week from the time of failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, will be used. The $\tau=168$ hours dominates the time after a burp ($t=2.8$ hours) that the valve could fail and be a problem.
BVDP29ZS	1E-2	DEMAND	HAND-OPERATED (MANUAL) VALVE FROM THE P29 EXHAUSTER ERRONOUSLY CLOSED; If this valve were left closed following maintenance or mistakenly closed when it was supposed to be opened, pressure will build up in the tank. It is assumed that recovery from this event could occur in within an hour assuming the cause of the pressure buildup is determined quickly.
TGB-4-1F	3.0E-1	DEMAND	DIESEL GENERATOR FOR EXHAUST FAN P-29 FAILS TO START; Hanford Type Code Database, GB F (3E-2), for starting of diesel generator. Since the diesel generator is not regularly tested the probability of failure to start on demand was increased to 3E-1. Failures on demand do not require a τ or t value.

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B.9 CASE SY5B - H₂ EXPLOSION IN TANK 101-SY WITHOUT VENTILATION FLOW

KEY: T = 101-SY
 CAFTA formula 3 = $1 - e^{-\lambda t}$ [approximation= λt]
 CAFTA formula 4 = $\lambda \tau / (\lambda \tau + 1) = 1 - (MTBF) / (MTBF + MTTR)$ [approximation= $\lambda \tau$]
 CAFTA formula 5 = $1 + (1/\lambda \tau)(e^{-\lambda \tau} - 1)$ [approximation= $\lambda \tau / 2$]

MTBF = Mean Time Between Failure = $1/\lambda$

MTTR = Mean Time to Repair

BASIC EVENT	λ OR PROB.	τ (tau) or t	DISCUSSION
IE-101	3.65/YR	NONE	BURPS PER YEAR IN 101-SY.
PWR2	1E-5/H	45H	LOSS OF POWER TO SY TANK FARM; Assumed one loss-of-power incident every 10 years and converted to hourly rate by dividing by 8,760 hours/year (1.14E-5/H). AC Power System Notebook for N Reactor used significant outage data from UNI-3642 of one per 23 years/4,400 hours operation per year [9.88E-6/H]. According to the Event Fact Sheets collected from the 200 Area, the majority of the power outages are typically momentary and last no longer than a few minutes. Accordingly, unavailability of main power at the time of the event is assumed to be dominated by loss of power during the burp. The time for the burp (combustible concentrations) is t=45 hours. CAFTA equation 3 is used.
PWR3	3E-6/H	24H	LOSS OF 120-V POWER TO P-23 CAM CAUSES P-23 EXHAUST FAN TO SHUT DOWN); Assumed loss of power is due to circuit breaker failure to remain closed. Use Hanford Type Code Database, CD D value of 3E-6/H. It is assumed that the tau for mean time to repair is 24 hours. Thus, CAFTA formula 4 will be used. The fact that the circuit breaker could fail during time t=1.6 hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL) is disregarded because it is dominated by the tau above.
SEASON	0.17	NONE	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATURE; Estimated that 2 months out of 12, the humidity is high enough and the temperature is cold enough to yield filters plugged due to moisture if the moisture is not removed or heated.

ST1	1E-8	168H*100FT	STEAM LINE TO HEATER RUPTURES; Hanford Type Code Database for PA L. It is estimated there is 100 ft of this piping. It is assumed that the tau for mean time to repair is 1 week (168 hours). Thus, CAFTA formula 4 will be used. The fact that the piping could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL) is disregarded because it is dominated by the tau above.
ST2	2E-6	24H	LOSS OF STEAM FROM 200 AREA POWER PLANT FACILITY; Based on the January 13, 1992 Hanford Reach article on the 200 Area Powerhouse, the facility has never totally lost steam in 48 years of operation. Assuming one failure in 50 years and converting to an hourly rate, results in a rate of $2.28E-6/H$. It is assumed to take 24 hours to repair the failure and get the powerhouse back in operation. Thus, CAFTA formula 4 will be used. The fact that the power house could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL) is disregarded because it is dominated by the tau above.
T1153A	0.00001	NONE	ELECTROSTATIC SPARKS FROM LESS-THAN-SUFFICIENT BONDING/GROUNDING OF TANK RISERS; Refer to description in case SY1A.
T1153B	6E-9/H	1.6H	ELECTROSTATIC SPARKS CAUSED BY LIGHTNING STRIKE; FAILS VENTILATION AND IGNITES; Lightning Assessment Letter 39220-90-TBP-079 (One lightning strike, with present lightning protection assumed to be 99.5 percent effective, per 18,000 years converted to an hourly rate [$6.34E-9/H$]). Since this event is a common cause event (fails ventilation and produces ignition source), CAFTA formula 3 is used with $t=1.6$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL). A one-time electrostatic spark occurring before the burp is not considered an ignition source of concern.
T1155A	0.0001	DEMAND	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE;

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Refer to description in case SY1A.
Failures on demand do not require a tau or t value.

T1155B	0.0001	DEMAND	MECHANICAL SPARKS FROM SLUDGE WEIGHT/CABLE STRIKING SAMPLING TUBES; Refer to description in case SY1A. Failures on demand do not require a tau or t value.
T1156A	5E-8/H •	2400H	ELECTRICAL SPARKS FROM FIC LEVEL PROBE; Refer to description in case SY1A. The fact that the FIC could fail during time t=45 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau=2,400 hours described in case SY1A. CAFTA formula 5 will be used.
T1156B	8E-10/H	2400H	ELECTRICAL SPARKS FROM SLACK TAPE DETECTOR FAULT; Refer to description in case SY1A. The fact that the slack tape detector could fail during time t=45 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau=2,400 hours described in case SY1A. CAFTA formula 5 will be used.
T1156C	5E-7/H	45H	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE; Refer to description in case SY1A related to frequency. The dominant time this event is of concern is after a burp when a flammable mixture is in the tank (t=45 hours). Thus, CAFTA formula 3 will be used. It is recognized that the manual level probe could be unavailable before the burp with a tau of 24 hours but the time of concern is dominated by the 45 hours mentioned above.
T1156D	1E-6/H	720H	ELECTRICAL SPARKS FROM EXPLOSION-PROOF LIGHT OR LIGHT LEAD FAULTS; Refer to description in case SY1A. The fact that the explosion-proof lights and light leads could fail during time t=45 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau=720 hours described in case SY1A.
T1156F1	1E-6/H	720H	ELECTRICAL SPARKS FROM VIDEO CAMERA; Refer to description in case SY1A. The fact that the video camera could fail during time t=45 hours (time flammable mixture is

			in the tank after a burp) is disregarded because it is dominated by the $\tau=720$ hours described in case SY1A.
T1156G	1E-8/H	45H	ELECTRICAL SPARKS FROM RADAR GAUGE FAULT; Refer to description in case SY1A related to frequency. The dominant time this event is of concern is after a burp when a flammable mixture is in the tank ($t=45$ hours). Thus, CAFTA formula 3 will be used. It is recognized that the radar gauge could be unavailable before the burp with a τ of 24 hours but the time of concern is dominated by the 45 hours mentioned above.
T1156H	1E-8/H	45H	ELECTRICAL SPARKS FROM THERMOCOUPLES; Refer to description in case SY1A related to frequency. The dominant time this event is of concern is after a burp when a flammable mixture is in the tank ($t=45$ hours). Thus, CAFTA formula 3 will be used. It is recognized that the thermocouples could be unavailable before the burp with a τ of 24 hours but the time of concern is dominated by the 45 hours mentioned above.
T1157J	4E-9/H	1.6H	BURNING GASOLINE SPILLS INTO TANK, FAILS VENT AND IGNITES LEAKING H_2 ; one gasoline engine fire has occurred on the Hanford Site in 26 years, and an assumed 1/1000 chance of the fire existing in the SY Tank Farm and spilling into tank is converted to an hourly rate ($4.39E-9/H$). It is assumed that burning or red-hot debris could exist for up to 2 hours. The fire could occur just before a burp, or it could occur just after a burp. If it occurs just before a burp and ignites leaking H_2 , then on average it occurs one hour before the burp. If it occurs after the burp, then H_2 is ignitable for 1.6 hours because this is a common cause event (fails ventilation and produces ignition source). It is judged that the $t=1.6$ hours dominates the time of concern for this event. Thus, CAFTA formula 3 will be used.
T1157K	4E-7/H	1.6H	RANGE FIRE PRODUCES SPARKS THAT FAIL VENT AND IGNITE LEAKING H_2 ; Based on information from the Hanford Fire Department, there are range fires of about

5,000 acres once every 5 years. The frequency of a range fire occurring somewhere on the Hanford Site is $2.3E-5/H$. The Site is roughly 500 mi^2 in area (320,000 acres). So the frequency that the fire occurs in a 5,000-acre section that includes the SY Tank Farm is $3.6E-7/H$ ($2.3E-5/H \times [5,000 \text{ acres}/320,000 \text{ acres}]$). It is assumed that burning or red-hot debris could exist for up to 2 hours. The fire could occur just before a burp, or it could occur just after a burp. If it occurs just before a burp and ignites leaking H_2 , then on average it occurs one hour before the burp. If it occurs after the burp, then H_2 is ignitable for 1.6 hours because this is a common cause event (fails ventilation and produces ignition source). It is judged that the $t=1.6$ hours dominates the time of concern for this event. Thus, CAFTA formula 3 will be used.

T1160A	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO_2 IN THE 101-SY VENTILATION HEADER; Given there is a flammable mixture in the tank dome space, it is assumed there is a flammable mixture in the 101-SY ventilation header with a probability of 1.0 even when the ventilation is not functioning.
T1160C	0.01	NONE	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101-SY VENT HEADER; Refer to description in case SY1A.
T1161B2	$2E-8/H$	2400H	ELECTRICAL SPARK FROM FAULT IN TELEDYNE H_2 ANALYZER; Refer to description in case SY1A. The fact that the Teledyne H_2 analyzer could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A.
T1161B3	$1E-6/H$	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF TELEDYNE VACUUM PUMP (BEARINGS); This event is like the one for case SY1A, except time is $t=45$ hours.
T1161B4	$3E-5/H$	2400H	ELECTRICAL SPARK FROM THE TELEDYNE VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to description in case SY1A. The fact that the Teledyne vacuum pump seal could fail

			during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A.
T1161B7A	1.0	NONE	ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1A.
T1162B3	1E-6/H	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CRYOGENIC VACUUM PUMP (BEARINGS); This event is like the one for case SY1A, except time is $t=45$ hours.
T1162B4	3E-5/H	45H	ELECTRICAL SPARK FROM THE CRYOGENIC VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to description in case SY1A related to frequency. The cryogenic vacuum pump is only used for 4 hours after a burp starts given the ventilation is functioning (according to the pump's shutdown procedure). But if the ventilation system were to fail, it is assumed the cryogenic vacuum pump would be used for at least 45 hours. Thus, the dominant time this event is of concern is after a burp when a flammable mixture is in the tank ($t=45$ hours). Thus, CAFTA formula 3 will be used.
T1163B7A	1.0	NONE	ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1A.
T1163B7B	1E-6/H	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF AMMONIA BUBBLER VACUUM PUMP (BEARINGS); This event is like the one for case SY1A, except time is $t=45$ hours.
T1163B7C	3E-5/H	45H	ELECTRICAL SPARK FROM THE AMMONIA BUBBLER VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to description in case SY1A related to frequency. The ammonia bubbler vacuum pump is only used for 8 hours after a burp starts given the ventilation is functioning (according to the pump's shutdown procedure). But if the ventilation system were to fail, it is assumed the ammonia bubbler vacuum pump would be used for at least 45 hours. Thus, the dominant time this event is of concern is after a burp when a flammable mixture is in the tank ($t=45$ hours). Thus, CAFTA formula 3 will be used.

T1170A	1E-8/H	2400H	ELECTRICAL SPARKS FROM VENT HEADER THERMOCOUPLE; Refer to description in case SY1A. The fact that the vent header thermocouple could fail during time t=45 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau=2,400 hours described in case SY1A.
T1170B	1E-8/H	2400H	ELECTRICAL SPARKS FROM VENT HEADER RELATIVE HUMIDITY DEVICE; Refer to description in case SY1A. The fact that the vent header relative humidity device could fail during time t=45 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau=2,400 hours described in case SY1A.
T1173A	5E-8/H	2400H	ELECTRICAL SPARK FROM FAULT IN THE (WHITTAKER) CHEMICAL CELL H ₂ ANALYZER; Refer to description in case SY1A. The fact that the chemical cell analyzer could fail during time t=45 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau=2,400 hours described in case SY1A.
T1173B	1E-6/H	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CHEMICAL CELL VACUUM PUMP (BEARINGS); This event is like the one for case SY1A, except time is t=45 hours.
T1173C	5E-7/H	2400H	ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (BELLOWS AND MOTOR); This event is like the one for case SY1A.
T1180A	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO ₂ IN THE MAIN SY VENTILATION SYSTEM; Refer to description in case SY1A.
T1182-1A	1E-6/H	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-1 VACUUM PUMP (BEARINGS); This event is like the one for case SY1A, except time is t=45 hours.
T1182-1B	1E-6/H	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-2 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1182-1A.
T1182-1C	3E-5/H	2400H	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL AND MOTOR);

			Refer to description in case SY1A. The fact that the vacuum pump seal could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A.
T1182-1D	3E-5/H	2400H	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for T1182-1C.
T1182-3A	6E-5/H	2400H	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS; Refer to description in case SY1A.
T1182-3C	1E-6/H	2400H	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP; Refer to description in case SY1A.
T1182-3D	1E-6/H	2400H	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP; Used the same values and reasoning as for T1182-3C.
T1182-4A	1.0	NONE	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1A.
T1182A	3E-7/H	4H	FAILURE OF PRESSURE SWITCH K1-PS-1-1 FAILS VENT AND CREATES SPARKS; One potential failure mode of the pressure switch shuts down the ventilation system and at the same time produces a spark source. Hydrogen can enter the switch contacts area because no seal exists between the high-pressure side (ventilation side) of the diaphragm and the switch. If the power wires attached to the back of the snap switch short then a continuous spark could be created. This is assumed to happen at a rate of 3E-7/H (WA 2 from Hanford Type Code Database). It is also assumed that the switch failure causes a spurious trip on the low setpoint (-6 in. WG) and shuts down the fan. Shutdown of the fan would be immediately detectable, but sparking in the pressure switch may not be detected at all. It is assumed that special authorization to start the backup fan will take 4 hours on average. Thus, CAFTA formula 4 is be used with time, $t=4$ hours to represent the unavailability of the P-23 ventilation and

presence of an ignition source prior to the startup of the backup fan. Failure during the burp (time=1.6 hours) is dominated by this failure. Another concern is that even though the backup fan is started, sparks continue to be produced. However, this case (SY1B) includes only situations in which the vent is failed. Other cases consider possibilities in which the vent works. This is a unique common cause event because the ventilation failure part of the common cause event will be detected quickly but the ignition source part may not be detected until ignition occurs.

T1182B	3E-7/H	2400H	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYSTEM); Refer to description in case SY1B. The fact that the pressure switch could fail during time t=45 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau=2,400 hours described in case SY1A.
T1182C	3E-7/H	2400H	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYSTEM); Used the same values and reasoning as for T1182B.
T1182D	1E-7/H	45H	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM RADIATION DET GM TUBE RM-EXH-K1-1; Refer to description in case SY1A for frequency value. The fact that the detector could fail during time t=45 hours (time flammable mixture is in the tank after a burp) [unreliability] dominates the mean time to repair [unavailability] of tau=12 hours as discussed in SY1A. Thus, CAFTA formula 3 is used.
T1183	1E-6/H	2400H	IGNITION FROM THE OVM SYSTEM; Refer to description in case SY1A.
T1183A	1E-5/H	1.6H	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF K1-4-1 (P-23) FAN (IN VENTILATION SYSTEM) (FAN BLADES COME OFF); Refer to description in case SY1B.
T1183D	0.0001	DEMAND	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAILURE; Assume a probability of 1/10,000 or 0.0001. This is a demand failure that occurs at the time of the burp due to the

pressure pulse. It provides both a spark source and a mechanism for failing the fan (piece of metal flies into fan), common cause event. Failures on demand do not require a tau or t value.

T1184A	1E-6/H	2400H	ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING AROUND THE DUCTWORK JOINTS; Refer to description in case SY1A. The fact that the bonding could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A.
TATMOSPH	4E-9/H	1.6H	ATMOSPHERIC CONDITIONS (TORNADO) THAT PRODUCE NEGATIVE PRESSURE <-6 IN. WG; The design basis tornado frequency is $3.4E-5/YR$ or $4E-9/H$ (SDC-4.1). It is assumed that a tornado could catastrophically fail the ventilation system and at the same time create spark sources (flying debris or disturbed electrical system), common cause event. Since passage of a tornado is over quickly, failure after a burp occurs dominates a fault duration event. Accordingly, CAFTA formula 3 with time, $t=1.6$ hours is used.
TCFIRELA	3E-4	DEMAND	ELECTRICAL RELAY CONTACTS, IR, NORMALLY ENERGIZED, FTOD; Refer to description in case SY1A. Failures on demand do not require a tau or t value.
TCFLO-XA	3E-4	DEMAND	ELECTRICAL RELAY CONTACTS, LO-X, NORMALLY ENERGIZED, FTOD; Refer to description in case SY1A. Failures on demand do not require a tau or t value.
TCHCAM13	1.6E-5/H	12H	CAM1 SPURIOUSLY ALARMS; Hanford Type Code Database, CH 3. This event fails ventilation since the CAM is interlocked to shut down the fan given high radiation detection. It is assumed that the CAM could be repaired or replaced in 12 hours from the time of the failure (immediately replaceable upon detection). Therefore, CAFTA formula 4 with time, $t=12$ hours is used. The $\tau=12$ hours dominates the time after a burp ($t=1.6$ hours) that the ventilation could fail and be a problem.

TDC-1-1E	1.0E-5/H	168H	DEENTRAINER K1-1-1 PLUGS; Hanford Type Code Database, DC E. This event fails ventilation. It is estimated that repairs could take a week from the time of the failure (immediately detectable). Accordingly, CAFTA formula 4 with time, $t=168$ hours is used. The $\tau=168$ hours dominates the time after a burp ($t=1.6$ hours) that the ventilation could fail and be a problem.
TDC-1-1P	1.0E-6/H	168H	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH; Hanford Type Code Database, DC P. This event fails ventilation by plugging the HEPA filters due to excessive moisture. The deentrainer and the filters will need to be replaced. This repair is estimated to take one week from the time of the failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours is used. The $\tau=168$ hours dominates the time after a burp ($t=1.6$ hours) that the ventilation could fail and be a problem.
TDFK1VTC	3.0E-7/H	168H	MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO; Hanford Type Code Database, DF C. The event defeats ventilation flow. Since mechanical failure of the valve to remain open indicates catastrophic damage, the repair time is estimated to be one week from the time of the failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours is used. The $\tau=168$ hours dominates the time after a burp ($t=1.6$ hours) that the ventilation could fail and be a problem.
TFAK1-4G	3.0E-5/H	168H	K1-4-1 FAILS TO CONTINUE RUNNING (NONCATASTROPHIC (e.g., FAN BELT BREAKS), NO SPARKS); Hanford Type Code Database, FA G. This failure is noncatastrophic and produces no sparks, but does fail the ventilation flow. The repair time is estimated to be one week from the time of the failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours is used. The $\tau=168$ hours dominates the time after a burp ($t=1.6$ hours) that the ventilation could fail and be a problem.

TFAP-28F	5E-3	DEMAND	BACKUP EXHAUST FAN P-28 FAILS TO START; Hanford Type Code Database, FA F. Failures on demand do not require a tau or t value.
TFAP-28G	3.0E-5/H	168H	P-28 FAILS TO CONTINUE RUNNING (NONCATASTROPHIC (e.g., FAN BELT BREAKS), NO SPARKS); Hanford Type Code Database, FA G. This failure is noncatastrophic and produces no sparks, but does fail the ventilation flow. The P-28 is the backup fan so it must run until the P-23 [K1-4-1] is repaired, so mission time is 168 hours. Accordingly, CAFTA formula 3 with time, t=168 hours is used. The tau=168 hours dominates the time after a burp (t=1.6 hours) that the ventilation could fail and be a problem.
TFB-5-1E	1.0E-5/H	168H	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FB E. This event defeats ventilation flow. It is estimated that replacement or repairs would take one week from the time of the failure. Accordingly, CAFTA formula 4 with time, t=168 hours is used. The tau=168 hours dominates the time after a burp (t=1.6 hours) that the ventilation could fail and be a problem.
TFC-3-1E	1.4E-8/H	168H	HEPA FILTER K1-3-1 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FC E. Used the same reasoning as for TFB-5-1E.
TFC-3-1L	1.4E-8/H	168H	HEPA FILTER K1-3-1 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for TFB-5-1E.
TFC-3-2E	1.4E-8/H	168H	HEPA FILTER K1-3-2 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FC E. Used the same reasoning as for TFB-5-1E.
TFC-3-2L	1.4E-8/H	168H	HEPA FILTER K1-3-2 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for TFB-5-1E.
TFLVENTP	1.0	NONE	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM; Assumed probability of 1.0 (without ventilation).
TGB-4-1F	3.0E-1	DEMAND	DIESEL GENERATOR FOR EXHAUST FANS P-23 AND P-28 FAILS TO START; Started with the

Hanford Type Code Database, GD F (3E-2), for starting of diesel generator. Since the diesel generator is not regularly tested, the probability of failure to start on demand was increased to 3E-1. Failures on demand do not require a tau or t value.

THA-2-14	1.0E-6/H	168H	STEAM HEATER K1-2-1 LEAKS FROM THE TUBES; Hanford Type Code Database, HA 4. This event fails ventilation flow by plugging the HEPA filters due to moisture. It is estimated that replacement or repairs would take one week from the time of the failure. Accordingly, CAFTA formula 4 with time, t=168 hours is used. The tau=168 hours dominates the time after a burp (t=1.6 hours) that the ventilation could fail and be a problem.
THOUSE1	.01	DEMAND	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL; Assumed a probability of 1/100 that during a release that enough radioactive material is released through the ventilation system to cause high reading at the CAM. This results in shutdown of the vent fan via a high rad interlock. Failures on demand do not require a tau or t value.
THOUSE2	.1	DEMAND	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCALIBRATED CAM; Assumed a probability of 1/10 that during a release that enough radioactive material is released to the ventilation system to produce a high radiation signal on a miscalibrated exhaust stack CAM. Again, this results in shutdown of the vent fan. Failures on demand do not require a tau or t value.
TOACAM1T	1E-3	DEMAND	HUMAN OPERATOR CAM1 MISCALIBRATES CAM SETPOINT LOW; Preliminary estimate. Failures on demand do not require a tau or t value.
TOAN2COQ	1E-3	DEMAND	HUMAN OPERATOR FAILS TO FILL NITROGEN BOTTLE (VIDEO CAMERA PURGE SYSTEM); Preliminary estimate. Failures on demand do not require a tau or t value.
TOAP-28Q	1E-3	DEMAND	HUMAN OPERATOR FAILS TO START BACKUP FAN P-28; Preliminary estimate. Failures on demand do not require a tau or t value.

TOAPS-1T	0.01	DEMAND	HUMAN OPERATOR MISCALIBRATES PRESSURE SWITCH (VIDEO CAMERA PURGE SYSTEM); Preliminary estimate. Failures on demand do not require a tau or t value.
TOAT1-2Q	1E-3	DEMAND	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE TI-1-2 READING; Preliminary estimate. Failures on demand do not require a tau or t value.
TOATRANQ	1E-3	DEMAND	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, TRANSFER TO BACKUP POWER SOURCE; Preliminary estimate. Failures on demand do not require a tau or t value.
TOAUCV1U	1E-2	DEMAND	HUMAN OPERATOR FTRTCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VALVE; Preliminary estimate. Failures on demand do not require a tau or t value.
TPAAMMOL	6E-5/H	2400H	AMMONIA BUBBLER PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP; Refer to description in case SY1A. The fact that the piping could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A.
TPALEAKL	1E-8/H-FT	6570H*100FT	VIDEO CAMERA PURGE PIPING LEAKS (PER FOOT OF <3-IN. PIPE); Refer to description in case SY1A. The fact that the piping could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=6,570$ hours times 100 ft described in case SY1A.
TPATELEL	6E-5/H	2400H	TELEDYNE H ₂ SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP; Refer to description in case SY1A. The fact that the piping could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A.
TPDAVACL	1E-6/H	2400H	AMMONIA BUBBLER VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABINET; Refer to description in case SY1A. The fact that the pump could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is

dominated by the $\tau=2,400$ hours described in case SY1A.

TPDTVACL $1E-6/H$ 2400

TELEDYNE H, SAMPLING SYSTEM VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABINET; Refer to description in case SY1A. The fact that the pump could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A.

TRAKP11H $3.9E-7/H$ 168H

RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. This event causes loss of the ventilation fan. It is estimated that replacement or repair of this relay would take one week from the time of the failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, is used. The $\tau=168$ hours dominates the time after a burp ($t=1.6$ hours) that the ventilation could fail and be a problem.

TRAORLYH $3.9E-7/H$ 168H

OVERLOAD RELAY ORLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. This event causes loss of the ventilation fan. It is estimated that replacement or repair of this relay would take one week from the time of the failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, is used. The $\tau=168$ hours dominates the time after a burp ($t=1.6$ hours) that the ventilation could fail and be a problem.

TSA-3-1L $7.0E-6/H$ 2400H

HEPA FILTER K1-3-1 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. This failure allows bypassing of HEPA filter K1-3-1 but leads to overloading the other HEPA filter. Since this failure is assumed to be undetectable, CAFTA formula 5 with time, $\tau=2,400$ hours, is used. The $\tau=2,400$ hours dominates the time after a burp ($t=1.6$ hours) that the ventilation could fail and be a problem.

TSA-3-2L $7.0E-6/H$ 2400H

HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. This failure allows bypassing of HEPA filter K1-3-1 but leads to overloading the other HEPA filter. Since this failure is assumed to be

			<p>undetectable, CAFTA formula 5 with time, $\tau=2,400$ hours, is used. The $\tau=2,400$ hours dominates the time after a burp ($t=1.6$ hours) that the ventilation could fail and be a problem.</p>
TSIPS-1I	3E-5	DEMAND	<p>PS FAILS TO OPEN WHEN REQUIRED (VIDEO CAMERA PURGE SYSTEM); Hanford Type Code Database, SI I. Refer to description in case SY1A.</p>
TSJ-1-13	1.0E-6/H	168H	<p>TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOSES; Hanford Type Code Database, SJ 3. This event results in the failure to dry the air in the ventilation flow path, which leads to plugging of the HEPA filters. It is assumed that situation could be remedied in one week from the time of the failure. Therefore, CAFTA formula 4 with time, $t=168$ hours is used. The $\tau=168$ hours dominates the time after a burp ($t=1.6$ hours) that the ventilation could fail and be a problem.</p>
TVB-1-1P	1.1E-5/H	168H	<p>TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER; Hanford Type Code Database, VB P. This event results in the failure to dry the air in the ventilation flow path, which leads to plugging of the HEPA filters. It is assumed that situation could be remedied in one week from the time of the failure. Therefore, CAFTA formula 4 with time, $t=168$ hours is used. The $\tau=168$ hours dominates the time after a burp ($t=1.6$ hours) that the ventilation could fail and be a problem.</p>
TVBPR-1C	3E-6/H	720H	<p>FLOW CONTROL (SELF-REGULATING) VALVE PR-1 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM); Assumed same as VC C from Hanford Type Code Database. Refer to description in case SY1A. The $\tau=720$ hours dominates the time after a burp ($t=45$ hours) that the nitrogen purge could fail and be a problem.</p>
TVBPR-2C	3E-6/H	720H	<p>FLOW CONTROL (SELF-REGULATING) VALVE PR-2 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM); Assumed same as VC C from Hanford Type Code Database. Used the same reasoning as for TVBPR-1C.</p>

TVD4501C	1.5E-7/H	168H	HAND-OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.T., FTRO; Hanford Type Code Database, VD C. If this valve fails closed, pressure will build up in the tank. This will trip a pressure switch which will energize an alarm. It is assumed that repairs on the valve take one week from the time of failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, will be used. The $\tau=168$ hours dominates the time after a burp ($t=45$ hours) that the valve could fail and be a problem.
TVD4501D	0	NONE	HAND-OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.T., FTRO; Normally fully open.
TVD4501S	1E-2	DEMAND	MANUAL VALVE 4501 FROM TANK 101-SY ERRONEOUSLY LEFT CLOSED; If this valve were left closed following maintenance or mistakenly closed when it was supposed to be opened, pressure will build up in the tank. This will trip a pressure switch which will energize an alarm. It is assumed that recovery from this event could occur in within an hour assuming the cause of the pressure buildup is determined quickly. The recovery should be taken into account in the accident sequence cutsets.
TVD4502D	9.4E-8/H	168H	HAND-OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTRO; Hanford Type Code Database, VD D. Failure of this valve to remain open will have a impact on the mass balance of the ventilation system. It is assumed that this event would trip the fan off due to low pressure (-6 in. WG). It is assumed that repairs on the valve take one week from the time of failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, will be used. The $\tau=168$ hours dominates the time after a burp ($t=1.6$ hours) that the valve could fail and be a problem.
TVD4503D	9.4E-8/H	168H	HAND-OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRO; Hanford Type Code Database, VD D. See the earlier discussion for event TVD4502D.
TVDAMMOL	2E-8/H	2400H	EITHER OF THE 2 DOWNSTREAM VALVES IN THE AMMONIA BUBBLER CABINET LEAK; Refer to

description in case SY1A. The fact that the valves could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A.

TVDSY-1B	2.9E-4	NONE	HAND-OPERATED (MANUAL) VALVE MV-K1-SY-1 TO P-23 FAN N.O., FTCD; Hanford Type Code Database, VD B. This valve must be closed after the P-23 has stopped running in order to allow the P-28 to exhaust the tanks of consideration.
TVDSY-1C	1.5E-7/H	168H	HAND-OPERATED (MANUAL) VALVE MV-K1-SY-1 TO P-23 FAN N.O., FTRO; Hanford Type Code Database, VD C. If this valve fails closed, P-23 may still be operating but it won't be effective in exhausting the tanks of consideration. Pressure will build up in the tanks due to lack of ventilation. This will trip a pressure switch which will energize an alarm. It is assumed that repairs on the valve take one week from the time of failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, will be used. The $\tau=168$ hours dominates the time after a burp ($t=45$ hours) that the valve could fail and be a problem.
TVDSY-1S	1E-2	DEMAND	MANUAL VALVE MV-K1-SY-1 TO P-23 ERRONEOUSLY CLOSED; If this valve were mistakenly closed when it was supposed to be remain open, pressure will build up in the tanks. This will trip a pressure switch which will energize an alarm. It is assumed that recovery from this event could occur within an hour assuming the cause of the pressure buildup is determined quickly. The recovery should be taken into account in the accident sequence cutsets.
TVDSY-2A	2.9E-4	NONE	HAND-OPERATED (MANUAL) VALVE MV-K1-SY-2 TO P-28 FAN N.C., FTOD; Hanford Type Code Database, VD A. This valve must be opened after the P-23 has stopped running in order to allow the P-28 to exhaust the tanks of consideration.
TVDSY-2S	1E-2	DEMAND	MANUAL VALVE MV-K1-SY-2 TO P-28 ERRONEOUSLY LEFT CLOSED; If this valve were mistakenly left closed when it was supposed to be opened so the P-28 could

exhaust the tanks of consideration as a backup, pressure will build up in the tanks. This will trip a pressure switch which will energize an alarm. It is assumed that recovery from this event could occur within an hour assuming the cause of the pressure buildup is determined quickly. The recovery should be taken into account in the accident sequence cutsets.

TVDUCV1C 1.5E-7/H 168H

HAND-OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO; Hanford Type Code Database, VD C. This event results in the failure to dry the air in the ventilation flow path, which leads to plugging of the HEPA filters. It is assumed that situation could be remedied in one week from the time of the failure. Therefore, CAFTA formula 4 with time, $t=168$ hours is used. The $\tau=168$ hours dominates the time after a burp ($t=1.6$ hours) that the ventilation could fail and be a problem.

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B.10 CASE SY5D - H₂ EXPLOSION IN TANK 103-SY WITHOUT VENTILATION FLOW WITH P-28 TEED INTO MAIN VENT HEADER NEAR THE P-23. THE P-28 IS USED AS A BACK-UP TO THE P-23.

KEY: B = 103-SY

T = 101-SY

CAFTA formula 3 = $1 - e^{-\lambda t}$

[approximation= λt]

CAFTA formula 4 = $\lambda \tau / (\lambda \tau + 1) = 1 - (\text{MTBF}) / (\text{MTBF} + \text{MTTR})$

[approximation= $\lambda \tau$]

CAFTA formula 5 = $1 + (1/\lambda \tau)(e^{-\lambda \tau} - 1)$

[approximation= $\lambda \tau / 2$]

MTBF = Mean Time Between Failure = $1/\lambda$

MTTR = Mean Time to Repair

<u>BASIC EVENT</u>	<u>λ OR PROB.</u>	<u>τ (tau) or t</u>	<u>DISCUSSION</u>
B1153A	0.00001	NONE	ELECTROSTATIC SPARKS FROM LESS-THAN-SUFFICIENT BONDING/GROUNDING OF TANK RISERS; Refer to description in case SY1C.
B1153C	0.01	NONE	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7); Refer to description in case SY1C.
B1155A	0.00001	DEMAND	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE; Refer to description in case SY1C. Failures on demand do not require a tau or t value.
B1156A	5E-8/H	4380H	ELECTRICAL SPARKS FROM FIC LEVEL PROBE; Refer to description in case SY1C. The fact that the FIC could fail during time $t=2.8$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=4,380$ hours described in case SY1C.
B1156C	5E-7/H	24H	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE; Refer to description in case SY1C related to frequency. It is assumed that the tau for time between failure detection is 24 hours, time between manual tape readings. Thus, CAFTA formula 5 will be used. The during time $t=2.8$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.
B1156H	1E-8/H	24H	ELECTRICAL SPARKS FROM THERMOCOUPLES; Refer to description in case SY1C related to frequency. It is assumed that the tau for time between failure detection is 24 hours, average time to notice bad readings. Thus, CAFTA formula 5 will be

			used. The fact that the thermocouples could fail during time $t=2.8$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.
B1178	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO_2 IN THE PUMP PIT; Refer to description in case SY1C.
B1179A	5E-4	NONE	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103-SY PUMP PIT; Refer to description in case SY1C related to probability.
B1179B	0	NONE	ELECTRICAL SPARK FROM PUMP P-103-1 IN THE 103-SY PUMP PIT; Refer to description in case SY1C.
B1180A	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO_2 IN THE MAIN SY VENTILATION SYSTEM; Refer to description in case SY1C.
IE-103	2/YR	NONE	BURPS PER YEAR IN 103-SY.
PWR2	1E-5/H	2.8H	LOSS OF POWER TO SY TANK FARM FROM MAIN POWER SOURCE (MCC); Refer to the description in case SY1B related to frequency. According to the Event Fact Sheets collected from the 200 Area, the majority of the power outages are typically momentary and last no longer than a few minutes. Accordingly, unavailability of main power at the time of the event is assumed to be dominated by loss of power during the burp. The time for the burp (combustible concentrations) is $t=2.8$ hours. CAFTA equation 3 is used.
PWR3	3E-6/H	24H	LOSS OF 120-V POWER TO P-23 CAM CAUSES P-23 EXHAUST FAN TO SHUT DOWN); Assumed loss of power is due to circuit breaker failure to remain closed. Use Hanford Type Code Database, CD D value of 3E-6/H. It is assumed that the tau for mean time to repair is 24 hours. Thus, CAFTA formula 4 will be used. The fact that the piping could fail during time $t=1.6$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL) is disregarded because it is dominated by the tau above.

ST1	1E-8	168H*100FT	STEAM LINE TO HEATER RUPTURES; Hanford Type Code Database for PA L. It is estimated there is 100 ft of this piping. It is assumed that the tau for mean time to repair is 1 week (168 hours). Thus, CAFTA formula 4 will be used. The fact that the piping could fail during time $t=0.1$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL) is disregarded because it is dominated by the tau above.
ST2	2E-6	24H	LOSS OF STEAM FROM 200 AREA POWER PLANT FACILITY; Refer to the description in case SY1B related to frequency. It is assumed to take 24 hours to repair the failure and get the powerhouse back in operation. Thus, CAFTA formula 4 will be used. The fact that the power house could fail during time $t=0.1$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL) is disregarded because it is dominated by the tau above.
T1153B	6E-9/H	0.1H	ELECTROSTATIC SPARKS CAUSED BY LIGHTNING STRIKE; FAILS VENTILATION AND IGNITES; Refer to the description in case SY1B related to frequency. Since this event is a common cause event (fails ventilation and produces ignition source), CAFTA formula 3 is used with $t=0.1$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL). A one-time electrostatic spark occurring before the burp is not considered an ignition source of concern.
T1157J	4E-9/H	1.0H	BURNING GASOLINE SPILLS INTO TANK, FAILS VENT AND IGNITES LEAKING H_2 ; Refer to the description in case SY1B related to frequency. It is assumed that burning or red-hot debris could exist for up to 2 hours. The fire could occur just before a burp, or it could occur just after a burp. If it occurs just before a burp and ignites leaking H_2 , then on average it occurs one hour before the burp. If it occurs after the burp, then H_2 is ignitable for 0.1 hours because this is a common cause event (fails ventilation and produces ignition source). It is judged

that the $\tau=1$ hour (mean time to either put fire out or let it burn out) dominates the time of concern for this event. Thus, CAFTA formula 4 will be used.

T1157K	4E-7/H	1.0H	RANGE FIRE PRODUCES SPARKS THAT FAIL VENT AND IGNITE LEAKING H_2 ; Refer to the description in case SY1B related to frequency. It is assumed that burning or red-hot debris could exist for up to 2 hours. The fire could occur just before a burp, or it could occur just after a burp. If it occurs just before a burp and ignites leaking H_2 , then on average it occurs one hour before the burp. If it occurs after the burp, then H_2 is ignitable for 0.1 hours because this is a common cause event (fails ventilation and produces ignition source). It is judged that the $\tau=1$ hour (mean time to either put fire out or let it burn out) dominates the time of concern for this event. Thus, CAFTA formula 4 will be used.
T1182-1A	1E-6/H	2.8H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-1 VACUUM PUMP (BEARINGS); Refer to description in case SY1A. The time flammable mixture is in the tank after a burp without ventilation operating is used ($t=2.8$ hours).
T1182-1B	1E-6/H	2.8H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-2 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1182-1A.
T1182-1C	3E-5/H	4380H	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to description in case SY1A for the frequency value. It is assumed that the τ for time between failure detection is 6 months (4,380 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the pump could fail during time $t=2.8$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the τ above.
T1182-1D	3E-5/H	4380H	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for T1182-1C.

T1182-3A	6E-5/H	4380H	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS; Refer to description in case SY1A for the frequency value. It is assumed that the tau for time between failure detection is 6 months (4,380 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the piping could fail during time t=2.8 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.
T1182-3C	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP; Refer to description in case SY1A for the frequency value. Refer to T1182-3A above for the reasoning for the tau value.
T1182-3D	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP; Used the same value and reasoning as for T1182-3C.
T1182-4A	1.0	NONE	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1A.
T1182A	3E-7/H	4H	FAILURE OF PRESSURE SWITCH K1-PS-1-1 FAILS VENT AND CREATES SPARKS; Used the same value and reasoning as for SY1B.
T1182B	3E-7/H	4380H	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYSTEM); Refer to description in case SY1A for the frequency value. It is assumed that the tau for time between failure detection is 6 months (4,380 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the wiring could fail during time t=2.8 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.
T1182C	3E-7/H	4380H	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYSTEM); Used the same value and reasoning as for T1182B.
T1182D	1E-7/H	12H	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM RADIATION DET GM TUBE RM-EXH-K1-1; Refer to description in case SY1A. The fact that the detector could fail during

			time $t=2.8$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=12$ hours as discussed in SY1A.
T1183	1E-6/H	4380H	IGNITION FROM THE OVM SYSTEM; Refer to description in case SY1A for the frequency value. It is assumed that the τ for time between failure detection is 6 months (4,380 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the OVM could fail during time $t=2.8$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the τ above.
T1183A	1E-5/H	0.1H	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF K1-4-1 (P-23) FAN (IN VENTILATION SYSTEM) (FAN BLADES COME OFF); Refer to description in case SY1B, except CAFTA formula 3 is used with time, $t=0.1$ hours.
T1183D	0.0001	DEMAND	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAILURE; Refer to description in case SY1B.
T1184A	1E-6/H	4380H	ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING AROUND THE DUCTWORK JOINTS; Refer to description in case SY1A for the frequency value. Refer to description in case SY1C for $\tau=4,380$ hours. The fact that the bonding could fail during time $t=2.8$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=4,380$ in case SY1C.
TATMOSPH	4E-9/H	0.1H	ATMOSPHERIC CONDITIONS (TORNADO) THAT PRODUCE NEGATIVE PRESSURE <-6 IN. WG; This event is like the one for case SY1B, except time is $t=0.1$ hours.
TCHCAM13	1.6E-5/H	12H	CAM1 SPURIOUSLY ALARMS; Hanford Type Code Database, CH 3. Refer to description in case SY1B. The $\tau=12$ hours from case SY1B dominates the time after a burp ($t=0.1$ hours) that the ventilation could fail and be a problem.
TDC-1-1E	1.0E-5/H	168H	DEENTRAINER K1-1-1 PLUGS; Hanford Type Code Database, DC E. Refer to description in case SY1B. The $\tau=168$ hours from case SY1B dominates the time after a burp

			(t=0.1 hours) that the ventilation could fail and be a problem.
TDC-1-1P	1.0E-6/H	168H	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH; Hanford Type Code Database, DC P. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TDFK1VTC	3.0E-7/H	168H	MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO; Hanford Type Code Database, DF C. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TFAK1-4G	3.0E-5/H	168H	K1-4-1 FAILS TO CONTINUE RUNNING (NONCATASTROPHIC (e.g., FAN BELT BREAKS), NO SPARKS); Hanford Type Code Database, FA G. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TFAP-28F	5E-3	DEMAND	BACKUP EXHAUST FAN P-28 FAILS TO START; Hanford Type Code Database, FA F. Failures on demand do not require a tau or t value.
TFAP-28G	3.0E-5/H	168H	P-28 FAILS TO CONTINUE RUNNING (NONCATASTROPHIC (e.g., FAN BELT BREAKS), NO SPARKS); Hanford Type Code Database, FA G. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TFB-5-1E	1.0E-5/H	168H	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FB E. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TFC-3-1E	1.4E-8/H	168H	HEPA FILTER K1-3-1 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FC E. Used the same reasoning as for TFB-5-1E.

TFC-3-1L	1.4E-8/H	168H	HEPA FILTER K1-3-1 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for TFB-5-1E.
TFC-3-2E	1.4E-8/H	168H	HEPA FILTER K1-3-2 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FC E. Used the same reasoning as for TFB-5-1E.
TFC-3-2L	1.4E-8/H	168H	HEPA FILTER K1-3-2 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for TFB-5-1E.
TFLVENTP	1.0	NONE	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM; Assumed probability of 1.0 (without ventilation).
TGB-4-1F	3.0E-1	DEMAND	DIESEL GENERATOR FOR EXHAUST FANS P-23 AND P-28 FAILS TO START; Hanford Type Code Database, GB F (3E-2), for starting of diesel generator. However, since it is not regularly tested the probability is increased. Failures on demand do not require a tau or t value.
THA-2-14	1.0E-6/H	168H	STEAM HEATER K1-2-1 LEAKS FROM THE TUBES; Hanford Type Code Database, HA 4. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
THOUSE1	.01	DEMAND	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL; Refer to description in case SY1B.
THOUSE2	.1	DEMAND	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCALIBRATED CAM; Refer to description in case SY1B.
TOACAM1T	1E-3	DEMAND	HUMAN OPERATOR CAM1 MISCALIBRATES CAM SETPOINT LOW; Preliminary estimate. Failures on demand do not require a tau or t value.
TOAP-28Q	1E-3	DEMAND	HUMAN OPERATOR FAILS TO START BACKUP FAN P-28; Preliminary estimate. Failures on demand do not require a tau or t value.
TOAT1-2Q	1E-3	DEMAND	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE TI-1-2 READING; Preliminary estimate. Failures on demand do not require a tau or t value.

TOATRANQ	1E-3	DEMAND	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, TRANSFER TO BACKUP POWER SOURCE; Preliminary estimate. Failures on demand do not require a tau or t value.
TOAUCV1U	1E-2	DEMAND	HUMAN OPERATOR FTRTCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VALVE; Preliminary estimate. Failures on demand do not require a tau or t value.
TRAKP11H	3.9E-7/H	168H	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TRAORLYH	3.9E-7/H	168H	OVERLOAD RELAY ORLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TSA-3-1L	7.0E-6/H	4380H	HEPA FILTER K1-3-1 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. This failure allows bypassing of HEPA filter K1-3-1 but leads to overloading the other HEPA filter. Since this failure is assumed to be undetectable, CAFTA formula 5 with time, tau=4,380 hours, is used. The tau=4,380 hours dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TSA-3-2L	7.0E-6/H	4380H	HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. Used the same reasoning as for TSA-3-1L.
TSJ-1-13	1.0E-6/H	168H	TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOSES; Hanford Type Code Database, SJ 3. Refer to description in case SY1B. The tau=168 hours from case SY1B dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TVB-1-1P	1.1E-5/H	168H	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER; Hanford

			Type Code Database, VB P. Used the same reasoning as for case SY1B.
TVD4501D	0	NONE	HAND-OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.T., FTRC; Normally fully open.
TVD4502C	1.5E-7/H	OH	HAND-OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTRO; Hanford Type Code Database, VD C. For this case this failure will not affect the results.
TVD4502D	9.4E-8/H	168H	HAND-OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTRC; Hanford Type Code Database, VD D. Refer to description in case SY1B. The tau=168 hours dominates the time after a burp (t=0.1 hours) that the valve could fail and be a problem.
TVD4503C	1.5E-7/H	168H	HAND-OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRO; Hanford Type Code Database, VD C. If this valve fails closed, pressure will build up in the tank. This will trip a pressure switch which will energize an alarm. It is assumed that repairs on the valve take one week from the time of failure. Accordingly, CAFTA formula 4 with time, t=168 hours, will be used. The tau=168 hours dominates the time after a burp (t=2.8 hours) that the valve could fail and be a problem.
TVD4503D	9.4E-8/H	168H	HAND-OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRC; Hanford Type Code Database, VD D. See the earlier discussion for event TVD4502D.
TVD4503S	1E-2	DEMAND	MANUAL VALVE 4503 FROM TANK 103-SY ERRONEOUSLY LEFT CLOSED; If this valve were left closed following maintenance or mistakenly closed when it was supposed to be opened, pressure will build up in the tank. This will trip a pressure switch which will energize an alarm. It is assumed that recovery from this event could occur in within an hour assuming the cause of the pressure buildup is determined quickly. The recovery should be taken into account in the accident sequence cutsets.
BVDP28ZA	3E-4/H	DEMAND	MANUAL VALVE P28Z FROM THE P28 EXHAUSTER N.C. FTOD; Hanford Type Code Database,

VD A. This valve is located in front of the demister on the P-28. If this valve were left closed following maintenance or mistakenly closed when it was supposed to be opened, pressure will build up in the tank. It is assumed that recovery from this event could occur within an hour, assuming the cause of the pressure buildup is determined quickly.

BVDP28ZS	1E-2/H	DEMAND	MANUAL VALVE P28Z FROM THE P28 EXHAUSTER ERRONOUSLY LEFT CLOSED; Refer to description in the above basic event TVD450YA.
TVDSY-1S	1E-2/H	DEMAND	MANUAL VALVE MV-K1-SY-1 ERRONOUSLY LEFT CLOSED; If this valve fails closed, pressure will build up in the tank. This will trip a pressure switch which will energize an alarm.
TVDSY-1T	1E-2/H	DEMAND	MANUAL VALVE MV-K1-SY-1 ERRONOUSLY LEFT OPEN; This valve is located in front of the K1 ventilation system. If the K1 ventilation system should go down this manual valve needs to be closed so the ventilation flow will be diverted down the P-28. If this valve is not closed an unfiltered release will occur since the K1 ventilation system is down.
TVDSY-1B	3E-4/H	DEMAND	MANUAL VALVE MV-K1-SY-1 N.O. FTCD; Hanford Type Code Database VD B. Refer to description in basic event TVDSY-1T.
TVDSY-1C	2E-7	168H	MANUAL VALVE MV-K1-SY-1 N.O. FTRO; Hanford Type Code Database VD C. Database, VD C. If this valve fails closed, pressure will build up in the tank. This will trip a pressure switch which will energize an alarm. It is assumed that repairs on the valve take one week from the time of failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, will be used. The $\tau=168$ hours dominates the time after a burp ($t=2.8$ hours) that the valve could fail and be a problem.
TVDSY-2A	3E-4	DEMAND	MANUAL VALVE MV-K1-SY-2 N.C. FTOD; Hanford Type Code Database. This valve allows flow from the tanks to be ventiated through the P-28, if the P-23 goes down.

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TVDSY-2S	1E-2	DEMAND	MANUAL VALVE MV-K1-SY-2 ERRONOUSLY LEFT CLOSED. Refer to above basic event TVDSY-2A for description.
TVDUCV1C	1.5E-7/H	168H	HAND-OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO; Hanford Type Code Database. The tau=168 hours dominates the time after a burp (t=0.1 hours) that the valve could fail and be a problem.

B.11 CASE SY9A - H₂ EXPLOSION IN TANK 101-SY WITH VENTILATION FLOW

KEY: T = 101-SY

CAFTA formula 3 = $1 - e^{-\lambda t}$ [approximation= λt]CAFTA formula 4 = $\lambda \tau / (\lambda \tau + 1) = 1 - (\text{MTBF}) / (\text{MTBF} + \text{MTTR})$ [approximation= $\lambda \tau$]CAFTA formula 5 = $1 + (1/\lambda \tau)(e^{-\lambda \tau} - 1)$ [approximation= $\lambda \tau / 2$]MTBF = Mean Time Between Failure = $1/\lambda$

MTTR = Mean Time to Repair

<u>BASIC EVENT</u>	<u>λ OR PROB.</u>	<u>τ (tau) or t</u>	<u>DISCUSSION</u>
IE-101	3.65/YR	NONE	BURPS PER YEAR IN 101-SY.
T1153A	0.00001	NONE	ELECTROSTATIC SPARKS FROM LESS-THAN-SUFFICIENT BONDING/GROUNDING OF TANK RISERS; Refer to description in case SY1A.
T1155A	0.0001	DEMAND	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE; Refer to description in case SY1A.
T1155B	0.0001	DEMAND	MECHANICAL SPARKS FROM SLUDGE WEIGHT/CABLE STRIKING SAMPLING TUBES; Refer to description in case SY1A.
T1156A	5E-8/H	2400H	ELECTRICAL SPARKS FROM FIC LEVEL PROBE; Refer to description in case SY1A. The fact that the FIC could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
T1156B	8E-10/H	2400H	ELECTRICAL SPARKS FROM SLACK TAPE DETECTOR FAULT; Refer to description in case SY1A. The fact that the slack tape detector could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
T1156C	5E-7/H	24H	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE; Refer to description in case SY1A. The fact that the 4,300-ohm resistor could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=24$ hours described in case SY1A. CAFTA formula 5 will be used.

T1156D	1E-6/H	720H	ELECTRICAL SPARKS FROM EXPLOSION PROOF LIGHT OR LIGHT LEAD FAULTS; Refer to description in case SY1A. The fact that the lights or the light leads could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=720$ hours described in case SY1A. CAFTA formula 5 will be used.
T1156F1	1E-6/H	720H	ELECTRICAL SPARKS FROM VIDEO CAMERA; Refer to description in case SY1A. The fact that the video camera could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=720$ hours described in case SY1A. CAFTA formula 5 will be used.
T1156G	1E-8/H	24H	ELECTRICAL SPARKS FROM RADAR GAUGE FAULT; Refer to description in case SY1A. The fact that the radar gauge could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=24$ hours described in case SY1A. CAFTA formula 5 will be used.
T1156H	1E-8/H	24H	ELECTRICAL SPARKS FROM THERMOCOUPLES; Refer to description in case SY1A. The fact that the thermocouples could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=24$ hours described in case SY1A. CAFTA formula 5 will be used.
T1160A	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO_2 IN THE 101-SY VENTILATION HEADER; Given there is a flammable mixture in the tank dome space, it is assumed there is a flammable mixture in the 101-SY ventilation header with a probability of 1.0 when the P-23 exhaustor is working.
T1160C	0.01	NONE	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101-SY VENT HEADER; Refer to description in case SY1A.
T1161B2	2E-8/H	2400H	ELECTRICAL SPARK FROM FAULT IN TELEDYNE H_2 ANALYZER; Refer to description in case SY1A. The fact that the analyzer could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a

burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.

T1161B3	1E-6/H	1.0H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF TELEDYNE VACUUM PUMP (BEARINGS); Refer to description in case SY1A. The only time this event is of concern is after a burp when a flammable mixture is in the tank ($t=1.0$ hours). CAFTA formula 3 will be used.
T1161B4	3E-5/H	2400H	ELECTRICAL SPARK FROM THE TELEDYNE VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to description in case SY1A. The fact that the vacuum pump seal could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
T1161B7A	1.0	NONE	ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1A.
T1162B3	1E-6/H	1.0H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CRYOGENIC VACUUM PUMP (BEARINGS); Used the same frequency value and reasoning as for T1161B3. Since the cryogenic system vacuum pump is not operated until after a burp has started, the only time this event is of concern is after a burp when a flammable mixture is in the tank ($t=1.0$ hours). Thus, CAFTA formula 3 will be used.
T1162B4	3E-5/H	4.0H	ELECTRICAL SPARK FROM THE CRYOGENIC VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to description in case SY1A. CAFTA formula 5 will be used.
T1163B7A	1.0	NONE	ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1A.
T1163B7B	1E-6/H	1.0H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF AMMONIA BUBBLER VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1161B3.
T1163B7C	3E-5/H	8H	ELECTRICAL SPARK FROM THE AMMONIA BUBBLER VACUUM PUMP FAILURE (SEAL AND MOTOR);

			Refer to description in case SY1A. CAFTA formula 5 will be used.
T1170A	1E-8/H	2400H	ELECTRICAL SPARKS FROM VENT HEADER THERMOCOUPLE; Refer to description in case SY1A. The fact that the thermocouple could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
T1170B	1E-8/H	2400H	ELECTRICAL SPARKS FROM VENT HEADER RELATIVE HUMIDITY DEVICE; Assume a value similar to T1170A.
T1171A	1E-6/H	168H	IGNITION SOURCE FROM P-28 FAN (FAN RUNNING); The ignition source is assumed to be from P-28 fan blades contacting the fan housing due to an imbalanced system that does not cause the fan to shut down catastrophically. This failure rate is assumed to be 1E-6/H. It is assumed that the τ for time between failure detection is 1 week (168 hours), the time the fan blades could continue striking the fan housing before it was shut down for correction. Thus, CAFTA formula 5 will be used. The fact that the fan blades could contact the fan housing during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the τ above.
T1171B	3E-7/H	2400H	ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-2-1 P-28 EXHAUSTER; A flammable mixture could exist at the switch contacts anytime there is a flammable mixture in the P-28 ventilation ductwork because no seal exists between the high-pressure side of the diaphragm and the switch. The power wires attached to the back of the snap switch are assumed to fail shorted to produce a continuous spark at a rate of 3E-7/H (WA 2 from Hanford Type Code Database). It is assumed that the τ for time between failure detection is 100 days (2,400 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the wiring could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is

			disregarded because it is dominated by the tau above.
T1171C	3E-7/H	2400H	ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-3-1 P-28 EXHAUSTER; Used the same value and reasoning as for T1171B.
T1171D	3E-7/H	2400H	ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-4-1 P-28 EXHAUSTER; Used the same value and reasoning as for T1171B.
T1171E	1E-6/H	2400H	ELECTROSTATIC SPARKS IN THE P-28 "ELEPHANT TRUNK" CONNECTION DUE TO FAILED BONDING; For electrostatic sparks to occur, the bonding must fail. Assumed the same failure rate as for type code CA 1 in the HANF-TC.TC database for Electrical Cable Fails Open (Open Circuit) [5E-6/H]. Bonding electrical cable is assumed to fail with a factor of 5 lower frequency than an electrical cable normally carrying current. So CA one failure rate is reduced to 1E-6/H. Since no checking of bonding has occurred since installation, it is assumed that the tau for time between failure detection is 100 days (2,400 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the bonding could fail during time t=1.0 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.
T1173A	5E-8/H	2400H	ELECTRICAL SPARK FROM FAULT IN THE (WHITTAKER) CHEMICAL CELL H ₂ ANALYZER; Refer to description in case SY1A. The fact that the analyzer could fail during time t=1.0 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau=2,400 hours described in case SY1A. CAFTA formula 5 will be used.
T1173B	1E-6/H	1.0H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CHEMICAL CELL VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1161B3.
T1173C	5E-7/H	2400H	ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (BELLOWS AND MOTOR); This event is like the one for case SY1A.

T1180A	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO ₂ IN THE MAIN SY VENTILATION SYSTEM; Assume a probability of 1.0 that there is a flammable mixture in the main SY ventilation system given there is a flammable mixture in the 101-SY Tank.
T1182-1A	1E-6/H	1.0H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-1 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1161B3.
T1182-1B	1E-6/H	1.0H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-2 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1182-1A.
T1182-1C	3E-5/H	2400H	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for T1161B4.
T1182-1D	3E-5/H	2400H	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for T1182-1C.
T1182-3A	6E-5/H	2400H	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS; Assume piping is tubing or hose and use value from Refer to description in case SY1A. The fact that the piping could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
T1182-3C	1E-6/H	2400H	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP; Refer to description in case SY1A. The fact that the pump could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
T1182-3D	1E-6/H	2400H	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP; Used the same values and reasoning as for T1182-3C.

T1182-4A	1.0	NONE	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1A.
T1182B	3E-7/H	2400H	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYSTEM); Refer to description in case SY1A. The fact that the wiring to the switch could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
T1182C	3E-7/H	2400H	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYSTEM); Used the same values and reasoning as for T1182B.
T1182D	1E-7/H	12H	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM RADIATION DET GM TUBE RM-EXH-K1-1; Refer to description in case SY1A. The fact that the detector could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=12$ hours described in case SY1A. CAFTA formula 4 will be used.
T1183	1E-6/H	2400H	IGNITION FROM THE OVM SYSTEM; Refer to description in case SY1A. The fact that the OVM could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
T1183A-1	1E-6/H	168H	IGNITION SOURCE FROM K1-4-1 FAN (IN P-23 VENTILATION SYSTEM) (FAN RUNNING); Refer to description in case SY1A. The fact that the fan blades could contact the fan housing during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=168$ hours described in case SY1A. CAFTA formula 5 will be used.
T1184A	1E-6/H	2400H	ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING AROUND THE DUCTWORK JOINTS; Refer to description in case SY1A. The fact that

			the bonding could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
TCFIRELA	3E-4	DEMAND	ELECTRICAL RELAY CONTACTS, IR, NORMALLY ENERGIZED., FTOD; Hanford Type Code Database, CF A. Failures on demand do not require a τ or t value.
TCFLO-XA	3E-4	DEMAND	ELECTRICAL RELAY CONTACTS, LO-X, NORMALLY ENERGIZED., FTOD; Hanford Type Code Database, CF A. Failures on demand do not require a τ or t value.
TFLVENTP	0.01	NONE	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM; Assumed probability of 0.01 with ventilation.
TOAN2COQ	1E-3	DEMAND	HUMAN OPERATOR FAILS TO FILL NITROGEN BOTTLE (VIDEO CAMERA PURGE SYSTEM); Preliminary estimate. Failures on demand do not require a τ or t value.
TOAPS-1T	0.01	DEMAND	HUMAN OPERATOR MISCALIBRATES PRESSURE SWITCH (VIDEO CAMERA PURGE SYSTEM); Preliminary estimate. Failures on demand do not require a τ or t value.
TPAAMMOL	6E-5/H	2400H	AMMONIA BUBBLER PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP; Refer to description in case SY1A. The fact that the piping could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
TPALEAKL	1E-8/H-FT	6570H*100FT	VIDEO CAMERA PURGE PIPING LEAKS (PER FOOT OF <3-IN. PIPE); Hanford Type Code Database, PA L. Refer to description in case SY1A. The fact that the piping could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=6,570$ hours times 100 ft described in case SY1A. CAFTA formula 5 will be used.
TPATELEL	6E-5/H	2400H	TELEDYNE H ₂ SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP; Refer to

			description in case SY1A. The fact that the piping could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
TPDAVACL	1E-6/H	2400H	AMMONIA BUBBLER VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABINET; Refer to description in case SY1A. The fact that the pump could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
TPDTVACL	1E-6/H	2400H	TELEDYNE H ₂ SAMPLING SYSTEM VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABINET; Refer to description in case SY1A. The fact that the pump could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
TSIPS-1I	3E-5	DEMAND	PS FAILS TO OPEN WHEN REQUIRED (VIDEO CAMERA PURGE SYSTEM); Hanford Type Code Database, SI I. Refer to description in case SY1A.
TVBPR-1C	3E-6/H	720H	FLOW CONTROL (SELF-REGULATING) VALVE PR-1 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM); Assumed same as VC C from Hanford Type Code Database. Refer to description in case SY1A. The fact that the valve could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=720$ hours described in case SY1A. CAFTA formula 5 will be used.
TVBPR-2C	3E-6/H	720H	FLOW CONTROL (SELF-REGULATING) VALVE PR-2 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM); Assumed same as VC C from Hanford Type Code Database. Used the same reasoning as for TVBPR-1C.
TVDAMMOL	2E-8/H	2400H	EITHER OF THE (2) DOWNSTREAM VALVES IN THE AMMONIA BUBBLER CABINET LEAK; Refer to description in case SY1A. The fact that

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the valves could fail during time
t=1.0 hours (time flammable mixture is in
the tank after a burp) is disregarded
because it is dominated by the
tau=2,400 hours described in case SY1A.
CAFTA formula 5 will be used.

B.12 CASE SY9B - H₂ EXPLOSION IN TANK 101-SY WITHOUT VENTILATION FLOW

KEY: T = 101-SY

CAFTA formula 3 = $1 - e^{-\lambda t}$ [approximation= λt]CAFTA formula 4 = $\lambda \tau / (\lambda \tau + 1) = 1 - (\text{MTBF}) / (\text{MTBF} + \text{MTTR})$ [approximation= $\lambda \tau$]CAFTA formula 5 = $1 + (1/\lambda \tau)(e^{-\lambda \tau} - 1)$ [approximation= $\lambda \tau / 2$]MTBF = Mean Time Between Failure = $1/\lambda$

MTTR = Mean Time to Repair

<u>BASIC EVENT</u>	<u>λ OR PROB.</u>	<u>τ (tau) or t</u>	<u>DISCUSSION</u>
IE-101	3.65/YR	NONE	BURPS PER YEAR IN 101-SY.
N423	1.0	NONE	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT; The heaters are electrically locked out because they are not intrinsically safe. Therefore, the probability of them not being functional is 1.0.
PWR2	1E-5/H	45H	LOSS OF POWER TO SY TANK FARM; Refer to description in case SY1B. CAFTA equation 3 is used.
PWR3	3E-6/H	24H	LOSS OF 120-V POWER TO P-23 CAM CAUSES P-23 EXHAUST FAN TO SHUT DOWN); Refer to description in case SY1B. The fact that the circuit breaker could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL) is disregarded because it is dominated by the $\tau=24$ hours described in case SY1B. CAFTA formula 4 will be used.
PWR3-1	3E-6/H	24H	LOSS OF 120-V POWER TO P-28 CAM CAUSES P-28 EXHAUST FAN TO SHUT DOWN); Used the same value and reasoning as for PWR3.
SEASON	0.17	NONE	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATURE; Estimated that 2 months out of 12, the humidity is high enough and the temperature is cold enough to yield filters plugged due to moisture if the moisture is not removed or heated.
ST1	1E-8	168H*100FT	STEAM LINE TO HEATER RUPTURES; Hanford Type Code Database for PA L. Refer to description in case SY1B. The fact that the piping could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp if ventilation were

			to function until mixture below LFL) is disregarded because it is dominated by the $\tau=168$ hours times 100 ft as described in case SY1B. CAFTA formula 4 will be used.
ST2	2E-6	24H	LOSS OF STEAM FROM 200 AREA POWER PLANT FACILITY; Refer to description in case SY1B. The fact that the power house could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL) is disregarded because it is dominated by the τ above. CAFTA formula 4 will be used.
T1153A	0.00001	NONE	ELECTROSTATIC SPARKS FROM LESS-THAN-SUFFICIENT BONDING/GROUNDING OF TANK RISERS; Refer to description in case SY1A.
T1153B	6E-9/H	1.0H	ELECTROSTATIC SPARKS CAUSED BY LIGHTNING STRIKE; FAILS VENTILATION AND IGNITES; Refer to description in case SY1B related to frequency. Since this event is a common cause event (fails ventilation and produces ignition source), CAFTA formula 3 is used with $t=1.0$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL). A one-time electrostatic spark occurring before the burp is not considered an ignition source of concern.
T1155A	0.0001	DEMAND	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE; Refer to description in case SY1A.
T1155B	0.0001	DEMAND	MECHANICAL SPARKS FROM SLUDGE WEIGHT/CABLE STRIKING SAMPLING TUBES; Refer to description in case SY1A.
T1156A	5E-8/H	2400H	ELECTRICAL SPARKS FROM FIC LEVEL PROBE; Refer to description in case SY1B. CAFTA formula 5 will be used.
T1156B	8E-10/H	2400H	ELECTRICAL SPARKS FROM SLACK TAPE DETECTOR FAULT; Refer to description in case SY1B. CAFTA formula 5 will be used.
T1156C	5E-7/H	45H	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE; Refer to description in case SY1B. CAFTA formula 3 will be used.
T1156D	1E-6/H	720H	ELECTRICAL SPARKS FROM EXPLOSION PROOF LIGHT OR LIGHT LEAD FAULTS; Refer to

			description in case SY1B. CAFTA formula 5 will be used.
T1156F1	1E-6/H	720H	ELECTRICAL SPARKS FROM VIDEO CAMERA; Refer to description in case SY1B. CAFTA formula 5 will be used.
T1156G	1E-8/H	45H	ELECTRICAL SPARKS FROM RADAR GAUGE FAULT; Refer to description in case SY1B. CAFTA formula 3 will be used.
T1156H	1E-8/H	45H	ELECTRICAL SPARKS FROM THERMOCOUPLES; Refer to description in case SY1B. CAFTA formula 3 will be used.
T1157J	4E-9/H	1.0H	BURNING GASOLINE SPILLS INTO TANK, FAILS VENT, AND IGNITES LEAKING H ₂ ; Refer to description in case SY1B related to frequency. It is assumed that burning or red-hot debris could exist for up to 2 hours. The fire could occur just before a burp, or it could occur just after a burp. If it occurs just before a burp and ignites leaking H ₂ , then on average it occurs one hour before the burp. If it occurs after the burp, then H ₂ is ignitable for 1.0 hours because this is a common cause event (fails ventilation and produces ignition source). Thus, t=1.0 hours is used for this event. CAFTA formula 3 will be used.
T1157K	4E-7/H	1.0H	RANGE FIRE PRODUCES SPARKS THAT FAIL VENT AND IGNITE LEAKING H ₂ ; Refer to description in case SY1B related to frequency. It is assumed that burning or red-hot debris could exist for up to 2 hours. The fire could occur just before a burp, or it could occur just after a burp. If it occurs just before a burp and ignites leaking H ₂ , then on average it occurs one hour before the burp. If it occurs after the burp, then H ₂ is ignitable for 1.0 hours because this is a common cause event (fails ventilation and produces ignition source). Thus, t=1.0 hours is used for this event. CAFTA formula 3 will be used.
T1160A	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO ₂ IN THE 101-SY VENTILATION HEADER; Given there is a flammable mixture in the tank dome space, it is assumed there is a flammable mixture in the 101-SY

			ventilation header with a probability of 1.0 when the P-23 and P-28 exhausters are not working.
T1160C	0.01	NONE	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101-SY VENT HEADER; Refer to description in case SY1A.
T1161B2	2E-8/H	2400H	ELECTRICAL SPARK FROM FAULT IN TELEDYNE H ₂ ANALYZER; Refer to description in case SY1B. CAFTA formula 5 will be used.
T1161B3	1E-6/H	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF TELEDYNE VACUUM PUMP (BEARINGS); Refer to description in case SY1B. CAFTA formula 3 will be used.
T1161B4	3E-5/H	2400H	ELECTRICAL SPARK FROM THE TELEDYNE VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to description in case SY1B. CAFTA formula 5 will be used.
T1161B7A	1.0	NONE	ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1A.
T1162B3	1E-6/H	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CRYOGENIC VACUUM PUMP (BEARINGS); Refer to description in case SY1B. CAFTA formula 3 will be used.
T1162B4	3E-5/H	45H	ELECTRICAL SPARK FROM THE CRYOGENIC VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to description in case SY1B. CAFTA formula 3 will be used.
T1163B7A	1.0	NONE	ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1A.
T1163B7B	1E-6/H	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF AMMONIA BUBBLER VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1161B3.
T1163B7C	3E-5/H	45H	ELECTRICAL SPARK FROM THE AMMONIA BUBBLER VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to description in case SY1B. CAFTA formula 5 will be used.
T1170A	1E-8/H	2400H	ELECTRICAL SPARKS FROM VENT HEADER THERMOCOUPLE; Refer to description in case SY1B. CAFTA formula 5 will be used.

T1170B	1E-8/H	2400H	ELECTRICAL SPARKS FROM VENT HEADER RELATIVE HUMIDITY DEVICE; Refer to description in case SY1B. CAFTA formula 5 will be used.
T1171A	1E-6/H	168H	IGNITION SOURCE FROM P-28 FAN (FAN RUNNING); The ignition source is assumed to be from P-28 fan blades contacting the fan housing due to an imbalanced system that does not cause the fan to shut down catastrophically. This failure rate is assumed to be 1E-6/H. It is assumed that the tau for time between failure detection is 1 week (168 hours), the time the fan blades could continue striking the fan housing before it was shut down for correction. Thus, CAFTA formula 5 will be used. The fact that the fan blades could contact the fan housing during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.
T1171B	3E-7/H	2400H	ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-2-1 P-28 EXHAUSTER; A flammable mixture could exist at the switch contacts anytime there is a flammable mixture in the P-28 ventilation ductwork because no seal exists between the high-pressure side of the diaphragm and the switch. The power wires attached to the back of the snap switch are assumed to fail shorted to produce a continuous spark at a rate of 3E-7/H (WA 2 from Hanford Type Code Database). It is assumed that the tau for time between failure detection is 100 days (2,400 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the wiring could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.
T1171C	3E-7/H	2400H	ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-3-1 P-28 EXHAUSTER; Used the same value and reasoning as for T1171B.
T1171D	3E-7/H	2400H	ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-4-1 P-28 EXHAUSTER; Used the same value and reasoning as for T1171B.
T1171E	1E-6/H	2400H	ELECTROSTATIC SPARKS IN THE P-28 "ELEPHANT TRUNK" CONNECTION DUE TO FAILED BONDING;

For electrostatic sparks to occur, the bonding must fail. Assumed the same failure rate as for type code CA 1 in the HANF-TC.TC database for Electrical Cable Fails Open (Open Circuit) [5E-6/H]. Bonding electrical cable is assumed to fail with a factor of 5 lower frequency than an electrical cable normally carrying current. So CA one failure rate is reduced to 1E-6/H. Since no checking of bonding has occurred since installation, it is assumed that the tau for time between failure detection is 100 days (2,400 hours), average time between burps. Thus, CAFTA formula 5 will be used. The fact that the bonding could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau above.

T1173A	5E-8/H	2400H	ELECTRICAL SPARK FROM FAULT IN THE (WHITTAKER) CHEMICAL CELL H ₂ ANALYZER; Refer to description in case SY1B. CAFTA formula 5 will be used.
T1173B	1E-6/H	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CHEMICAL CELL VACUUM PUMP (BEARINGS); Refer to description in case SY1B. CAFTA formula 3 will be used.
T1173C	5E-7/H	2400H	ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (BELLOWS AND MOTOR); Refer to description in case SY1A. CAFTA formula 5 will be used.
T1176A	1E-7/H	45H	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF P-28 CAM BETA/GAMMA DETECTOR; Based on DP-1633, page 17, the failure rate for a GM detector is 1.39E-5/H. Assume that only 1/100 of these failures are structural failures of the GM detector tube. Therefore, the rate of producing electrical sparks from structural failure of GM tube is assumed to be 1E-7/H. It is assumed that the tau for time to repair is 12 hours, average time between CAM checks. The fact that the detector could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) [unreliability] dominates the mean time to repair [unavailability] of tau=12 hours as discussed above. Thus, CAFTA formula 3 is used.

T1176B	1E-8/H	45H	ELECTRICAL SPARKS FROM MULTIPLE FAILURES OF P-28 CAM ALPHA DETECTOR SYSTEM; Without an analysis of this instrument failing and producing sparks, it is assumed to have a frequency of producing sparks that is a factor of 10 below that for the beta/gamma detector. Therefore, the alpha detector failure rate for producing sufficient sparks is taken to be 1E-8/H. It is assumed that the tau for time to repair is 12 hours, average time between CAM checks. The fact that the detector could fail during time t=45 hours (time flammable mixture is in the tank after a burp) [unreliability] dominates the mean time to repair [unavailability] of tau=12 hours as discussed above. Thus, CAFTA formula 3 is used.
T1176C	1E-6/H	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF P-28 CAM VP-1 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1161B3. CAFTA formula 3 will be used.
T1176D	3E-5/H	2400H	ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for T1161B4. CAFTA formula 5 will be used.
T1176E	1E-6/H	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF P-28 CAM VP-2 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1161B3. CAFTA formula 3 will be used.
T1176F	3E-5/H	2400H	ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for T1161B4. CAFTA formula 5 will be used.
T1176G	1E-6/H	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF P-28 CAM VP-3 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1161B3. CAFTA formula 3 will be used.
T1176H	3E-5/H	2400H	ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for T1161B4. CAFTA formula 5 will be used.
T1178-1A	1.0	NONE	ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTOR); Refer to description of event T1182-4A in case SY1A.

T1178A	6E-5/H	2400H	P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS; Refer to description of event T1182-3A in case SY1A. The fact that the piping could fail during time t=45 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau=2,400 hours described in case SY1A. CAFTA formula 5 will be used.
T1178B	1E-6/H	2400H	P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-1 LEAKS ON OUTLET SIDE OF PUMP; Refer to description of event T1182-3C in case SY1A. The fact that the pump could fail during time t=45 hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the tau=2,400 hours described in case SY1A. CAFTA formula 5 will be used.
T1178C	1E-6/H	2400H	P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-2 LEAKS ON OUTLET SIDE OF PUMP; Used the same values and reasoning as for T1178B.
T1178D	1E-6/H	2400H	P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-3 LEAKS ON OUTLET SIDE OF PUMP; Used the same values and reasoning as for T1178B.
T1180A	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO ₂ IN THE MAIN SY VENTILATION SYSTEM; Refer to description in case SY1A.
T1182-1A	1E-6/H	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-1 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1161B3.
T1182-1B	1E-6/H	45H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-2 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1182-1A.
T1182-1C	3E-5/H	2400H	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for T1161B4.
T1182-1D	3E-5/H	2400H	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for T1182-1C.

T1182-3A	6E-5/H	2400H	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS; Refer to description in case SY1A. The fact that the piping could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
T1182-3C	1E-6/H	2400H	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP; Refer to description in case SY1A. The fact that the pump could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
T1182-3D	1E-6/H	2400H	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP; Used the same values and reasoning as for T1182-3C.
T1182-4A	1.0	NONE	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1A.
T1182A	3E-7/H	4H	FAILURE OF PRESSURE SWITCH K1-PS-1-1 FAILS VENTILATION AND CREATES SPARKS; Refer to description in case SY1B. This is a common cause event. CAFTA formula 4 will be used.
T1182A-1	3E-7/H	4H	FAILURE OF PRESSURE SWITCH P28-PS-1 FAILS VENTILATION AND CREATES SPARKS; Used the same values and reasoning as for T1182A above. This is a common cause event. CAFTA formula 4 will be used.
T1182A-2	3E-7/H	4H	FAILURE OF PRESSURE SWITCH P28-PS-2 FAILS VENTILATION AND CREATES SPARKS; Used the same values and reasoning as for T1182A. This is a common cause event. CAFTA formula 4 will be used.
T1182A-4	3E-7/H	4H	FAILURE OF PRESSURE SWITCH P28-PS-4 FAILS VENTILATION AND CREATES SPARKS; Used the same values and reasoning as for T1182A. This is a common cause event. CAFTA formula 4 will be used.

T1182B	3E-7/H	2400H	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYSTEM); Refer to description in case SY1A. The fact that the wiring to the switch could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
T1182C	3E-7/H	2400H	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYSTEM); Used the same values and reasoning as for T1182B.
T1182D	1E-7/H	45H	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM RADIATION DET GM TUBE RM-EXH-K1-1; Refer to description in case SY1A. The fact that the detector could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) [unreliability] dominates the mean time to repair [unavailability] of $\tau=12$ hours as discussed above. Thus, CAFTA formula 3 is used.
T1183	1E-6/H	2400H	IGNITION FROM THE OVM SYSTEM; Refer to description in case SY1A. The fact that the OVM could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
T1183A	1E-5/H	1.0H	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF K1-4-1 (P-23) FAN (IN VENTILATION SYSTEM) (FAN BLADES COME OFF); Refer to description in case SY1B. CAFTA formula 3 is used with time, $t=1.0$ hours.
T1183A-2	1E-5/H	1.0H	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF P-28 FAN ON RISER 7B OF 101-SY (FAN BLADES COME OFF); Used the same values and reasoning as for T1183A above.
T1184A	1E-6/H	2400H	ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING AROUND THE DUCTWORK JOINTS; Refer to description in case SY1A. The fact that the bonding could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded

because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.

TATMOSPH	4E-9/H	1.0H	ATMOSPHERIC CONDITIONS (TORNADO) THAT PRODUCE NEGATIVE PRESSURE <-6 IN. WG; Refer to description in case SY1B. CAFTA formula 3 with time, $t=1.0$ hours is used.
TCFIRELA	3E-4	DEMAND	ELECTRICAL RELAY CONTACTS, IR, NORMALLY ENERGIZED., FTOD; Hanford Type Code Database, CF A. Failures on demand do not require a τ or t value.
TCFLO-XA	3E-4	DEMAND	ELECTRICAL RELAY CONTACTS, LO-X, NORMALLY ENERGIZED., FTOD; Hanford Type Code Database, CF A. Failures on demand do not require a τ or t value.
TCHCAM13	1.6E-5/H	12H	CAM1 SPURIOUSLY ALARMS; Hanford Type Code Database, CH 3. Refer to description in case SY1B. CAFTA formula 4 is used. The $\tau=12$ hours dominates the time after a burp ($t=1.0$ hours) that the ventilation could fail and be a problem.
TCHCAM33	1.6E-5/H	12H	CAM3 (P-28) SPURIOUSLY ALARMS; Hanford Type Code Database, CH 3. This event fails the P-28 ventilation since the CAM3 is interlocked to shut down the fan given high radiation detection. It is assumed that the CAM could be repaired or replaced in 12 hours from the time of the failure (immediately replaceable upon detection). Therefore, CAFTA formula 4 with time, $t=12$ hours is used. The $\tau=12$ hours dominates the time after a burp ($t=1.0$ hours) that the ventilation could fail and be a problem.
TDC-1-1E	1.0E-5/H	168H	DEENTRAINER K1-1-1 PLUGS; Hanford Type Code Database, DC E. Refer to description in case SY1B. CAFTA formula 4 is used. The $\tau=168$ hours dominates the time after a burp ($t=1.0$ hours) that the ventilation could fail and be a problem.
TDC-1-1P	1.0E-6/H	168H	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH; Hanford Type Code Database, DC P. Refer to description in case SY1B. CAFTA formula 4 is used. The $\tau=168$ hours dominates the time after a burp ($t=1.0$ hours) that the ventilation could fail and be a problem.

TDCP281E	1.0E-5/H	168H	DEENTRAINER P28-1 PLUGS; Hanford Type Code Database, DC E. Used the same value and reasoning as for TDC-1-1E above. CAFTA formula 4 is used.
TDCP281P	1.0E-6/H	168H	DEENTRAINER P28-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH; Hanford Type Code Database, DC P. Used the same value and reasoning as for TDC-1-1P above. CAFTA formula 4 is used.
TDFK1VTC	3.0E-7/H	168H	MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO; Hanford Type Code Database, DF C. Refer to description in case SY1B. CAFTA formula 4 is used. The tau=168 hours dominates the time after a burp (t=1.0 hours) that the ventilation could fail and be a problem.
TFK1-4G	3.0E-5/H	168H	K1-4-1 FAILS TO CONTINUE RUNNING (NONCATASTROPHIC (e.g., FAN BELT BREAKS), NO SPARKS); Hanford Type Code Database, FA G. Refer to description in case SY1B. CAFTA formula 4 is used. The tau=168 hours dominates the time after a burp (t=1.0 hours) that the ventilation could fail and be a problem.
TFAP-28G	3.0E-5/H	168H	P-28 FAILS TO CONTINUE RUNNING (NONCATASTROPHIC, NO SPARKS); Hanford Type Code Database, FA G. This failure is noncatastrophic and produces no sparks, but does fail part of the ventilation flow. The P-28 is a redundant fan but it must run until the P-23 [K1-4-1] is repaired, so mission time is 168 hours. Accordingly, CAFTA formula 3 with time, t=168 hours is used. The tau=168 hours dominates the time after a burp (t=1.0 hours) that the ventilation could fail and be a problem.
TFB-5-1E	1.0E-5/H	168H	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FB E. This event defeats part of the ventilation flow. It is estimated that replacement or repairs would take one week from the time of the failure. Accordingly, CAFTA formula 4 with time, t=168 hours is used. The tau=168 hours dominates the time after a burp (t=1.0 hours) that the ventilation could fail and be a problem.

TFC-3-1E	1.4E-8/H	168H	HEPA FILTER K1-3-1 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FC E. Used the same reasoning as for TFB-5-1E.
TFC-3-1L	1.4E-8/H	168H	HEPA FILTER K1-3-1 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for TFB-5-1E.
TFC-3-2E	1.4E-8/H	168H	HEPA FILTER K1-3-2 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FC E. Used the same reasoning as for TFB-5-1E.
TFC-3-2L	1.4E-8/H	168H	HEPA FILTER K1-3-2 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for TFB-5-1E.
TFCP281E	1.4E-8/H	168H	HEPA FILTER P28-1 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FC E. Used the same reasoning as for TFB-5-1E.
TFCP281L	1.4E-8/H	168H	HEPA FILTER P28-1 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for TFB-5-1E.
TFCP282E	1.4E-8/H	168H	HEPA FILTER P28-2 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FC E. Used the same reasoning as for TFB-5-1E.
TFCP282L	1.4E-8/H	168H	HEPA FILTER P28-2 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for TFB-5-1E.
TFLVENTP	1.0	NONE	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM; Assumed probability of 1.0 (without ventilation).
TGB-4-1F	3.0E-1	DEMAND	DIESEL GENERATOR FOR EXHAUST FANS P-23 AND P-28 FAILS TO START; Start with the Hanford Type Code Database, GD F (3E-2), for starting of diesel generator. Since the diesel generator is not regularly tested, the probability of failure to start on demand was increased to 3E-1. Failures on demand do not require a tau or t value.
THA-2-14	1.0E-6/H	168H	STEAM HEATER K1-2-1 LEAKS FROM THE TUBES; Hanford Type Code Database, HA 4. Refer to description in case SY1B. CAFTA formula 4 is used. The tau=168 hours

dominates the time after a burp (t=1.0 hours) that the ventilation could fail and be a problem.

THOUSE1	.01	DEMAND	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL; Assumed a probability of 1/100 that during a release that enough radioactive material is released through the ventilation system to cause high reading at the CAM. This results in shutdown of the vent fan via a high rad interlock. Failures on demand do not require a tau or t value.
THOUSE2	.1	DEMAND	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCALIBRATED CAM; Assumed a probability of 1/10 that during a release that enough radioactive material is released to the ventilation system to produce a high radiation signal on a miscalibrated exhaust stack CAM. Again, this results in shutdown of the vent fan. Failures on demand do not require a tau or t value.
TOACAM1T	1E-3	DEMAND	HUMAN OPERATOR CAM1 MISCALIBRATES CAM SETPOINT LOW; Preliminary estimate. Failures on demand do not require a tau or t value.
TOACAM3T	1E-3	DEMAND	HUMAN OPERATOR CAM3 MISCALIBRATES CAM SETPOINT LOW (P28); Preliminary estimate. Failures on demand do not require a tau or t value.
TOAN2COQ	1E-3	DEMAND	HUMAN OPERATOR FAILS TO FILL NITROGEN BOTTLE (VIDEO CAMERA PURGE SYSTEM); Preliminary estimate. Failures on demand do not require a tau or t value.
TOAPS-1T	0.01	DEMAND	HUMAN OPERATOR MISCALIBRATES PRESSURE SWITCH (VIDEO CAMERA PURGE SYSTEM); Preliminary estimate. Failures on demand do not require a tau or t value.
TOAT1-2Q	1E-3	DEMAND	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE TI-1-2 READING; Preliminary estimate. Failures on demand do not require a tau or t value.
TOATRANQ	1E-3	DEMAND	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, TRANSFER TO BACKUP POWER SOURCE; Preliminary estimate. Failures on demand do not require a tau or t value.

TOAUCV1U	1E-2	DEMAND	HUMAN OPERATOR FTRTCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VALVE; Preliminary estimate. Failures on demand do not require a tau or t value.
TPAAMMOL	6E-5/H	2400H	AMMONIA BUBBLER PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP; Refer to description in case SY1A. The fact that the piping could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
TPALEAKL	1E-8/H-FT	6570H*100FT	VIDEO CAMERA PURGE PIPING LEAKS (PER FOOT OF <3-IN. PIPE); Hanford Type Code Database, PA L. Refer to description in case SY1A. The fact that the piping could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=6,570$ hours times 100 ft described in case SY1A. CAFTA formula 5 will be used.
TPATELEL	6E-5/H	2400H	TELEDYNE H_2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP; Refer to description in case SY1A. The fact that the piping could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
TPDAVACL	1E-6/H	2400H	AMMONIA BUBBLER VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABINET; Refer to description in case SY1A. The fact that the pump could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
TPDTVACL	1E-6/H	2400H	TELEDYNE H_2 SAMPLING SYSTEM VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABINET; Refer to description in case SY1A. The fact that the pump could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the

tau=2,400 hours described in case SY1A.
CAFTA formula 5 will be used.

TRAKP11H	3.9E-7/H	168H	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. Refer to description in case SY1B. CAFTA formula 4 is used. The tau=168 hours dominates the time after a burp (t=1.0 hours) that the ventilation could fail and be a problem.
TRAORLYH	3.9E-7/H	168H	OVERLOAD RELAY ORLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. Refer to description in case SY1B. CAFTA formula 4 is used. The tau=168 hours dominates the time after a burp (t=1.0 hours) that the ventilation could fail and be a problem.
TRAP-28H	3.9E-7/H	168H	OVERLOAD RELAY P-28 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. This event causes loss of the P-28 ventilation fan. It is estimated that replacement or repair of this relay would take one week from the time of the failure. Accordingly, CAFTA formula 4 with time, t=168 hours, is used. The tau=168 hours dominates the time after a burp (t=1.0 hours) that the ventilation could fail and be a problem.
TRAP281H	3.9E-7/H	168H	RELAY P28-KP-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. Used the same reasoning as for TRAP-28H.
TRAP282H	3.9E-7/H	168H	RELAY P28-KP-2 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. Used the same reasoning as for TRAP-28H.
TRAP284H	3.9E-7/H	168H	RELAY P28-KP-4 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. Used the same reasoning as for TRAP-28H.
TSA-3-1L	7.0E-6/H	2400H	HEPA FILTER K1-3-1 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. Refer to description in case SY1B. CAFTA formula 5 is used. The tau=2,400 hours dominates the time after a

			burp ($t=1.0$ hours) that the ventilation could fail and be a problem.
TSA-3-2L	$7.0E-6/H$	2400H	HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. Refer to description in case SY1B. CAFTA formula 5 is used. The $\tau=2,400$ hours dominates the time after a burp ($t=1.0$ hours) that the ventilation could fail and be a problem.
TSAP281L	$7.0E-6/H$	2400H	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. Used the same reasoning as for TSA-3-1L.
TSAP282L	$7.0E-6/H$	2400H	HEPA FILTER P28-2 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. Used the same reasoning as for TSA-3-2L.
TSIPS-1I	$3E-5$	DEMAND	PS FAILS TO OPEN WHEN REQUIRED (VIDEO CAMERA PURGE SYSTEM); Hanford Type Code Database, SI I. Refer to description in case SY1A.
TSJ-1-13	$1.0E-6/H$	168H	TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOSES; Hanford Type Code Database, SJ 3. Refer to description in case SY1B. CAFTA formula 4 is used. The $\tau=168$ hours dominates the time after a burp ($t=1.0$ hours) that the ventilation could fail and be a problem.
TVB-1-1P	$1.1E-5/H$	168H	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER; Hanford Type Code Database, VB P. Refer to description in case SY1B. CAFTA formula 4 is used. The $\tau=168$ hours dominates the time after a burp ($t=1.0$ hours) that the ventilation could fail and be a problem.
TVBPR-1C	$3E-6/H$	720H	FLOW CONTROL (SELF-REGULATING) VALVE PR-1 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM); Assumed same as VC C from Hanford Type Code Database. Refer to description in case SY1B. CAFTA formula 5 is used.
TVBPR-2C	$3E-6/H$	720H	FLOW CONTROL (SELF-REGULATING) VALVE PR-2 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM); Assumed same as VC C from Hanford Type Code Database. Used the same reasoning as for TVBPR-1C.

TVD4501C	1.5E-7/H	168H	HAND-OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.T., FTRO; Hanford Type Code Database, VD C. If this valve fails closed and the P-28 exhaust fan shuts down, pressure will build up in the tank. This will trip a pressure switch which will energize an alarm. It is assumed that repairs on the valve take one week from the time of failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, will be used. The $\tau=168$ hours dominates the time after a burp ($t=45$ hours) that the valve could fail and be a problem.
TVD4501D	0	NONE	HAND-OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.T., FTRO; Normally fully open.
TVD4501S	1E-2	DEMAND	MANUAL VALVE 4501 FROM TANK 101-SY ERRONEOUSLY LEFT CLOSED; If this valve were left closed following maintenance or mistakenly closed when it was supposed to be opened and the P-28 exhaust fan shuts down, pressure will build up in the tank. This will trip a pressure switch which will energize an alarm. It is assumed that recovery from this event could occur in within an hour assuming the cause of the pressure buildup is determined quickly. The recovery should be taken into account in the accident sequence cutsets.
TVD4502C	1.5E-7/H	OH	HAND-OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTRO; Hanford Type Code Database, VD C. For this case this failure will not affect the results.
TVD4502D	9.4E-8/H	168H	HAND-OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTRO; Hanford Type Code Database, VD D. Failure of this valve to remain open will have a impact on the mass balance of the ventilation system. It is assumed that this event would trip the fan off due to low pressure (-6 in. WG). It is assumed that repairs on the valve take one week from the time of failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, will be used. The $\tau=168$ hours dominates the time after a burp ($t=1.6$ hours) that the valve could fail and be a problem.

TVD4503C	1.5E-7/H	OH	HAND-OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRO; Hanford Type Code Database, VD C. For this case this failure will not affect the results.
TVD4503D	9.4E-8/H	168H	HAND-OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRO; Hanford Type Code Database, VD D. See the earlier discussion for event TVD4502D.
TVDAMMOL	2E-8/H	2400H	EITHER OF THE 2 DOWNSTREAM VALVES IN THE AMMONIA BUBBLER CABINET LEAK; Refer to description in case SY1A. The fact that the valves could fail during time $t=45$ hours (time flammable mixture is in the tank after a burp) is disregarded because it is dominated by the $\tau=2,400$ hours described in case SY1A. CAFTA formula 5 will be used.
TVDP28ZC	1.5E-7/H	168H	HAND-OPERATED (MANUAL) INLET VALVE TO P28 EXHAUSTER N.O., FTRO; Hanford Type Code Database, VD C. If this valve fails closed it shuts down flow from 101-SY to P-28 exhauster fan. If the P-23 exhauster fan is still running, 101-SY will still be ventilated. If the P-23 exhauster fan is also shut down, pressure will build up in the tank. This will trip a pressure switch which will energize an alarm. It is assumed that repairs on the valve take one week from the time of failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, will be used. The $\tau=168$ hours dominates the time after a burp ($t=45$ hours) that the valve could fail and be a problem.
TVDUCV1C	1.5E-7/H	168H	HAND-OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO; Hanford Type Code Database, VD C. Refer to description in case SY1B. CAFTA formula 4 is used. The $\tau=168$ hours dominates the time after a burp ($t=1.0$ hours) that the ventilation could fail and be a problem.

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B.13 CASE SY9D - H₂ EXPLOSION IN TANK 103-SY WITHOUT VENTILATION FLOW

KEY: T = 101-SY

CAFTA formula 3 = $1 - e^{-\lambda t}$ [approximation= λt]CAFTA formula 4 = $\lambda \tau / (\lambda \tau + 1) = 1 - (\text{MTBF}) / (\text{MTBF} + \text{MTTR})$ [approximation= $\lambda \tau$]CAFTA formula 5 = $1 + (1/\lambda \tau)(e^{-\lambda \tau} - 1)$ [approximation= $\lambda \tau / 2$]MTBF = Mean Time Between Failure = $1/\lambda$

MTTR = Mean Time to Repair

BASIC EVENT	λ OR PROB.	τ (tau) or t	DISCUSSION
B1153A	0.00001	NONE	ELECTROSTATIC SPARKS FROM LESS-THAN-SUFFICIENT BONDING/GROUNDING OF TANK RISERS; Refer to description in case SY1C.
B1153C	0.01	NONE	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7); Refer to description in case SY1C.
B1155A	0.00001	DEMAND	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE; Refer to description in case SY1C. Failures on demand do not require a tau or t value.
B1156A	5E-8/H	4380H	ELECTRICAL SPARKS FROM FIC LEVEL PROBE; Refer to description in case SY1D. CAFTA formula 5 will be used.
B1156C	5E-7/H	24H	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE; Refer to description in case SY1D. CAFTA formula 5 will be used.
B1156H	1E-8/H	24H	ELECTRICAL SPARKS FROM THERMOCOUPLES; Refer to description in case SY1D. CAFTA formula 5 will be used.
B1178	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO ₂ IN THE PUMP PIT; Refer to description in case SY1C.
B1179A	5E-4	NONE	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103-SY PUMP PIT; Refer to description in case SY1C related to probability.
B1179B	0	NONE	ELECTRICAL SPARK FROM PUMP P-103-1 IN THE 103-SY PUMP PIT; Refer to description in case SY1C.
B1180A	1.0	NONE	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO ₂ IN THE MAIN SY VENTILATION SYSTEM; Refer to description in case SY1C.

IE-103	2/YR	NONE	BURPS PER YEAR IN 103-SY.
N423	1.0	NONE	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT; The heaters are electrically locked out because they are not intrinsically safe. Therefore, the probability of them not being functional is 1.0.
PWR2	1E-5/H	45H	LOSS OF POWER TO SY TANK FARM; Refer to description in case SY1B. CAFTA equation 3 is used.
PWR3	3E-6/H	24H	LOSS OF 120-V POWER TO P-23 CAM CAUSES P-23 EXHAUST FAN TO SHUT DOWN); Refer to description in case SY1B. The fact that the circuit breaker could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL) is disregarded because it is dominated by the $\tau=24$ hours described in case SY1B. CAFTA formula 4 will be used.
PWR3-1	3E-6/H	24H	LOSS OF 120-V POWER TO P-28 CAM CAUSES P-28 EXHAUST FAN TO SHUT DOWN); Used the same value and reasoning as for PWR3.
SEASON	0.17	NONE	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATURE; Estimated that 2 months out of 12, the humidity is high enough and the temperature is cold enough for moisture to plug filters if the moisture is not removed or heated.
ST1	1E-8	168H*100FT	STEAM LINE TO HEATER RUPTURES; Hanford Type Code Database for PA L. Refer to description in case SY1B. The fact that the piping could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until mixture below LFL) is disregarded because it is dominated by the $\tau=168$ hours times 100 feet as described in case SY1B. CAFTA formula 4 will be used.
ST2	2E-6	24H	LOSS OF STEAM FROM 200 AREA POWER PLANT FACILITY; Refer to description in case SY1B. The fact that the power house could fail during time $t=1.0$ hours (time flammable mixture is in the tank after a burp if ventilation were to function until

mixture below LFL) is disregarded because it is dominated by the tau above. CAFTA formula 4 will be used.

T1153B	6E-9/H	0.1H	ELECTROSTATIC SPARKS CAUSED BY LIGHTNING STRIKE; FAILS VENTILATION AND IGNITES; Refer to description in case SY1D. CAFTA formula 3 is used.
T1157J	4E-9/H	1.0H	BURNING GASOLINE SPILLS INTO TANK, FAILS VENT AND IGNITES LEAKING H ₂ ; Refer to description in case SY1D. CAFTA formula 4 will be used.
T1157K	4E-7/H	1.0H	RANGE FIRE PRODUCES SPARKS THAT FAIL VENT AND IGNITE LEAKING H ₂ ; Refer to description in case SY1D. CAFTA formula 4 will be used.
T1182-1A	1E-6/H	2.8H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-1 VACUUM PUMP (BEARINGS); Refer to description in case SY1D. CAFTA formula 3 will be used.
T1182-1B	1E-6/H	2.8H	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-2 VACUUM PUMP (BEARINGS); Used the same value and reasoning as for T1182-1A.
T1182-1C	3E-5/H	4380H	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL AND MOTOR); Refer to description in case SY1D. CAFTA formula 5 will be used.
T1182-1D	3E-5/H	4380H	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL AND MOTOR); Used the same value and reasoning as for T1182-1C.
T1182-3A	6E-5/H	4380H	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS; Refer to description in case SY1D. CAFTA formula 5 will be used.
T1182-3C	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP; Refer to description in case SY1D. CAFTA formula 5 will be used.
T1182-3D	1E-6/H	4380H	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP; Used the same values and reasoning as for T1182-3C.

T1182-4A	1.0	NONE	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR); Refer to description in case SY1A.
T1182A	3E-7/H	8H	<p>FAILURE OF PRESSURE SWITCH K1-PS-1-1 FAILS VENT AND CREATES SPARKS; One potential failure mode of the pressure switch shuts down the ventilation system and at the same time produces a spark source. Hydrogen can enter the switch contacts area because no seal exists between the high-pressure side (ventilation side) of the diaphragm and the switch. If the power wires attached to the back of the snap switch short then a continuous spark could be created. This is assumed to happen at a rate of 3E-7/H (WA 2 from Hanford Type Code Database). It is also assumed that the switch failure causes a spurious trip on the low setpoint (-6 in. WG) and shuts down the fan. Shutdown of the fan would be immediately detectable, but sparking in the pressure switch may not be detected at all. Since redundant exhaust fans are used in this configuration, it is anticipated that it could take 8 hours diagnose the problem and restart the P-23 fan (even though a spark source could still exist). Thus, CAFTA formula 4 is be used with time, t=8 hours to represent the unavailability of the P-23 ventilation and presence of an ignition source before a burp. Failure during the burp (time=0.1 hours) is dominated by this failure. This is a unique common cause event because the P-23 ventilation failure part of the common cause event will be detected quickly but the ignition source part may not be detected until ignition occurs.</p>
T1182A-1	3E-7/H	8H	<p>FAILURE OF PRESSURE SWITCH P28-PS-1 FAILS VENTILATION AND CREATES SPARKS; Used the same values and reasoning as for T1182A above. This is a common cause event. CAFTA formula 4 will be used.</p>
T1182A-2	3E-7/H	8H	<p>FAILURE OF PRESSURE SWITCH P28-PS-2 FAILS VENTILATION AND CREATES SPARKS; Used the same values and reasoning as for T1182A. This is a common cause event. CAFTA formula 4 will be used.</p>

T1182A-4	3E-7/H	8H	FAILURE OF PRESSURE SWITCH P28-PS-4 FAILS VENTILATION AND CREATES SPARKS; Used the same values and reasoning as for T1182A. This is a common cause event. CAFTA formula 4 will be used.
T1182B	3E-7/H	4380H	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYSTEM); Refer to description in case SY1D. CAFTA formula 5 will be used.
T1182C	3E-7/H	4380H	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYSTEM); Used the same values and reasoning as for T1182B.
T1182D	1E-7/H	12H	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM RADIATION DET GM TUBE RM-EXH-K1-1; Refer to description in case SY1D. CAFTA formula 4 is used.
T1183	1E-6/H	4380H	IGNITION FROM THE OVM SYSTEM; Refer to description in case SY1D. CAFTA formula 5 will be used.
T1183A	1E-5/H	0.1H	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF K1-4-1 (P-23) FAN (IN VENTILATION SYSTEM) (FAN BLADES COME OFF); Refer to description in case SY1D. CAFTA formula 3 is used.
T1183A-2	1E-5/H	0.1H	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF P-28 FAN ON RISER 7B OF 101-SY (FAN BLADES COME OFF); Used the same values and reasoning as for T1183A above.
T1183D	0.0001	DEMAND	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAILURE; Refer to description in case SY1B.
T1184A	1E-6/H	4380H	ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING AROUND THE DUCTWORK JOINTS; Refer to description in case SY1D. CAFTA formula 5 will be used.
TATMOSPH	4E-9/H	1.0H	ATMOSPHERIC CONDITIONS (TORNADO) THAT PRODUCE NEGATIVE PRESSURE <-6 IN. WG; Refer to description in case SY1B. CAFTA formula 3 with time, t=1.0 hours is used.
TCHCAM13	1.6E-5/H	12H	CAM1 SPURIOUSLY ALARMS; Hanford Type Code Database, CH 3. Refer to description in case SY1B. CAFTA formula 4 is used.

TCHCAM33	1.6E-5/H	12H	CAM3 (P-28) SPURIOUSLY ALARMS; Hanford Type Code Database, CH 3. This event fails the P-28 ventilation since the CAM3 is interlocked to shut down the fan given high radiation detection. It is assumed that the CAM could be repaired or replaced in 12 hours from the time of the failure (immediately replaceable upon detection). Therefore, CAFTA formula 4 with time, $t=12$ hours is used. The $\tau=12$ hours dominates the time after a burp ($t=0.1$ hours) that the ventilation could fail and be a problem.
TDC-1-1E	1.0E-5/H	168H	DEENTRAINER K1-1-1 PLUGS; Hanford Type Code Database, DC E. Refer to description in case SY1D. CAFTA formula 4 is used.
TDC-1-1P	1.0E-6/H	168H	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH; Hanford Type Code Database, DC P. Refer to description in case SY1D. CAFTA formula 4 is used.
TDCP281E	1.0E-5/H	168H	DEENTRAINER P28-1 PLUGS; Hanford Type Code Database, DC E. Used the same value and reasoning as for TDC-1-1E above. CAFTA formula 4 is used.
TDCP281P	1.0E-6/H	168H	DEENTRAINER P28-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH; Hanford Type Code Database, DC P. Used the same value and reasoning as for TDC-1-1P above. CAFTA formula 4 is used.
TDFK1VTC	3.0E-7/H	168H	MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO; Hanford Type Code Database, DF C. Refer to description in case SY1D. CAFTA formula 4 is used.
TFAK1-4G	3.0E-5/H	168H	K1-4-1 FAILS TO CONTINUE RUNNING (NONCATASTROPHIC (e.g., FAN BELT BREAKS), NO SPARKS); Hanford Type Code Database, FA G. Refer to description in case SY1D. CAFTA formula 4 is used.
TFAP-28G	3.0E-5/H	168H	P-28 FAILS TO CONTINUE RUNNING (NONCATASTROPHIC, NO SPARKS); Hanford Type Code Database, FA G. This failure is noncatastrophic and produces no sparks, but it does fail part of the ventilation flow. The P-28 is a redundant fan, but it must run until the P-23 [K1-4-1] is repaired, so mission time is 168 hours. Accordingly, CAFTA formula 3 with time,

t=168 hours is used. The tau=168 hours dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.

TFB-5-1E	1.0E-5/H	168H	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FB E. This event defeats part of the ventilation flow. It is estimated that replacement or repairs would take 1 week from the time of the failure. Accordingly, CAFTA formula 4 with time, t=168 hours is used. The tau=168 hours dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TFC-3-1E	1.4E-8/H	168H	HEPA FILTER K1-3-1 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FC E. Used the same reasoning as for TFB-5-1E.
TFC-3-1L	1.4E-8/H	168H	HEPA FILTER K1-3-1 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for TFB-5-1E.
TFC-3-2E	1.4E-8/H	168H	HEPA FILTER K1-3-2 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FC E. Used the same reasoning as for TFB-5-1E.
TFC-3-2L	1.4E-8/H	168H	HEPA FILTER K1-3-2 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for TFB-5-1E.
TFCP281E	1.4E-8/H	168H	HEPA FILTER P28-1 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FC E. Used the same reasoning as for TFB-5-1E.
TFCP281L	1.4E-8/H	168H	HEPA FILTER P28-1 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for TFB-5-1E.
TFCP282E	1.4E-8/H	168H	HEPA FILTER P28-2 PLUGS, DUE TO PARTICULATES; Hanford Type Code Database, FC E. Used the same reasoning as for TFB-5-1E.
TFCP282L	1.4E-8/H	168H	HEPA FILTER P28-2 LEAKS OR RUPTURES; Hanford Type Code Database, FC L. Used the same reasoning as for TFB-5-1E.

TFLVENTP	1.0	NONE	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM; Assumed probability of 1.0 (without ventilation).
TGB-4-1F	3.0E-1	DEMAND	DIESEL GENERATOR FOR EXHAUST FANS P-23 AND P-28 FAILS TO START; Started with the Hanford Type Code Database, GD F (3E-2), for starting of diesel generator. Since the diesel generator is not regularly tested, the probability of failure to start on demand was increased to 3E-1. Failures on demand do not require a tau or t value.
THA-2-14	1.0E-6/H	168H	STEAM HEATER K1-2-1 LEAKS FROM THE TUBES; Hanford Type Code Database, HA 4. Refer to description in case SY1D. CAFTA formula 4 is used.
THOUSE1	.01	DEMAND	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL; Refer to description in case SY1B.
THOUSE2	.1	DEMAND	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCALIBRATED CAM; Refer to description in case SY1B.
TOACAM1T	1E-3	DEMAND	HUMAN OPERATOR CAM1 MISCALIBRATES CAM SETPOINT LOW; Preliminary estimate. Failures on demand do not require a tau or t value.
TOACAM3T	1E-3	DEMAND	HUMAN OPERATOR CAM3 MISCALIBRATES CAM SETPOINT LOW (P28); Preliminary estimate. Failures on demand do not require a tau or t value.
TOAT1-2Q	1E-3	DEMAND	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE TI-1-2 READING; Preliminary estimate. Failures on demand do not require a tau or t value.
TOATRANQ	1E-3	DEMAND	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, TRANSFER TO BACKUP POWER SOURCE; Preliminary estimate. Failures on demand do not require a tau or t value.
TOAUCV1U	1E-2	DEMAND	HUMAN OPERATOR FTRTCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VALVE; Preliminary estimate. Failures on demand do not require a tau or t value.
TP28STKE	1E-10/H	24H	P28 EXHAUST STACK PLUGS; Assumed less likely than piping plugs failure rate

(PA E = 5E-10/H from Hanford Type Code Database), therefore, assumed 1E-10/H. A stack plug would be detected after shutdown of the P-28 fan. Assumed average time to diagnose and repair is 24 hours. Therefore, $\tau=24$ hours and CAFTA formula 4 is used.

TRAKP11H	3.9E-7/H	168H	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. Refer to description in case SY1D. CAFTA formula 4 is used.
TRAORLYH	3.9E-7/H	168H	OVERLOAD RELAY ORLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. Refer to description in case SY1D. CAFTA formula 4 is used.
TRAP-28H	3.9E-7/H	168H	OVERLOAD RELAY P-28 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. This event causes loss of the P-28 ventilation fan. It is estimated that replacement or repair of this relay would take 1 week from the time of the failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, is used. The $\tau=168$ hours dominates the time after a burp ($t=0.1$ hours) that the ventilation could fail and be a problem.
TRAP281H	3.9E-7/H	168H	RELAY P28-KP-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. Used the same reasoning as for TRAP-28H.
TRAP282H	3.9E-7/H	168H	RELAY P28-KP-2 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. Used the same reasoning as for TRAP-28H.
TRAP284H	3.9E-7/H	168H	RELAY P28-KP-4 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN; Hanford Type Code Database, RA H. Used the same reasoning as for TRAP-28H.
TSA-3-1L	7.0E-6/H	4380H	HEPA FILTER K1-3-1 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. Refer to description in case SY1D. CAFTA formula 5 is used.

TSA-3-2L	7.0E-6/H	4380H	HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. Refer to description in case SY1D. CAFTA formula 5 is used.
TSAP281L	7.0E-6/H	4380H	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. Used the same reasoning as for TSA-3-1L.
TSAP282L	7.0E-6/H	4380H	HEPA FILTER P28-2 FAILS TO FILTER DUE TO SEAL FAILURE; Hanford Type Code Database, SA L. Used the same reasoning as for TSA-3-2L.
TSJ-1-13	1.0E-6/H	168H	TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOSES; Hanford Type Code Database, SJ 3. Refer to description in case SY1D. CAFTA formula 4 is used.
TVB-1-1P	1.1E-5/H	168H	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER; Hanford Type Code Database, VB P. Refer to description in case SY1B. CAFTA formula 4 is used. The tau=168 hours dominates the time after a burp (t=0.1 hours) that the ventilation could fail and be a problem.
TVD4501C	1.5E-7/H	168H	HAND-OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.T., FTRO; Hanford Type Code Database, VD C. If this valve fails closed and the P-28 exhaust fan shuts down, pressure would build up in the tank. This will trip a pressure switch which will energize an alarm. It is assumed that repairs on the valve take one week from the time of failure. Accordingly, CAFTA formula 4 with time, t=168 hours, will be used. The tau=168 hours dominates the time after a burp (t=0.1 hours) that the valve could fail and be a problem.
TVD4501D	0	NONE	HAND-OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.T., FTRC; Normally fully open.
TVD4501S	1E-2	DEMAND	MANUAL VALVE 4501 FROM TANK 101-SY ERRONEOUSLY LEFT CLOSED; If this valve were left closed following maintenance or mistakenly closed when it was supposed to be opened and the P-23 exhaust fan shuts down, pressure would build up in the tank. This will trip a pressure switch which

will energize an alarm. It is assumed that recovery from this event could occur in within an hour assuming the cause of the pressure buildup is determined quickly. The recovery should be taken into account in the accident sequence cutsets.

TVD4502D	9.4E-8/H	168H	HAND-OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTRC; Hanford Type Code Database, VD D. Failure of this valve to remain open will have an impact on the mass balance of the ventilation system. It is assumed that this event would trip the fan off due to low pressure (-6 in. WG). It is assumed that repairs on the valve take 1 week from the time of failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, will be used. The $\tau=168$ hours dominates the time after a burp ($t=0.1$ hours) that the valve could fail and be a problem.
TVD4503C	1.5E-7/H	168H	HAND-OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRO; Hanford Type Code Database, VD C. Refer to description in case SY1D. CAFTA formula 4 is used.
TVD4503D	9.4E-8/H	168H	HAND-OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRC; Hanford Type Code Database, VD D. See the earlier discussion for event TVD4502D.
TVD4503S	1E-2	DEMAND	MANUAL VALVE 4503 FROM TANK 103-SY ERRONEOUSLY LEFT CLOSED; Refer to description in case SY1D.
TVDP28ZC	1.5E-7/H	168H	HAND-OPERATED (MANUAL) INLET VALVE TO P28 EXHAUSTER N.O., FTRO; Hanford Type Code Database, VD C. If this valve fails closed it shuts down flow from 101-SY to P-28 exhauster fan. If the P-23 exhauster fan is still running, 101-SY will still be ventilated. If the P-23 exhauster fan is also shut down, pressure will build up in the tank. This will trip a pressure switch that will energize an alarm. It is assumed that repairs on the valve take 1 week from the time of failure. Accordingly, CAFTA formula 4 with time, $t=168$ hours, will be used. The $\tau=168$ hours dominates the time after a burp ($t=0.1$ hours) that the valve could fail and be a problem.

TVDUCV1C 1.5E-7/H 168H

HAND-OPERATED (MANUAL) VALVE UPSTREAM OF
TCV-1-1 N.O., FTRO; Hanford Type Code
Database, VD C. Refer to description in
case SY1D. CAFTA formula 4 is used.

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APPENDIX C

BASIC EVENT AND TYPE CODE REPORT FILES

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BASIC EVENT AND TYPE CODE REPORT FOR SYC1A

NAME	RATE	U	FACTOR	U C	PROB	DESC
1 1E-101			3.65 Y		3.65E+00	BURPS PER YEAR IN 101-SY
2 11153A			0.00001		1.00E-05	ELECTROSTATIC SPARKS FROM LESS THAN SUFFICIENT BONDING/GROUNDING OF TANK RISERS
3 11155A			0.0001		1.00E-04	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE
4 11155B			0.0001		1.00E-04	MECHANICAL SPARKS FROM SLUDGE WEIGHT/ CABLE STRIKING SAMPLING TUBES
5 11156A	5E-8 H		2400 H 5		6.00E-05	ELECTRICAL SPARKS FROM PIC LEVEL PROBE
6 11156B	8E-10 H		2400 H 5		9.60E-07	ELECTRICAL SPARKS FROM SLACK TAPE DETECTOR FAULT
7 11156C	5E-7 H		24 H 5		6.00E-06	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE
8 11156D	1E-6 H		720 H 5		3.60E-04	ELECTRICAL SPARKS FROM EXPLOSION PROOF LIGHT OR LIGHT LEAD FAULTS
9 11156F1	1E-6 H		720 H 5		3.60E-04	ELECTRICAL SPARKS FROM VIDEO CAMERA
10 11156G	1E-8 H		24 H 5		1.20E-07	ELECTRICAL SPARKS FROM RADAR GAUGE FAULT
11 11156H	1E-8 H		24 H 5		1.20E-07	ELECTRICAL SPARKS FROM THERMOCOUPLES
12 11160A			1.0		1.00E+00	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER
13 11160C			0.01		1.00E-02	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER
14 11161B2	2E-8 H		2400 H 5		2.40E-05	ELECTRICAL SPARK FROM FAULT IN TELEDYNE H2 ANALYZER
15 11161B3	1E-6 H		1.6 H 3		1.60E-06	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF TELEDYNE VAC-UUM PUMP (BEARINGS)
16 11161B4	3E-5 H		2400 H 5		3.52E-02	ELECTRICAL SPARK FROM THE TELEDYNE VACUUM PUMP FAILURE (SEAL & MOTOR)
17 11161B7A			1.0		1.00E+00	ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)
18 11162B3	1E-6 H		1.6 H 3		1.60E-06	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CRYOGENIC VACUUM PUMP (BEARINGS)
19 11162B4	3E-5 H		1.6 H 3		4.80E-05	ELECTRICAL SPARK FROM THE CRYOGENIC VACUUM PUMP FAILURE (SEAL & MOTOR)
20 11163B7A			1.0		1.00E+00	ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)
21 11163B7B	1E-6 H		1.6 H 3		1.60E-06	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF AMMONIA BUBBLER VACUUM PUMP (BEARINGS)
22 11163B7C	3E-5 H		8 H 5		1.20E-04	ELECTRICAL SPARK FROM THE AMMONIA BUBBLER VACUUM PUMP FAILURE (SEAL & MOTOR)
23 11170A	1E-8 H		2400 H 5		1.20E-05	ELECTRICAL SPARKS FROM VENT HEADER THERMOCOUPLE
24 11170B	1E-8 H		2400 H 5		1.20E-05	ELECTRICAL SPARKS FROM VENT HEADER RELATIVE HUMIDITY DEVICE
25 11173A	5E-8 H		2400 H 5		6.00E-05	ELECTRICAL SPARK FROM FAULT IN THE (WHITTAKER) CHEMICAL CELL H2 ANALYZER
26 11173B	1E-6 H		1.6 H 3		1.60E-06	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CHEMICAL CELL VACUUM PUMP (BEARING)
27 11173C	5E-7 H		2400 H 5		6.00E-04	ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (SEAL & MOTOR)
28 11180A			1.0		1.00E+00	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYSTEM
29 11182-1A	1E-6 H		1.6 H 3		1.60E-06	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-1 VACUUM PUMP (BEARING)
30 11182-1B	1E-6 H		1.6 H 3		1.60E-06	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-2 VACUUM PUMP (BEARING)
31 11182-1C	3E-5 H		2400 H 5		3.52E-02	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)
32 11182-1D	3E-5 H		2400 H 5		3.52E-02	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)
33 11182-3A	6E-5 H		2400 H 5		6.87E-02	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS
34 11182-3C	1E-6 H		2400 H 5		1.20E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP
35 11182-3D	1E-6 H		2400 H 5		1.20E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP
36 11182-4A			1.0		1.00E+00	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)
37 11182B	3E-7 H		2400 H 5		3.60E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PF-2-1 (IN P-23 VENTILATION SYSTEM)
38 11182C	3E-7 H		2400 H 5		3.60E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PB-3-1 (IN P-23 VENTILATION SYSTEM)
39 11182D	1E-7 H		12 H 4		1.20E-06	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM RADIATION DET GM TUBE RM-EXH-K
40 11183	1E-6 H		2400 H 5		1.20E-03	IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM
41 11183A-1	1E-6 H		168 H 5		8.40E-05	IGNITION SOURCE FROM K1-4-1 FAN (IN P-23 VENTILATION SYSTEM) (FAN RUNNING)
42 11184A	1E-6 H		2400 H 5		1.20E-03	ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING
43 TCFIRELA	3E-4		1		3.00E-04	ELECTRICAL RELAY CONTACTS, IR, NORMALLY ENERGIZED., FTOD
44 TCFLO-XA	3E-4		1		3.00E-04	ELECTRICAL RELAY CONTACTS, LO-X, NORMALLY ENERGIZED., FTOD
45 TFLVENTP			0.01		1.00E-02	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM
46 TOAN2COQ	1E-3		1		1.00E-03	HUMAN OPERATOR FAILS TO FILL NITROGEN BOTTLE (VIDEO CAMERA PURGE SYSTEM)
47 TOAPS-1T	1E-2		1		1.00E-02	HUMAN OPERATOR MISCALIBRATES PRESSURE SWITCH (VIDEO CAMERA PURGE SYSTEM)
48 TPAAMMOL	6E-5 H		2400 H 5		6.87E-02	AMMONIA BUBBLER PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP
49 TPALEAKL	1E-8 H		6.57E+5 H 5		3.28E-03	VIDEO CAMERA PURGE PIPING LEAKS (PER FOOT OF < 3" PIPE)
50 TPATELEL	6E-5 H		2400 H 5		6.87E-02	TELEDYNE H2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP
51 TPDVAVCL	1E-6 H		2400 H 5		1.20E-03	AMMONIA BUBBLER VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABINET
52 TPDTVACL	1E-6 H		2400 H 5		1.20E-03	TELEDYNE H2 SAMPLING SYSTEM VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABIN
53 TS1PB-1I	3E-5		1		3.00E-05	PS FAILS TO OPEN WHEN REQUIRED (VIDEO CAMERA PURGE SYSTEM)
54 TVBPR-1C	3E-6 H		720 H 5		1.08E-03	FLOW CONTROL (SELF-REGULATING) VALVE PR-1 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM)
55 TVBPR-2C	3E-6 H		720 H 5		1.08E-03	FLOW CONTROL (SELF-REGULATING) VALVE PR-2 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM)
56 TVDAMMOL	2E-8 H		2400 H 5		2.40E-05	EITHER OF (2) DOWN-STREAM VALVES IN THE AMMONIA BUBBLER CABINET LEAK

BASIC EVENT AND TYPE CODE REPORT FOR SYC1B

NAME	RATE	U	FACTOR	U C	PROB	DESC
1 1E-101			3.65 Y		3.65E+00	BURPS PER YEAR IN 101-SY
2 K422A					0.00E+00	FILTERS K1-5-1/ K1-3-1/K1-3-2 ARE PLUGGED DUE TO MOISTURE FROM AIR
3 PWR2	1E-5 H	45 H 3			4.50E-04	LOSS OF POWER TO SY TANK FARM
4 PWR3	3E-6 H	24 H 4			7.20E-05	LOSS OF 120 V POWER TO P-23 CAM CAUSES P-23 EXHAUST FAN TO BE SHUTDOWN
5 RVD45018	1E-2	.01			1.00E-02	FAILURE TO DIAGNOSE PROBLEM AND OPEN VALVE 4501 BEFORE <LFL
6 SEASON		.17			1.70E-01	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATURE
7 ST1	1E-8 I	1.68E+4 H 4			1.68E-04	STEAM LINE TO HEATER RUPTURES
8 ST2	2E-6 H	24 H 4			4.80E-05	LOSS OF STEAM FROM POWER PLANT FACILITY
9 T1153A		0.0001			1.00E-05	ELECTROSTATIC SPARKS FROM LESS THAN SUFFICIENT BONDING/GROUNDING OF TANK RISERS
10 T1153B	6E-9 H	1.6 H 3			9.60E-09	ELECTROSTATIC SPARKS CAUSED BY LIGHTNING STRIKE; FAILS VENTILATION AND IGNITES
11 T1155A		0.0001			1.00E-04	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE
12 T1159B		0.0001			1.00E-04	MECHANICAL SPARKS FROM SLUDGE WEIGHT/ CABLE STRIKING SAMPLING TUBES
13 T1156A	5E-8 H	2400 H 5			6.00E-05	ELECTRICAL SPARKS FROM FIC LEVEL PROBE
14 T1156B	8E-10 H	2400 H 5			9.60E-07	ELECTRICAL SPARKS FROM BLACK TAPE DETECTOR FAULT
15 T1156C	5E-7 H	45 H 3			2.25E-05	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE
16 T1156D	1E-6 H	720 H 5			3.60E-04	ELECTRICAL SPARKS FROM EXPLOSION PROOF LIGHT OR LIGHT LEAD FAULTS
17 T1156F1	1E-6 H	720 H 5			3.60E-04	ELECTRICAL SPARKS FROM VIDEO CAMERA
18 T1156G	1E-8 H	45 H 3			4.50E-07	ELECTRICAL SPARKS FROM RADAR GAUGE FAULT
19 T1156H	1E-8 H	45 H 3			4.50E-07	ELECTRICAL SPARKS FROM THERMOCOUPLES
20 T1157J	4E-9 H	1.6 H 3			6.40E-09	BURNING GASOLINE SPILLS INTO TANK, FAILS VENT & IGNITES LEAKING H2
21 T1157K	4E-7 H	1.6 H 3			6.40E-07	RANGE FIRE PRODUCES SPARKS THAT FAIL VENT AND IGNITE LEAKING H2
22 T1160A		1.0			1.00E+00	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER
23 T1160C		0.01			1.00E-02	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER
24 T1161B2	2E-8 H	2400 H 5			2.40E-05	ELECTRICAL SPARK FROM FAULT IN TELEDYNE H2 ANALYZER
25 T1161B3	1E-6 H	45 H 3			4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF TELEDYNE VACUUM PUMP (BEARINGS)
26 T1161B4	3E-5 H	2400 H 5			3.52E-02	ELECTRICAL SPARK FROM THE TELEDYNE VACUUM PUMP FAILURE (SEAL & MOTOR)
27 T1161B7A		1.0			1.00E+00	ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)
28 T1162B3	1E-6 H	45 H 3			4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CRYOGENIC VACUUM PUMP (BEARINGS)
29 T1162B4	3E-5 H	45 H 3			1.35E-03	ELECTRICAL SPARK FROM THE CRYOGENIC VACUUM PUMP FAILURE (SEAL & MOTOR)
30 T1163B7A		1.0			1.00E+00	ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)
31 T1163B7B	1E-6 H	45 H 3			4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF AMMONIA BUBBLER VACUUM PUMP (BEARINGS)
32 T1163B7C	3E-5 H	45 H 3			1.35E-03	ELECTRICAL SPARK FROM THE AMMONIA BUBBLER VACUUM PUMP FAILURE (SEAL & MOTOR)
33 T1170A	1E-8 H	2400 H 5			1.20E-05	ELECTRICAL SPARKS FROM VENT HEADER THERMOCOUPLE
34 T1170B	1E-8 H	2400 H 5			1.20E-05	ELECTRICAL SPARKS FROM VENT HEADER RELATIVE HUMIDITY DEVICE
35 T1173A	5E-8 H	2400 H 5			6.00E-05	ELECTRICAL SPARK FROM FAULT IN THE (WHITTAKER) CHEMICAL CELL H2 ANALYZER
36 T1173B	1E-6 H	45 H 3			4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CHEMICAL CELL VACUUM PUMP (BEARING)
37 T1173C	5E-7 H	2400 H 5			6.00E-04	ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (SEAL & MOTOR)
38 T1180A		1.0			1.00E+00	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYSTEM
39 T1182-1A	1E-6 H	45 H 3			4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-1 VACUUM PUMP (BEARING)
40 T1182-1B	1E-6 H	45 H 3			4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-2 VACUUM PUMP (BEARING)
41 T1182-1C	3E-5 H	2400 H 5			3.52E-02	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)
42 T1182-1D	3E-5 H	2400 H 5			3.52E-02	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)
43 T1182-3A	6E-5 H	2400 H 5			6.87E-02	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS
44 T1182-3C	1E-6 H	2400 H 5			1.20E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP
45 T1182-3D	1E-6 H	2400 H 5			1.20E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP
46 T1182-4A		1.0			1.00E+00	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)
47 T1182A	3E-7 H	4 H 4			1.20E-06	FAILURE OF PRESSURE SWITCH K1-PS-1-1 FAILS VENTILATION AND CREATES SPARKS
48 T1182B	3E-7 H	2400 H 5			3.60E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYSTEM)
49 T1182C	3E-7 H	2400 H 5			3.60E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYSTEM)
50 T1182D	1E-7 H	45 H 3			4.50E-06	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM RADIATION DET GM TUBE RM-EXH-K
51 T1183	1E-6 H	2400 H 5			1.20E-03	IGNITION FROM THE ORGANIC VAPOR MONITOR (OVN) SYSTEM
52 T1183A	1E-5 H	1.6 H 3			1.60E-05	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF K1-4-1 (P-23) FAN (IN VENTILATION)
53 T1183D		0.0001			1.00E-04	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAILURE
54 T1184A	1E-6 H	2400 H 5			1.20E-03	ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING
55 ATMOSPHERIC	4E-9 H	1.6 H 3			6.40E-09	ATMOSPHERIC CONDITIONS (TORNADO) THAT PRODUCE NEGATIVE PRESSURE <- 6 IN WG
56 TCFIRELA	3E-4	1			1.300E-04	ELECTRICAL RELAY CONTACTS, IR, NORMALLY ENERGIZED., FTCD
57 TCFLO-XA	3E-4	1			1.300E-04	ELECTRICAL RELAY CONTACTS, LO-X, NORMALLY ENERGIZED., FTCD
58 TCHCAM13	2E-5 H	12 H 4			2.40E-04	CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS
59 TDC-1-1E	1E-5 H	168 H 4			1.68E-03	DEENTRAINER K1-1-1 PLUGS
60 TDC-1-1P	1E-6 H	168 H 4			1.68E-04	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH
61 TDFK1VTC	3E-7 H	168 H 4			5.04E-05	MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN NEPAS N.O., FTRO
62 TFAK1-4G	3E-5 H	168 H 4			5.01E-03	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS], NO S
63 TFAP-28F	5E-3	1			1.500E-03	BACKUP EXHAUST FAN P-28 FAILS TO START
64 TFAP-28G	3E-5 H	168 H 3			5.03E-03	P-28 FAILS TO CONTINUE RUNNING
65 TFB-5-1E	1E-5 H	168 H 4			1.68E-03	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES
66 TFC-3-1E	1E-8 H	168 H 4			1.68E-06	HEPA FILTER K1-3-1 PLUGS, DUE TO PARTICULATES
67 TFC-3-1L	1E-8 H	168 H 4			1.68E-06	HEPA FILTER K1-3-1 LEAKS OR RUPTURES
68 TFC-3-2E	1E-8 H	168 H 4			1.68E-06	HEPA FILTER K1-3-2 PLUGS, DUE TO PARTICULATES
69 TFC-3-2L	1E-8 H	168 H 4			1.68E-06	HEPA FILTER K1-3-2 LEAKS OR RUPTURES
70 TFLVENTP		1.0			1.00E+00	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM
71 TGB-4-1F	3E-1	1			3.00E-01	DIESEL GENERATOR FOR EXHAUST FANS P-23 & P-28 FAILS TO START

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NAME	RATE	U	FACTOR	U	C	PROB	DESC
72 TNA-2-14	1E-6 H		168 H 4	1.68E-04		STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	
73 THOUSE1			.01	1.00E-02		ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL	
74 THOUSE2			.1	1.00E-01		ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CAM	
75 TOACAM1T	1E-3		1 1	1.00E-03		HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	
76 TOAN2COO	1E-3		1 1	1.00E-03		HUMAN OPERATOR FAILS TO FILL NITROGEN BOTTLE (VIDEO CAMERA PURGE SYSTEM)	
77 TOAP-28Q	1E-3		1 1	1.00E-03		HUMAN OPERATOR FAILS TO START BACKUP FAN P-28	
78 TOAPS-1T	1E-2		1 1	1.00E-02		HUMAN OPERATOR MISCALIBRATES PRESSURE SWITCH (VIDEO CAMERA PURGE SYSTEM)	
79 TOAT1-20	1E-3		1 1	1.00E-03		HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE LOW TI-1-2 READING	
80 TOATRANQ	1E-3		1 1	1.00E-03		HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, TO ACTIVATE BACKUP POWER SOURCE	
81 TOAUCV1U	1E-2		1 1	1.00E-02		HUMAN OPERATOR PTRTCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VALVE	
82 TPAAMMOL	6E-5 H		2400 H 5	6.87E-02		AMMONIA BUBBLER PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	
83 TPALAKL	1E-8 H		6.57E+5 H 5	3.28E-03		VIDEO CAMERA PURGE PIPING LEAKS (PER FOOT OF < 3" PIPE)	
84 TPATELEL	6E-5 H		2400 H 5	6.87E-02		TELEDYNE H2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	
85 TPDAVACL	1E-6 H		2400 H 5	1.20E-03		AMMONIA BUBBLER VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABINET	
86 TPOTVACL	1E-6 H		2400 H 5	1.20E-03		TELEDYNE H2 SAMPLING SYSTEM VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABIN	
87 TRAKP11H	4E-7 H		168 H 4	6.72E-05		RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN	
88 TRAORLYH	4E-7 H		168 H 4	6.72E-05		OVERLOAD RELAY ONLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN	
89 TSA-3-1L	7E-6 H		2400 H 5	8.35E-03		HEPA FILTER K1-3-1 FAILS TO FILTER DUE TO SEAL FAILURE	
90 TSA-3-2L	7E-6 H		2400 H 5	8.35E-03		HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	
91 TSIPS-1I	3E-5		1 H 1	3.00E-05		PS FAILS TO OPEN WHEN REQUIRED (VIDEO CAMERA PURGE SYSTEM)	
92 TSJ-1-13	1E-6 H		168 H 4	1.68E-04		TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOSSES	
93 TVB-1-1P	1E-5 H		168 H 4	1.68E-03		TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	
94 TVBPR-1C	3E-6 H		720 H 5	1.08E-03		FLOW CONTROL (SELF-REGULATING) VALVE PR-1 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM)	
95 TVBPR-2C	3E-6 H		720 H 5	1.08E-03		FLOW CONTROL (SELF-REGULATING) VALVE PR-2 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM)	
96 TVD4501C	2E-7 H		168 H 4	3.36E-05		HAND OPERATED (MANUAL) VALVE 4501 FROM TANK 101-BY N.O., FTRO	
97 TVD4501D	0		0	0.00E+00		HAND OPERATED (MANUAL) VALVE 4501 FROM TANK 101-BY N.T., FTRO	
98 TVD4501S	1E-2		1E-2	1.00E-02		MANUAL VALVE 4501 FROM TANK 101-BY ERRONEOUSLY LEFT CLOSED	
99 TVD4502D	9E-8 H		168 H 4	1.51E-05		HAND OPERATED (MANUAL) VALVE 4502 FROM TANK 102-BY N.T., FTRO	
100 TVD4503D	9E-8 H		168 H 4	1.51E-05		HAND OPERATED (MANUAL) VALVE 4503 FROM TANK 103-BY N.T., FTRO	
101 TVDAMMOL	2E-8 H		2400 H 5	2.40E-05		EITHER OF (2) DOWN-STREAM VALVES IN THE AMMONIA BUBBLER CABINET LEAK	
102 TVDUCV1C	2E-7 H		168 H 4	3.36E-05		HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	

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BASIC EVENT AND TYPE CODE REPORT FOR SYC1C

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NAME	RATE	U	FACTOR	U C	PROB	DESC
1 B1153A			0.00001		1.00E-05	ELECTROSTATIC SPARKS FROM LESS THAN SUFFICIENT BONDING/GROUNDING OF TANK RISERS
2 B1153C			.01		1.00E-02	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)
3 B1155A			0.00001		1.00E-05	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE
4 B1156A	5E-8 H		4380 H 5		1.09E-04	ELECTRICAL SPARKS FROM FIC LEVEL PROBE
5 B1156C	5E-7 H		24 H 5		6.00E-06	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE
6 B1156H	1E-8 H		24 H 5		1.20E-07	ELECTRICAL SPARKS FROM THERMOCOUPLES
7 B1178			1.0		1.00E+00	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE PUMP PIT
8 B1179A			5E-4		5.00E-04	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN THE 103SY PUMP PIT
9 B1179B			0 H		0.00E+00	ELE. RICAL SPARKS FROM PUMP P-103-1 IN THE 103SY PUMP PIT
10 B1180A			1.0		1.00E+00	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYSTEM
11 IE-103			2 Y		2.00E+00	BURPS PER YEAR IN 103-SY
12 T1182-1A	1E-6 H		0.1 H 3		1.00E-07	IGNITION SOURCE FROMCATASTROPHIC FAILURE OF CAM VP-EXH-K1-1 VACUUM PUMP (BEAR1
13 T1182-1B	1E-6 H		0.1 H 3		1.00E-07	IGNITION SOURCE FROMCATASTROPHIC FAILURE OF CAM VP-EXH-K1-2 VACUUM PUMP (BEAR1
14 T1182-1C	3E-5 H		4380 H 5		6.29E-02	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)
15 T1182-1D	3E-5 H		4380 H 5		6.29E-02	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)
16 T1182-3A	6E-5 H		4380 H 5		1.21E-01	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS
17 T1182-3C	1E-6 H		4380 H 5		2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP
18 T1182-3D	1E-6 H		4380 H 5		2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP
19 T1182-4			.10E+01		1.00E+00	
20 T1182-4A			1.0		1.00E+00	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)
21 T1182B	3E-7 H		4380 H 5		6.57E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYSTEM)
22 T1182C	3E-7 H		4380 H 5		6.57E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYSTEM)
23 T1182D	1E-7 H		12 H 4		1.20E-06	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM RADIATION DET GM TUBE RM-EXH-K
24 T1183	1E-6 H		4380 H 5		2.19E-03	IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM
25 T1183A-1	1E-6 H		168 H 5		8.40E-05	IGNITION SOURCE FROM K1-4-1 FAN (IN P-23 VENTILATION SYSTEM) (FAN RUNNING)
26 T1184A	1E-6 H		4380 H 5		2.19E-03	ELECTROSTATIC SPARKSIN THE P-23 VENTILA-TION DUCTWORK DUE TO FAILED BONDING
27 TFLVENTP			0.01		1.00E-02	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM

BASIC EVENT AND TYPE CODE REPORT FOR SYC1D

NAME	RATE	U	FACTOR	U	C	PROB	DESC
1 B1153A			0.00001			1.00E-05	ELECTROSTATIC SPARKS FROM LESS THAN SUFFICIENT BONDING/GROUNDING OF TANK RISERS
2 B1153C			0.01			1.00E-02	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)
3 B1155A			0.00001			1.00E-05	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE
4 B1156A	5E-8 H		4380	H	5	1.09E-04	ELECTRICAL SPARKS FROM FIC LEVEL PROBE
5 B1156C	5E-7 H		24	H	5	6.00E-06	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE
6 B1156H	1E-8 H		24	H	5	1.20E-07	ELECTRICAL SPARKS FROM THERMOCOUPLES
7 B1178			1.0			1.00E+00	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO2 IN THE PUMP PIT
8 B1179A			5E-4			5.00E-04	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103SY PUMP PIT
9 B1179B			0.0			0.00E+00	ELECTRICAL SPARK FROM PUMP P-103-1 IN THE 103SY PUMP PIT
10 B1180A			1.0			1.00E+00	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYSTEM
11 IE-103			2	Y		2.00E+00	BURPS PER YEAR IN 103-SY
12 K422A						0.00E+00	FILTERS K1-5-1/ K1-3-1/K1-3-2 ARE PLUGGED DUE TO MOISTURE FROM AIR
13 PWR2	1E-5 H		2.8	H	3	2.80E-05	LOSS OF POWER TO SY TANK FARM
14 PWR3	3E-6 H		24	H	4	7.20E-05	LOSS OF 120 V POWER TO P-23 CAM CAUSES P-23 EXHAUST FAN TO SHUTDOWN
15 SEASON			.17			1.70E-01	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATURE
16 ST1	1E-8 H		1.68E+4	H	4	1.68E-04	STEAM LINE TO HEATER RUPTURES
17 ST2	2E-6 H		24	H	4	4.80E-05	LOSS OF STEAM FROM POWER PLANT FACILITY
18 T1153B	6E-9 H		0.1	H	3	6.00E-10	ELECTROSTATIC SPARKS CAUSED BY LIGHTNING STRIKE; FAILS VENTILATION AND IGNITES
19 T1157J	4E-9 H		1.0	H	4	4.00E-09	BURNING GASOLINE SPILLS INTO TANK, FAILS VENT & IGNITES LEAKING H2
20 T1157K	4E-7 H		1.0	H	4	4.00E-07	RANGE FIRE PRODUCES SPARKS THAT FAIL VENT AND IGNITE LEAKING H2
21 T1182-1A	1E-6 H		2.8	H	3	2.80E-06	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-1 VACUUM PUMP (BEAR1
22 T1182-1B	1E-6 H		2.8	H	3	2.80E-06	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-2 VACUUM PUMP (BEAR1
23 T1182-1C	3E-5 H		4380	H	5	6.29E-02	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)
24 T1182-1D	3E-5 H		4380	H	5	6.29E-02	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)
25 T1182-3A	6E-5 H		4380	H	5	1.21E-01	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS
26 T1182-3C	1E-6 H		4380	H	5	2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP
27 T1182-3D	1E-6 H		4380	H	5	2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP
28 T1182-4A			1.0			1.00E+00	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)
29 T1182A	3E-7 H		4	H	4	1.20E-06	FAILURE OF PRESSURE SWITCH K1-PS-1-1 FAILS VENTILATION AND CREATES SPARKS
30 T1182B	3E-7 H		4380	H	5	6.57E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYSTEM)
31 T1182C	3E-7 H		4380	H	5	6.57E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYSTEM)
32 T1182D	1E-7 H		12	H	4	1.20E-06	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM RADIATION DET GM TUBE RM-EXH-K
33 T1183	1E-6 H		4380	H	5	2.19E-03	IGNITION FROM THE ORGANIC VAPOR MONITOR (OVH) SYSTEM
34 T1183A	1E-5 H		0.1	H	3	1.00E-06	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF K1-4-1 (P-23) FAN (IN VENTILATIO
35 T1183D			0.0001			1.00E-04	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAILURE
36 T1184A	1E-6 H		4380	H	5	2.19E-03	ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING
37 TATMOSPH	4E-9 H		0.1	H	3	4.00E-10	ATMOSPHERIC CONDITIONS (TORNADO) THAT PRODUCE NEGATIVE PRESSURE < 6 IN WG
38 TCHCAM13	2E-5 H		12	H	4	2.40E-04	CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS
39 TDC-1-1E	1E-5 H		168	H	4	1.68E-03	DEENTRAINER K1-1-1 PLUGS
40 TDC-1-1P	1E-6 H		168	H	4	1.68E-04	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH
41 TDFK1VTC	3E-7 H		168	H	4	5.04E-05	MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN NEPAS N.O., FTRO
42 TFAK1-4G	3E-5 H		168	H	4	5.01E-03	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS], NO S
43 TFAP-28F	5E-3		1	H	1	5.00E-03	BACKUP EXHAUST FAN P-28 FAILS TO START
44 TFAP-28G	3E-5 H		168	H	3	5.03E-03	P-28 FAILS TO CONTINUE RUNNING
45 TFB-5-1E	1E-5 H		168	H	4	1.68E-03	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES
46 TFC-3-1E	1E-8 H		168	H	4	1.68E-06	HEPA FILTER K1-3-1 PLUGS, DUE TO PARTICULATES
47 TFC-3-1L	1E-8 H		168	H	4	1.68E-06	HEPA FILTER K1-3-1 LEAKS OR RUPTURES
48 TFC-3-2E	1E-8 H		168	H	4	1.68E-06	HEPA FILTER K1-3-2 PLUGS, DUE TO PARTICULATES
49 TFC-3-2L	1E-8 H		168	H	4	1.68E-06	HEPA FILTER K1-3-2 LEAKS OR RUPTURES
50 TFLVENTP			1.0			1.00E+00	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM
51 TGB-4-1F	3E-1		1	H	1	3.00E-01	DIESEL GENERATOR FOR EXHAUST FANS P-23 & P-28 FAILS TO START
52 THA-2-14	1E-6 H		168	H	4	1.68E-04	STEAM HEATER K1-2-1 LEAKS FROM THE TUBES
53 THOUSE1			.01			1.00E-02	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL
54 THOUSE2			.1			1.00E-01	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CAM
55 TOACAM1T	1E-3		1	H	1	1.00E-03	HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW
56 TOAP-28Q	1E-3		1	H	1	1.00E-03	HUMAN OPERATOR FAILS TO START BACKUP FAN P-28
57 TOAT1-20	1E-3		1	H	1	1.00E-03	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE LOW TI-1-2 READING
58 TOATRANO	1E-3		1	H	1	1.00E-03	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK TO ACTIVATE BACKUP POWER SOURCE
59 TOAUCV1U	1E-2		1	H	1	1.00E-02	HUMAN OPERATOR FTRCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VALVE
60 TRAKP11H	4E-7 H		168	H	4	6.72E-05	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN
61 TRAORLYH	4E-7 H		168	H	4	6.72E-05	OVERLOAD RELAY ORLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN
62 TSA-3-1L	7E-6 H		4380	H	5	1.52E-02	HEPA FILTER K1-3-1 FAILS TO FILTER DUE TO SEAL FAILURE
63 TSA-3-2L	7E-6 H		4380	H	5	1.52E-02	HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE
64 TSJ-1-13	1E-6 H		168	H	4	1.68E-04	TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOSES
65 TVB-1-1P	1E-5 H		168	H	4	1.68E-03	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER
66 TVD4501D	0		0			0.00E+00	HAND OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.T., FTRC
67 TVD4502D	9E-8 H		168	H	4	1.51E-05	HAND OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTRC
68 TVD4503C	2E-7 H		168	H	4	3.36E-05	HAND OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRC
69 TVD4503D	9E-8 H		168	H	4	1.51E-05	HAND OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRC
70 TVD4503S	1E-2		1	H	1	1.00E-02	MANUAL VALVE 4503 FROM TANK 103-SY ERRONEOUSLY LEFT CLOSED
71 TVDUCV1C	2E-7 H		168	H	4	3.36E-05	HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO

BASIC EVENT AND TYPE CODE REPORT FOR SYC2C

NYC2C.BE

CAFTA Database Report

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NAME	RATE	U	FACTOR	U	C	PROB	DESC
1 B1153A			0.00001			1.00E-05	ELECTROSTATIC SPARKS FROM INSUFFICIENT BONDING/GROUNDING OF TANK RISERS
2 B1153C			0.01			1.00E-02	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHT
3 B1155A			0.00001			1.00E-05	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE
4 B1156A	5E-8 H		4380	H	5	1.09E-04	ELECTRICAL SPARKS FROM FIC LEVEL PROBE
5 B1156C	5E-7 H		24	H	5	6.00E-06	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE
6 B1156H	1E-8 H		24	H	5	1.20E-07	ELECTRICAL SPARKS FROM THERMOCOUPLES
7 B1178			1.0			1.00E+00	FLAMMABLE MIXTURE OF H2, AIR AND NO2 IN PUMP PIT
8 B1179A			5E-4			5.00E-04	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103-SYPUMP PIT
9 B1179B			0.0			0.00E+00	ELECTRICAL SPARK FROM PUMP 103-1 IN THE 103-SY PUMP PIT
10 B1180A			1.0			1.00E+00	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM
11 B1182-1A	1E-6 H		2.8	H	3	2.80E-06	IGNITION SOURCES FROM CATASTROPHIC FAILURE OF CAM VP-1 (BEARINGS)
12 B1182-1B	1E-6 H		2.8	H	3	2.80E-06	IGNITION SOURCES FROM CATASTROPHIC FAILURE OF CAM VP-2 (BEARINGS)
13 B1182-1C	1E-6 H		2.8	H	3	2.80E-06	IGNITION SOURCES FROM CATASTROPHIC FAILURE OF CAM VP-3 (BEARINGS)
14 B1182-1D	3E-5 H		4380	H	5	6.29E-02	ELECTRICAL SPARKS FROM CAM VP-1 (SEAL & MOTOR)
15 B1182-1E	3E-5 H		4380	H	5	6.29E-02	ELECTRICAL SPARKS FROM CAM VP-2 (SEAL AND MOTOR)
16 B1182-1F	3E-5 H		4380	H	5	6.29E-02	ELECTRICAL SPARKS FROM CAM VP-3 (SEAL AND MOTOR)
17 B1182-3A	6E-5 H		4380	H	5	1.21E-01	CAM SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS
18 B1182-3C	1E-6 H		4380	H	5	2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-1 LEAKS ON OUTLET SIDE OF PUMP
19 B1182-3D	1E-6 H		4380	H	5	2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMPS VP-2 LEAKS ON OUTLET SIDE OF PUMP
20 B1182-3E	1E-6 H		4380	H	5	2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-3 LEAKS ON OUTLET SIDE OF PUMP
21 B1182-4A			1.0			1.00E+00	ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)
22 B1182A-A	3E-7 H		4	H	4	1.20E-06	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-1 CREATES SPARK
23 B1182B-B	3E-7 H		4	H	4	1.20E-06	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-2 CREATES SPARK
24 B1182C-C	3E-7 H		4	H	4	1.20E-06	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-4, CREATES SPARK
25 B1182D	1E-7 H		12	H	4	1.20E-06	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM BETA/GAMMA DETECTOR
26 B1182E	1E-7 H		12	H	4	1.20E-06	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF ALPHA DETECTOR RAM-EXH-K1-1
27 B1183A-1	1E-6 H		168	H	5	8.40E-05	IGNITION SOURCE FROM P29 FAN (IN VENT. SYSTEM) (FAN RUNNING)
28 B1184A	1E-6 H		4380	H	5	2.19E-03	ELECTROSTATIC SPARKS IN P29 VENTILATION DUCTWORK DUE TO FAILED BONDING
29 BFLVENTP			0.01			1.00E-02	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM
30 IE-103			2.0	Y		2.00E+00	BURPS/YEAR IN TANK 103-SY

BASIC EVENT AND TYPE REPORT FOR SYC2D

NAME	RATE	U	FACTOR	U C	PROB	DESC
1 01153A			0.00001		1.00E-05	ELECTROSTATIC SPARKS FROM INSUFFICIENT BONDING/GROUNDING OF TANK RISERS
2 01153C			0.01		1.00E-02	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHT
3 01155A			0.00001		1.00E-05	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE
4 01156A	5E-8 H		4380	H 5	1.09E-04	ELECTRICAL SPARKS FROM FIC LEVEL PROBE
5 01156C	5E-7 H		24	H 5	6.00E-06	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE
6 01156H	1E-8 H		24	H 5	1.20E-07	ELECTRICAL SPARKS FROM THERMOCOUPLES
7 01178			1.0		1.00E+00	FLAMMABLE MIXTURE OF H2, AIR AND NO2 IN PUMP PIT
8 01179A			5E-4		5.00E-04	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103-SYPUMP PIT
9 01179B			0.0		0.00E+00	ELECTRICAL SPARK FROM PUMP P-103-1 IN THE 103-SY PUMP PIT
10 01180A			1.0		1.00E+00	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM
11 01182-1A	1E-6 H		2.8	H 3	2.80E-06	IGNITION SOURCES FROM CATASTROPHIC FAILURE OF CAM VP-1 (BEARINGS)
12 01182-1B	1E-6 H		2.8	H 3	2.80E-06	IGNITION SOURCES FROM CATASTROPHIC FAILURE OF CAM VP-2 (BEARINGS)
13 01182-1C	1E-6 H		2.8	H 3	2.80E-06	IGNITION SOURCES FROM CATASTROPHIC FAILURE OF CAM VP-3 (BEARINGS)
14 01182-1D	3E-5 H		4380	H 5	6.29E-02	ELECTRICAL SPARKS FROM CAM VP-1 (SEAL & MOTOR)
15 01182-1E	3E-5 H		4380	H 5	6.29E-02	ELECTRICAL SPARKS FROM CAM VP-2 (SEAL AND MOTOR)
16 01182-1F	3E-5 H		4380	H 5	6.29E-02	ELECTRICAL SPARKS FROM CAM VP-3 (SEAL AND MOTOR)
17 01182-3A	6E-5 H		4380	H 5	1.21E-01	CAM SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS
18 01182-3C	1E-6 H		4380	H 5	2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-1 LEAKS ON OUTLET SIDE OF PUMP
19 01182-3D	1E-6 H		4380	H 5	2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMPS VP-2 LEAKS ON OUTLET SIDE OF PUMP
20 01182-3E	1E-6 H		4380	H 5	2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-3 LEAKS ON OUTLET SIDE OF PUMP
21 01182-4A			1.0		1.00E+00	ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)
22 01182A	3E-7 H		4	H 4	1.20E-06	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-1 FAILS VENT & CREATES SPARK
23 01182B	3E-7 H		4	H 4	1.20E-06	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-2 FAILS VENT & CREATES SPARK
24 01182C	3E-7 H		4	H 4	1.20E-06	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-4, FAILS VENT & CREATES SPARK
25 01182D	1E-7 H		12	H 4	1.20E-06	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM BETA/GAMMA DETECTOR
26 01182E	1E-7 H		12	H 4	1.20E-06	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF ALPHA DETECTOR RAN-EXH-K1-1
27 01183A	1E-5 H		0.1	H 3	1.00E-06	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF P29 FAN
28 01183D			0.0001		1.00E-04	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAILURE
29 01184A	1E-6 H		4380	H 5	2.19E-03	ELECTRICAL SPARKS IN P29 VENTILATION DUCTWORK DUE TO FAILED BONDING
30 BHCAM13	2E-5 H		12	H 4	2.40E-04	CAM SPURIOUSLY ALARMS (P29)
31 BDC-1-1E	1E-5 H		168	H 4	1.68E-03	DEENTRAINER P-29 PLUGS
32 BDC-1-1P	1E-6 H		168	H 4	1.68E-04	DEENTRAINER FAILS AND ALLOW EXCESSIVE WATER THROUGH
33 BFAK1-4G	3E-5 H		168	H 4	5.01E-03	P29 FAN FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC) (E.G. FAN BELTS BREAK)
34 BFC-3-1E	1E-8 H		168	H 4	1.68E-06	HEPA FILTER P29-1 PLUGS, DUE TO PARTICULATES
35 BFC-3-1L	1E-8 H		168	H 4	1.68E-06	HEPA FILTER P29-1 LEAKS OR RUPTURES
36 BFC-3-2E	1E-8 H		168	H 4	1.68E-06	HEPA FILTER P29-2 PLUGS DUE TO PARTICULATES
37 BFC-3-2L	1E-8 H		168	H 4	1.68E-06	HEPA FILTER P29-2 LEAKS OR RUPTURES
38 BFLVENTP			1.0		1.00E+00	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM
39 BHOUSE1			0.01		1.00E-02	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL
40 BHOUSE2			.1		1.00E-01	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HIGH MISCAL. CAM
41 BHTS1&2L			1.0		1.00E+00	ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT
42 BOACAM2T	1E-3 H		1	1	1.00E-03	HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW
43 BRAKP11H	4E-7 H		168	H 4	6.72E-05	RELAY P29-KP-1 SPURIOUSLY CHANGES STATE, FAN OPERATING CIRCUIT IS BROKEN
44 BRAKP12H	4E-7 H		168	H 4	6.72E-05	RELAY P29-KP-2 SPURIOUSLY CHANGES STATE, FAN OPERATING CIRCUIT IS BROKEN
45 BRAKP14H	4E-7 H		168	H 4	6.72E-05	RELAY P29-KP-4 SPURIOUSLY CHANGES STATE, FAN OPERATING CIRCUIT IS BROKEN
46 BRAORLYH	4E-7 H		168	H 4	6.72E-05	OVERLOAD RELAY SPURIOUSLY CHANGES STATE. FAN CIRCUIT BROKEN
47 BSA-3-1L	7E-6 H		4380	H 5	1.52E-02	HEPA FILTER P29-1 FAILS TO FILTER DUE TO SEAL FAILURE
48 BSA-3-2L	7E-6 H		4380	H 5	1.52E-02	HEPA FILTER P29-2 FAILS TO FILTER DUE TO SEAL FAILURE
49 BSTACKE	1E-10 H		24	H 4	2.40E-09	P29 EXHAUST STACK PLUGS
50 BVD450XC	2E-7 H		168	H 4	3.36E-05	HAND OPERATED MANUAL VALVE TEED INTO LINE FROM P29 EXHAUST N.O. FTRO
51 BVD450XS	1E-2 H		1	1	1.00E-02	HAND OPERATED (MANUAL) VALVE TEED INTO LINE FROM P29 EXHAUST-ER ERROROUSLY CLOSED
52 BVDP292C	2E-7 H		168	H 4	3.36E-05	HAND OPERATED (MANUAL) VALVE FROM P29 EXHAUST N.O. FTRO
53 BVDP292S	1E-2 H		1	1	1.00E-02	HAND OPERATED (MANUAL) VALVE FROM P29 EXHAUST ERROROUSLY CLOSED
54 IE-103			2.0	Y	2.00E+00	BURPS/YEAR IN TANK 103-SY
55 PWR2	1E-5 H		2.8	H 3	2.80E-05	LOSS OF POWER TO SY TANK FARM FROM MAIN POWER SOURCE
56 PWR3	3E-6 H		24	H 4	7.20E-05	LOSS OF 120V TO CAM CABINET FROM MAIN POWER SOURCE
57 SEASON			1.7E-1		1.70E-01	FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATURES
58 T1153B	6E-9 H		.1	H 3	6.00E-10	ELECTROSTATIC SPARKS CAUSED BY LIGHTNING STRIKE, FAILS VENT&IGNITES LEAKING H2
59 T1157J	4E-9 H		1.0	H 4	4.00E-09	BURNING GASOLINE SPILLS INTO TANK, FAILS VENT AND IGNITES LEAKING H2
60 T1157K	4E-7 H		1.0	H 4	4.00E-07	RANGE FIRE PRODUCES SPARKS THAT FAIL VENT. AND IGNITES LEAKING H2
61 ATMOSP	4E-9 H		0.1	H 3	4.00E-10	ATMOSPHERIC CONDITIONS (TORNADO) THAT PRODUCE NEGATIVE PRESSURE <-6 IN. W.G.
62 TGB-4-1F	3E-1 H		1	1	3.00E-01	DIESEL GENERATOR FOR EXHAUST FAN P-29 FAILS TO START
63 TOATRANQ	1E-3 H		1	1	1.00E-03	OPERATOR FAILS TO PERFORM A KNOWN TASK, TRANSFER TO BACKUP POWER SOURCE
64 TVD4502C	2E-7 H		168	H 4	3.36E-05	HAND OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.O. FTRO
65 TVD4502D	9E-8 H		168	H 4	1.51E-05	HAND OPERATED MANUAL VALVE 4502 FROM TANK 102-SY N.T. FTRO
66 TVD4502S	1E-2 H		1	1	1.00E-02	HAND OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY ERROROUSLY LEFT CLOSED
67 TVD4503C	2E-7 H		168	H 4	3.36E-05	HAND OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.O., FTRO
68 TVD4503D	9E-8 H		168	H 4	1.51E-05	HAND OPERATED MANUAL VALVE 4503 FROM TANK 103-SY N.T. FTRO
69 TVD4503S	1E-2 H		1	1	1.00E-02	HAND OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY ERROROUSLY LEFT CLOSED

BASIC EVENT AND TYPE REPORT FOR SYC3C

SYC3C.BE

CAFTA Database Report

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NAME	RATE	U	FACTOR	U	C	PROB	DESC
1 01153A			0.00001			1.00E-05	ELECTROSTATIC SPARKS FROM INSUFFICIENT BONDING/GROUNDING OF TANK RISERS
2 01153C			0.01			1.00E-02	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHT
3 01155A			0.00001			1.00E-05	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANKD DUE TO SUPPORT FAILURE
4 01156A	5E-8 H		4380	H	5	1.09E-04	ELECTRICAL SPARKS FROM PIC LEVEL PROBE
5 01156C	5E-7 H		24	H	5	6.00E-06	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE
6 01156H	1E-8 H		24	H	5	1.20E-07	ELECTRICAL SPARKS FROM THERMOCOUPLES
7 0117B			1.0			1.00E+00	FLAMMABLE MIXTURE OF H2, AIR AND NO2 IN PUM' PIT
8 01179A			5E-4			5.00E-04	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103-SY PUMP PIT
9 01179B			0.0			0.00E+00	ELECTRICAL SPARK FROM PUMP P-103-1 IN THE 103-SY PUMP PIT
10 01180A			1.0			1.00E+00	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM
11 01182-1A	1E-6 H		2.8	H	3	2.80E-06	IGNITION SOURCES FROM CATASTROPHIC FAILURE OF CAM VP-1 (BEARINGS)
12 01182-1B	1E-6 H		2.8	H	3	2.80E-06	IGNITION SOURCES FROM CATASTROPHIC FAILURE OF CAM VP-2 (BEARINGS)
13 01182-1C	1E-6 H		2.8	H	3	2.80E-06	IGNITION SOURCES FROM CATASTROPHIC FAILURE OF CAM VP-3 (BEARINGS)
14 01182-1D	3E-5 H		4380	H	5	6.29E-02	ELECTRICAL SPARKS FROM CAM VP-1 (SEAL & MOTOR)
15 01182-1E	3E-5 H		4380	H	5	6.29E-02	ELECTRICAL SPARKS FROM CAM VP-2 (SEAL AND MOTOR)
16 01182-1F	3E-5 H		4380	H	5	6.29E-02	ELECTRICAL SPARKS FROM CAM VP-3 (SEAL AND MOTOR)
17 01182-3A	6E-5 H		4380	H	5	1.21E-01	CAM SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS
18 01182-3C	1E-6 H		4380	H	5	2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-1 LEAKS ON OUTLET SIDE OF PUMP
19 01182-3D	1E-6 H		4380	H	5	2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMPS VP-2 LEAKS ON OUTLET SIDE OF PUMP
20 01182-3E	1E-6 H		4380	H	5	2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-3 LEAKS ON OUTLET SIDE OF PUMP
21 01182-4A			1.0			1.00E+00	ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)
22 01182A-A	3E-7 H		4	H	4	1.20E-06	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-1 CREATES SPARK
23 01182B-B	3E-7 H		4	H	4	1.20E-06	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-2 CREATES SPARK
24 01182C-C	3E-7 H		4	H	4	1.20E-06	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-4, CREATES SPARK
25 01182D	1E-7 H		12	H	4	1.20E-06	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM BETA/GAMMA DETECTOR
26 01182E	1E-7 H		12	H	4	1.20E-06	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF ALPHA DETECTOR RAN-EXH-K1-1
27 01183A-1	1E-6 H		168	H	5	8.40E-05	IGNITION SOURCE FROM P29 FAN (IN VENT. SYSTEM) (FAN RUNNING)
28 01184A	1E-6 H		4380	H	5	2.19E-03	ELECTROSTATIC SPARKS IN P29 VENTILATION DUCTWORK DUE TO FAILED BONDING
29 01184B			1.0			1.00E+00	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM
30 1E-103			2.0	Y		2.00E+00	BURPS/YEAR IN TANK 103-SY

BASIC EVENT AND TYPE REPORT FOR SYC3D

NAME	RATE	U	FACTOR	U	C	PROB	DESC
1 B1153A			0.00001			1.00E-05	ELECTROSTATIC SPARKS FROM INSUFFICIENT BONDING/GROUNDING OF TANK RISERS
2 B1153C			0.01			1.00E-02	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHT
3 B1155A			0.00001			1.00E-05	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE.
4 B1156A	5E-8 H		4380 H	5		1.00E-04	ELECTRICAL SPARKS FROM PIC LEVEL PROBE
5 B1156C	5E-7 H		24 H	5		6.00E-06	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE
6 B1156H	1E-8 H		24 H	5		1.20E-07	ELECTRICAL SPARKS FROM THERMOCOUPLES
7 B1178			1.0			1.00E+00	FLAMMABLE MIXTURE OF H2, AIR AND NO2 IN PUMP PIT
8 B1179A			5E-4			5.00E-04	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103-SY PUMP PIT
9 B1179B			0.0			0.00E+00	ELECTRICAL SPARK FROM PUMP P-103-1 IN THE 103-SY PUMP PIT
10 B1180A			1.0			1.00E+00	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM
11 B1182-1A	1E-6 H		2.8 H	3		2.80E-06	IGNITION SOURCES FROM CATASTROPHIC FAILURE OF CAM VP-1 (BEARINGS)
12 B1182-1B	1E-6 H		2.8 H	3		2.80E-06	IGNITION SOURCES FROM CATASTROPHIC FAILURE OF CAM VP-2 (BEARINGS)
13 B1182-1C	1E-6 H		2.8 H	3		2.80E-06	IGNITION SOURCES FROM CATASTROPHIC FAILURE OF CAM VP-3 (BEARINGS)
14 B1182-1D	3E-5 H		4380 H	5		6.29E-02	ELECTRICAL SPARKS FROM CAM VP-1 (SEAL & MOTOR)
15 B1182-1E	3E-5 H		4380 H	5		6.29E-02	ELECTRICAL SPARKS FROM CAM VP-2 (SEAL AND MOTOR)
16 B1182-1F	3E-5 H		4380 H	5		6.29E-02	ELECTRICAL SPARKS FROM CAM VP-3 (SEAL AND MOTOR)
17 B1182-3A	6E-5 H		4380 H	5		1.21E-01	CAM SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS
18 B1182-3C	1E-6 H		4380 H	5		2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-1 LEAKS ON OUTLET SIDE OF PUMP
19 B1182-3D	1E-6 H		4380 H	5		2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMPS VP-2 LEAKS ON OUTLET SIDE OF PUMP
20 B1182-3E	1E-6 H		4380 H	5		2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-3 LEAKS ON OUTLET SIDE OF PUMP
21 B1182-4A			1.0			1.00E+00	ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)
22 B1182A	3E-7 H		4 H	4		1.20E-06	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-1 FAILS VENT & CREATES SPARK
23 B1182B	3E-7 H		4 H	4		1.20E-06	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-PS-2 FAILS VENT & CREATES SPARK
24 B1182C	3E-7 H		4 H	4		1.20E-06	ELECTRICAL SPARKS FROM PRESSURE SWITCH P29-4, FAILS VENT & CREATES SPARK
25 B1182D	1E-7 H		12 H	4		1.20E-06	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM BETA/GAMMA DETECTOR
26 B1182E	1E-7 H		12 H	4		1.20E-06	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF ALPHA DETECTOR RAN-EXH-K1-1
27 B1183A	1E-5 H		0.1 H	3		1.00E-06	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF P29 FAN
28 B1183D			0.0001			1.00E-04	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAILURE
29 B1184A	1E-6 H		4380 H	5		2.19E-03	ELECTRICAL SPARKS IN P29 VENTILATION DUCTWORK DUE TO FAILED BONDING
30 BNCAM13	2E-5 H		12 H	4		2.40E-04	CAM SPURIOUSLY ALARMS (P29)
31 BDC-1-1E	1E-5 H		168 H	4		1.68E-03	DEENTRAINER P-29 PLUGS
32 BDC-1-1P	1E-6 H		168 H	4		1.68E-04	DEENTRAINER FAILS AND ALLOW EXCESSIVE WATER THROUGH
33 BFAK1-4Q	3E-5 H		168 H	4		5.01E-03	P29 FAN FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC) (E.G. FAN BELTS BREAK)
34 BFC-3-1E	1E-8 H		168 H	4		1.68E-06	HEPA FILTER P29-1 PLUGS, DUE TO PARTICULATES
35 BFC-3-1L	1E-8 H		168 H	4		1.68E-06	HEPA FILTER P29-1 LEAKS OR RUPTURES
36 BFC-3-2E	1E-8 H		168 H	4		1.68E-06	HEPA FILTER P29-2 PLUGS DUE TO PARTICULATES
37 BFC-3-2L	1E-8 H		168 H	4		1.68E-06	HEPA FILTER P29-2 LEAKS OR RUPTURES
38 BFLVENTP			1.0			1.00E+00	FLAME PROPAGATES BACK TO TANK FROM P-29 VENTILATION SYSTEM
39 BHOUSE1			0.01			1.00E-02	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL
40 BHOUSE2			.1			1.00E-01	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HIGH MISCAL. CAM
41 BHTS1&2L			1.0			1.00E+00	ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT
42 BOACAM2T	1E-3 H		1	1		1.00E-03	HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW
43 BRAKP11H	4E-7 H		168 H	4		6.72E-05	RELAY P29-KP-1 SPURIOUSLY CHANGES STATE, FAN OPERATING CIRCUIT IS BROKEN
44 BRAKP12H	4E-7 H		168 H	4		6.72E-05	RELAY P29-KP-2 SPURIOUSLY CHANGES STATE, FAN OPERATING CIRCUIT IS BROKEN
45 BRAKP14H	4E-7 H		168 H	4		6.72E-05	RELAY P29-KP-4 SPURIOUSLY CHANGES STATE, FAN OPERATING CIRCUIT IS BROKEN
46 BRAORLYH	4E-7 H		168 H	4		6.72E-05	OVERLOAD RELAY SPURIOUSLY CHANGES STATE, FAN CIRCUIT BROKEN
47 BSA-3-1L	7E-6 H		4380 H	5		1.52E-02	HEPA FILTER P29-1 FAILS TO FILTER DUE TO SEAL FAILURE
48 BSA-3-2L	7E-6 H		4380 H	5		1.52E-02	HEPA FILTER P29-2 FAILS TO FILTER DUE TO SEAL FAILURE
49 BSTACKE	1E-10 H		24 H	4		2.40E-09	P29 EXHAUST STACK PLUGS
50 BVDP292C	2E-7 H		168 H	4		3.36E-05	MANUAL VALVE FROM P29 EXHAUSTER N.O. FTRO
51 BVDP292S	1E-2 H		1	1		1.00E-02	HAND OPERATED (MANUAL) VALVE P29 EXHAUSTER ERRORNOUSLY CLOSED
52 IE-103			2.0 Y			2.00E+00	BURPS/YEAR IN TANK 103-SY
53 PWR2	1E-5 H		2.8 H	3		2.80E-05	LOSS OF POWER TO SY TANK FARM FROM MAIN POWER SOURCE
54 PWR3	3E-6 H		24 H	4		7.20E-05	LOSS OF 120V TO CAM CABINET FROM MAIN POWER SOURCE
55 SEASON			1.7E-1			1.70E-01	FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATURES
56 T1153B	6E-9 H		.1 H	3		6.00E-10	ELECTROSTATIC SPARKS CAUSED BY LIGHTNING STRIKE, FAILS VENT&IGNITES LEAKING H2
57 T1157J	4E-9 H		1.0 H	4		4.00E-09	BURNING GASOLINE SPILLS INTO TANK, FAILS VENT AND IGNITES LEAKING H2
58 T1157K	4E-7 H		1.0 H	4		4.00E-07	RANGE FIRE PRODUCES SPARKS THAT FAIL VENT. AND IGNITES LEAKING H2
59 TATMOSPH	4E-9 H		0.1 H	3		4.00E-10	ATMOSPHERIC CONDITIONS (TORNADO) THAT PRODUCE NEGATIVE PRESSURE <-6 IN. W.G.
60 TGB-4-1F	3E-1 H		1	1		3.00E-01	DIESEL GENERATOR FOR EXHAUST FAN P-29 FAILS TO START
61 TOATRANG	1E-3 H		1	1		1.00E-03	OPERATOR FAILS TO PERFORM A KNOWN TASK, TRANSFER TO BACKUP POWER SOURCE

WHC-EP-0579

BASIC EVENT AND TYPE REPORT FOR SYCSB

AIM

Association for Information and Image Management

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NAME	RATE	U	FACTOR	U	C	PROB	DESC
1 IE-101						3.65 Y	3.65E+00 BURPS PER YEAR IN 101-SY
2 K100B2							0.00E+00 SHUTDOWN OF P-28 FAN BY P28-PS-1 OR -2 SIGNAL (<-6 IN. WG.)
3 PWR2	1E-5 H		45	H	3	4.50E-04	LOSS OF POWER TO SY TANK FARM
4 PWR3	3E-6 H		24	H	4	7.20E-05	LOSS OF 120 V POWER TO P-23 CAM CAUSES P-23 EXHAUST FAN TO BE SHUTDOWN
5 SEASON						.17	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATURE
6 ST1	1E-8 H		1.68E+4	H	4	1.68E-04	STEAM LINE TO HEATER RUPTURES
7 ST2	2E-6 H		24	H	4	4.80E-05	LOSS OF STEAM FROM POWER PLANT FACILITY
8 T1153A			0.00001			1.00E-05	ELECTROSTATIC SPARKS FROM LESS THAN SUFFICIENT BONDING/GROUNDING OF TANK RISERS
9 T1153B	6E-9 H		1.6	H	3	9.60E-09	ELECTROSTATIC SPARKS CAUSED BY LIGHTNING STRIKE; FAILS VENTILATION AND IGNITES
10 T1155A			0.0001			1.00E-04	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE
11 T1155B			0.0001			1.00E-04	MECHANICAL SPARKS FROM SLUDGE WEIGHT/ CABLE STRIKING SAMPLING TUBES
12 T1156A	5E-8 H		2400	H	5	6.00E-05	ELECTRICAL SPARKS FROM FIC LEVEL PROBE
13 T1156B	8E-10 H		2400	H	5	9.60E-07	ELECTRICAL SPARKS FROM SLACK TAPE DETECTOR FAULT
14 T1156C	5E-7 H		45	H	3	2.25E-05	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE
15 T1156D	1E-6 H		720	H	5	3.60E-04	ELECTRICAL SPARKS FROM EXPLOSION PROOF LIGHT OR LIGHT LEAD FAULTS
16 T1156F1	1E-6 H		720	H	5	3.60E-04	ELECTRICAL SPARKS FROM VIDEO CAMERA
17 T1156G	1E-8 H		45	H	3	4.50E-07	ELECTRICAL SPARKS FROM RADAR GAUGE FAULT
18 T1156H	1E-8 H		45	H	3	4.50E-07	ELECTRICAL SPARKS FROM THERMOCOUPLES
19 T1157J	4E-9 H		1.6	H	3	6.40E-09	BURNING GASOLINE SPILLS INTO TANK, FAILS VENT & IGNITES LEAKING H2
20 T1157K	4E-7 H		1.6	H	3	6.40E-07	RANGE FIRE PRODUCES SPARKS THAT FAIL VENT AND IGNITE LEAKING H2
21 T1160A			1.0			1.00E+00	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER
22 T1160C			0.01			1.00E-02	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER
23 T1161B2	2E-8 H		2400	H	5	2.40E-05	ELECTRICAL SPARK FROM FAULT IN TELEDYNE H2 ANALYZER
24 T1161B3	1E-6 H		45	H	3	4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF TELEDYNE VACUUM PUMP (BEARINGS)
25 T1161B4	3E-5 H		2400	H	5	3.52E-02	ELECTRICAL SPARK FROM THE TELEDYNE VACUUM PUMP FAILURE (SEAL & MOTOR)
26 T1161B7A			1.0			1.00E+00	ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)
27 T1162B3	1E-6 H		45	H	3	4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CRYOGENIC VACUUM PUMP (BEARINGS)
28 T1162B4	3E-5 H		45	H	3	1.35E-03	ELECTRICAL SPARK FROM THE CRYOGENIC VACUUM PUMP FAILURE (SEAL & MOTOR)
29 T1163B7A			1.0			1.00E+00	ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)
30 T1163B7B	1E-6 H		45	H	3	4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF AMMONIA BUBBLER VACUUM PUMP (BEARINGS)
31 T1163B7C	3E-5 H		45	H	3	1.35E-03	ELECTRICAL SPARK FROM THE AMMONIA BUBBLER VACUUM PUMP FAILURE (SEAL & MOTOR)
32 T1170A	1E-8 H		2400	H	5	1.20E-05	ELECTRICAL SPARKS FROM VENT HEADER THERMOCOUPLE
33 T1170B	1E-8 H		2400	H	5	1.20E-05	ELECTRICAL SPARKS FROM VENT HEADER RELATIVE HUMIDITY DEVICE
34 T1173A	5E-8 H		2400	H	5	6.00E-05	ELECTRICAL SPARK FROM FAULT IN THE (WHITTAKER) CHEMICAL CELL H2 ANALYZER
35 T1173B	1E-6 H		45	H	3	4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CHEMICAL CELL VACUUM PUMP (BEARING)
36 T1173C	5E-7 H		2400	H	5	6.00E-04	ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (SEAL & MOTOR)
37 T1180A			1.0			1.00E+00	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYSTEM
38 T1182-1A	1E-6 H		45	H	3	4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-1 VACUUM PUMP (BEARINGS)
39 T1182-1B	1E-6 H		45	H	3	4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-2 VACUUM PUMP (BEARINGS)
40 T1182-1C	3E-5 H		2400	H	5	3.52E-02	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)
41 T1182-1D	3E-5 H		2400	H	5	3.52E-02	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)
42 T1182-3A	6E-5 H		2400	H	5	6.87E-02	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS
43 T1182-3C	1E-6 H		2400	H	5	1.20E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP
44 T1182-3D	1E-6 H		2400	H	5	1.20E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP
45 T1182-4A			1.0			1.00E+00	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)
46 T1182A	3E-7 H		4	H	4	1.20E-06	FAILURE OF PRESSURE SWITCH K1-PS-1-1 FAILS VENTILATION AND CREATES SPARKS
47 T1182B	3E-7 H		2400	H	5	3.60E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYSTEM)
48 T1182C	3E-7 H		2400	H	5	3.60E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYSTEM)
49 T1182D	1E-7 H		45	H	3	4.50E-06	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM RADIATION DET GM TUBE RM-EXH-K
50 T1183	1E-6 H		2400	H	5	1.20E-03	IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM
51 T1183A	1E-5 H		1.6	H	3	1.60E-05	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF K1-4-1 (P-23) FAN (IN VENTILATION)
52 T1183D			0.0001			1.00E-04	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAILURE
53 T1184A	1E-6 H		2400	H	5	1.20E-03	ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING
54 TATMOSPH	4E-9 H		1.6	H	3	6.40E-09	ATMOSPHERIC CONDITIONS (TORNADO) THAT PRODUCE NEGATIVE PRESSURE <- 6 IN WG
55 TCFIRELA	3E-4		1			1.300E-04	ELECTRICAL RELAY CONTACTS, IR, NORMALLY ENERGIZED., FTOD
56 TCFLO-XA	3E-4		1			1.300E-04	ELECTRICAL RELAY CONTACTS, LO-X, NORMALLY ENERGIZED., FTOD
57 TCHCAM13	2E-5 H		12	H	4	2.40E-04	CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS
58 TDC-1-1E	1E-5 H		168	H	4	1.68E-03	DEENTRAINER K1-1-1 PLUGS
59 TDC-1-1P	1E-6 H		168	H	4	1.68E-04	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH
60 TDFK1VTC	3E-7 H		168	H	4	5.04E-05	MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO
61 TFAK1-4G	3E-5 H		168	H	4	5.01E-03	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS], NO S
62 TFAP-28F	5E-3		1			1.500E-03	BACKUP EXHAUST FAN P-28 FAILS TO START
63 TFAP-28G	3E-5 H		168	H	3	5.03E-03	P-28 FAILS TO CONTINUE RUNNING
64 TFB-5-1E	1E-5 H		168	H	4	1.68E-03	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES
65 TFC-3-1E	1E-8 H		168	H	4	1.68E-06	HEPA FILTER K1-3-1 PLUGS, DUE TO PARTICULATES
66 TFC-3-1L	1E-8 H		168	H	4	1.68E-06	HEPA FILTER K1-3-1 LEAKS OR RUPTURES
67 TFC-3-2E	1E-8 H		168	H	4	1.68E-06	HEPA FILTER K1-3-2 PLUGS, DUE TO PARTICULATES
68 TFC-3-2L	1E-8 H		168	H	4	1.68E-06	HEPA FILTER K1-3-2 LEAKS OR RUPTURES
69 TFLVENTP			1.0			1.00E+00	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM
70 TGB-4-1F	3E-1		1			1.300E-01	DIESEL GENERATOR FOR EXHAUST FANS P-23 & P-28 FAILS TO START
71 THA-2-14	1E-6 H		168	H	4	1.68E-04	STEAM HEATER K1-2-1 LEAKS FROM THE TUBES

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NAME	RATE	U	FACTOR	U	C	PROB	DESC
72 THOUSE1			.01			1.00E-02	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL
73 THOUSE2			.1			1.00E-01	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CAM
74 TOACAM1T	1E-3		1	1		1.00E-03	HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW
75 TOAN2COQ	1E-3		1	1		1.00E-03	HUMAN OPERATOR FAILS TO FILL NITROGEN BOTTLE (VIDEO CAMERA PURGE SYSTEM)
76 TOAP-28Q	1E-3		1	1		1.00E-03	HUMAN OPERATOR FAILS TO START BACKUP FAN P-28
77 TOAPS-1T	1E-2		1	1		1.00E-02	HUMAN OPERATOR MISCALIBRATES PRESSURE SWITCH (VIDEO CAMERA PURGE SYSTEM)
78 TOAT1-2Q	1E-3		1	1		1.00E-03	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE LOW TI-1-2 READING
79 TOATRANQ	1E-3		1	1		1.00E-03	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK TO ACTIVATE BACKUP POWER SOURCE
80 TOAUCV1U	1E-2		1	1		1.00E-02	HUMAN OPERATOR FTRCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VALVE
81 TPAAMMOL	6E-5 H		2400 H	5		6.87E-02	AMMONIA BUBBLER PIP-ING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP
82 TPALAKL	1E-8 H		6.57E+5 H	5		3.28E-03	VIDEO CAMERA PURGE PIPING LEAKS (PER FOOT OF < 3" PIPE)
83 TPATELEL	6E-5 H		2400 H	5		6.87E-02	TELEDYNE H2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP
84 TPDVACL	1E-6 H		2400 H	5		1.20E-03	AMMONIA BUBBLER VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABINET
85 TPDTVACL	1E-6 H		2400 H	5		1.20E-03	TELEDYNE H2 SAMPLING SYSTEM VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABIN
86 TRAKP11H	4E-7 H		168 H	4		6.72E-05	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN
87 TRAORLYH	4E-7 H		168 H	4		6.72E-05	OVERLOAD RELAY ONLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN
88 TSA-3-1L	7E-6 H		2400 H	5		8.35E-03	HEPA FILTER K1-3-1 FAILS TO FILTER DUE TO SEAL FAILURE
89 TSA-3-2L	7E-6 H		2400 H	5		8.35E-03	HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE
90 TSIPS-11	3E-5		1 N	1		3.00E-05	PS FAILS TO OPEN WHEN REQUIRED (VIDEO CAMERA PURGE SYSTEM)
91 TSJ-1-13	1E-6 H		168 H	4		1.68E-04	TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOSSES
92 TVB-1-1P	1E-5 H		168 H	4		1.68E-03	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER
93 TVBPR-1C	3E-6 H		720 H	5		1.08E-03	FLOW CONTROL (SELF-REGULATING) VALVE PR-1 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM)
94 TVBPR-2C	3E-6 H		720 H	5		1.08E-03	FLOW CONTROL (SELF-REGULATING) VALVE PR-2 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM)
95 TVD4501C	2E-7 H		168 H	4		3.36E-05	HAND OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.O., FTRO
96 TVD4501D	0		0			0.00E+00	HAND OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.T., FTRO
97 TVD4501S	1E-2		1E-2			1.00E-02	MANUAL VALVE 4501 FROM TANK 101-SY ERRONEOUSLY LEFT CLOSED
98 TVD4502D	9E-8 H		168 H	4		1.51E-05	HAND OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTRO
99 TVD4503D	9E-8 H		168 H	4		1.51E-05	HAND OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRO
100 TVDAMMOL	2E-8 H		2400 H	5		2.40E-05	EITHER OF (2) DOWN-STREAM VALVES IN THE AMMONIA BUBBLER CABINET LEAK
101 TVDSY-1B	3E-4		1	1		3.00E-04	HAND OPERATED (MANUAL) VALVE MV-K1-SY-1 TO P-23 FAN N.O., FTCD
102 TVDSY-1C	2E-7 H		168 H	4		3.36E-05	HAND OPERATED (MANUAL) VALVE MV-K1-SY-1 TO P-23 FAN N.O., FTRO
103 TVDSY-1S			1E-2			1.00E-02	HAND OPERATED (MANUAL) VALVE MV-K1-SY-1 TO P-23 FAN ERRONEOUSLY CLOSED
104 TVDSY-2A	3E-4		1	1		3.00E-04	HAND OPERATED (MANUAL) VALVE MV-K1-SY-2 TO P-28 FAN N.C., FTOD
105 TVDSY-2S			1E-2			1.00E-02	HAND OPERATED (MANUAL) VALVE MV-K1-SY-2 TO P-28 FAN ERRONEOUSLY LEFT CLOSED
106 TVDUCV1C	2E-7 H		168 H	4		3.36E-05	HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO

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BASIC EVENT AND TYPE CODE REPORT FOR SYC5D

NAME	RATE	U	FACTOR	U	C	PROB	DESC
1 B1153A			0.00001			1.00E-05	ELECTROSTATIC SPARKS FROM LESS THAN SUFFICIENT BONDING/GROUNDING OF TANK RISERS
2 B1153C			0.01			1.00E-02	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)
3 B1155A			0.00001			1.00E-05	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE
4 B1156A	5E-8 H		4380	H	5	1.09E-04	ELECTRICAL SPARKS FROM FIC LEVEL PROBE
5 B1156C	5E-7 H		24	H	5	6.00E-06	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE
6 B1156H	1E-8 H		24	H	5	1.20E-07	ELECTRICAL SPARKS FROM THERMOCOUPLES
7 B1178			1.0			1.00E+00	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO2 IN THE PUMP PIT
8 B1179A			5E-4			5.00E-04	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103SY PUMP PIT
9 B1179B			0.0			0.00E+00	ELECTRICAL SPARK FROM PUMP P-103-1 IN THE 103SY PUMP PIT
10 B1180A			1.0			1.00E+00	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYSTEM
11 BVDP28ZA	3E-4 H		1	1		3.00E-04	MANUAL VALVE P28Z FROM P28 EXHAUSTER N.C. FTOD
12 BVDP28ZS	1E-2 H		1	1		1.00E-02	MANUAL VALVE P28Z FROM P28 EXHAUSTER FRRRONOUSLY LEFT CLOSED
13 IE-103			2	Y		2.00E+00	BURPS PER YEAR IN 103-SY
14 PWR2	1E-5 H		2.8	H	3	2.80E-05	LOSS OF POWER TO SY TANK FARM FROM MAIN POWER SOURCE (MCC)
15 PWR3	3E-6 H		24	H	4	7.20E-05	LOSS OF 120 V POWER TO P-23 CAM CAUSES P-23 EXHAUST FAN TO SHUTDOWN
16 ST1	1E-8 H		1.68E+4	H	4	1.68E-04	STEAM LINE TO HEATER RUPTURES
17 ST2	2E-6 H		24	H	4	4.80E-05	LOSS OF STEAM FROM POWER PLANT FACILITY
18 T1153B	6E-9 H		0.1	H	3	6.00E-10	ELECTROSTATIC SPARKS CAUSED BY LIGHTNING STRIKE; FAILS VENTILATION AND IGNITES
19 T1157J	4E-9 H		1.0	H	4	4.00E-09	BURNING GASOLINE SPILLS INTO TANK, FAILS VENT & IGNITES LEAKING H2
20 T1157K	4E-7 H		1.0	H	4	4.00E-07	RANGE FIRE PRODUCES SPARKS THAT FAIL VENT AND IGNITE LEAKING H2
21 T1182-1A	1E-6 H		2.8	H	3	2.80E-06	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-1 VACUUM PUMP (BEARI
22 T1182-1B	1E-6 H		2.8	H	3	2.80E-06	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-1 VACUUM PUMP (BEARI
23 T1182-1C	3E-5 H		4380	H	5	6.29E-02	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)
24 T1182-1D	3E-5 H		4380	H	5	6.29E-02	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)
25 T1182-3A	6E-5 H		4380	H	5	1.21E-01	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS
26 T1182-3C	1E-6 H		4380	H	5	2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP
27 T1182-3D	1E-6 H		4380	H	5	2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP
28 T1182-4A			1.0			1.00E+00	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)
29 T1182A	3E-7 H		4	H	4	1.20E-06	FAILURE OF PRESSURE SWITCH K1-PS-1-1 FAILS VENTILATION AND CREATES SPARKS
30 T1182B	3E-7 H		4380	H	5	6.57E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYSTEM)
31 T1182C	3E-7 H		4380	H	5	6.57E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYSTEM)
32 T1182D	1E-7 H		12	H	4	1.20E-06	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM RADIATION DET GM TUBE RM-EXH-K
33 T1183	1E-6 H		4380	H	5	2.19E-03	IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM
34 T1183A	1E-5 H		0.1	H	3	1.00E-06	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF K1-4-1 (P-23) FAN (IN VENTILATIO
35 T1183D			0.0001			1.00E-04	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAILURE
36 T1184A	1E-6 H		4380	H	5	2.19E-03	ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING
37 TATMOSPH	4E-9 H		0.1	H	3	4.00E-10	ATMOSPHERIC CONDIT- TIONS (TORNADO) THAT PRODUCE NEGATIVE PRESSURE <- 6 IN WG
38 TCHCAM13	2E-5 H		12	H	4	2.40E-04	CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS
39 TDC-1-1E	1E-5 H		168	H	4	1.68E-03	DEENTRAINER K1-1-1 PLUGS
40 TDC-1-1P	1E-6 H		168	H	4	1.68E-04	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH
41 TDFK1VTC	3E-7 H		168	H	4	5.04E-05	MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN NEPAS N.O., FTRO
42 TFAK1-4G	3E-5 H		168	H	4	5.01E-03	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS], NO S
43 TFAP-28F	5E-3		1	1		5.00E-03	BACKUP EXHAUST FAN P-28 FAILS TO START
44 TFAP-28G	3E-5 H		168	H	3	5.03E-03	P-28 FAILS TO CONTINUE RUNNING
45 TFB-5-1E	1E-5 H		168	H	4	1.68E-03	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES
46 TFC-3-1E	1E-8 H		168	H	4	1.68E-06	HEPA FILTER K1-3-1 PLUGS, DUE TO PARTICULATES
47 TFC-3-1L	1E-8 H		168	H	4	1.68E-06	HEPA FILTER K1-3-1 LEAKS OR RUPTURES
48 TFC-3-2E	1E-8 H		168	H	4	1.68E-06	HEPA FILTER K1-3-2 PLUGS, DUE TO PARTICULATES
49 TFC-3-2L	1E-8 H		168	H	4	1.68E-06	HEPA FILTER K1-3-2 LEAKS OR RUPTURES
50 TFLVENTP			1.0			1.00E+00	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM
51 TGB-4-1F	3E-1		1	1		3.00E-01	DIESEL GENERATOR FOR EXHAUST FANS P-23 & P-28 FAILS TO START
52 THA-2-14	1E-6 H		168	H	4	1.68E-04	STEAM HEATER K1-2-1 LEAKS FROM THE TUBES
53 THOUSE1			.01			1.00E-02	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL
54 THOUSE2			.1			1.00E-01	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CAM
55 TOACAM1T	1E-3		1	1		1.00E-03	HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW
56 TOAP-28Q	1E-3		1	1		1.00E-03	HUMAN OPERATOR FAILS TO START BACKUP FAN P-28
57 TOAT1-2Q	1E-3		1	1		1.00E-03	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE LOW T1-1-2 READING
58 TOATRANG	1E-3		1	1		1.00E-03	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK TO ACTIVATE BACKUP POWER SOURCE
59 TOAUCV1U	1E-2		1	1		1.00E-02	HUMAN OPERATOR FTRTCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VALVE
60 TRAKP11H	4E-7 H		168	H	4	6.72E-05	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN
61 TRAORLYH	4E-7 H		168	H	4	6.72E-05	OVERLOAD RELAY ONLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN
62 TSA-3-1L	7E-6 H		4380	H	5	1.52E-02	HEPA FILTER K1-3-1 FAILS TO FILTER DUE TO SEAL FAILURE
63 TSA-3-2L	7E-6 H		4380	H	5	1.52E-02	HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE
64 TSJ-1-13	1E-6 H		168	H	4	1.68E-04	TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOSSES
65 TVB-1-1P	1E-5 H		168	H	4	1.68E-03	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER
66 TVD4501D	0		0			0.00E+00	HAND OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.T., FTTC
67 TVD4502D	9E-8 H		168	H	4	1.51E-05	HAND OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTTC
68 TVD4503C	2E-7 H		168	H	4	3.36E-05	HAND OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRO
69 TVD4503D	9E-8 H		168	H	4	1.51E-05	HAND OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTTC
70 TVD4503S	1E-2		1	1		1.00E-02	MANUAL VALVE 4503 FROM TANK 103-SY ERRONOUSLY LEFT CLOSED
71 TVDSY-18	3E-4 H		1	1		3.00E-04	MANUAL VALVE MV-K1-SY-1 N.O. FTCD

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	NAME	RATE	U	FACTOR	U C	PROB	DESC
72	TVDSY-1C	2E-7	H		168	H 4 3.36E-05	MANUAL VALVE MV-K1-SY-1 N.O. FTRO
73	TVDSY-1S	1E-2			1	1 1.00E-02	MANUAL VALVE MV-K1-SY-1 ERRONOUSLY LEFT CLOSED
74	TVDSY-1T	1E-2	H		1	1 1.00E-02	MANUAL VALVE MV-K1-SY-1 ERRONOUSLY LEFT OPEN
75	TVDSY-2A	3E-4	H		1	1 3.00E-04	MANUAL VALVE MV-K1-SY-2 TEED INTO SY MAIN VENT. HEADER N.C. FTOD
76	TVDSY-2S	1E-2	H		1	1 1.00E-02	MANUAL VALVE MV-K1-SY-2 TEED INTO SY MAIN VENT. HEADER ERRONOUSLY LEFT CLS
77	TVDUCV1C	2E-7	H		168	H 4 3.36E-05	HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO

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BASIC EVENT AND TYPE CODE REPORT FOR SYC9A

NAME	RATE	U	FACTOR	U C	PROB	DESC
1 IE-101			3.65 Y		3.65E+00	BURPS PER YEAR IN 101-SY
2 11153A			0.00001		1.00E-05	ELECTROSTATIC SPARKS FROM LESS THAN SUFFICIENT BONDING/GROUNDING OF TANK RISERS
3 11155A			0.0001		1.00E-04	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE
4 11155B			0.0001		1.00E-04	MECHANICAL SPARKS FROM SLUDGE WEIGHT/ CABLE STRIKING SAMPLING TUBES
5 11156A	5E-8 H		2400 H 5		6.00E-05	ELECTRICAL SPARKS FROM FIC LEVEL PROBE
6 11156B	8E-10 H		2400 H 5		9.60E-07	ELECTRICAL SPARKS FROM SLACK TAPE DETECTOR FAULT
7 11156C	5E-7 H		24 H 5		6.00E-06	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE
8 11156D	1E-6 H		720 H 5		3.60E-04	ELECTRICAL SPARKS FROM EXPLOSION PROOF LIGHT OR LIGHT LEAD FAULTS
9 11156F1	1E-6 H		720 H 5		3.60E-04	ELECTRICAL SPARKS FROM VIDEO CAMERA
10 11156G	1E-8 H		24 H 5		1.20E-07	ELECTRICAL SPARKS FROM RADAR GAUGE FAULT
11 11156H	1E-8 H		24 H 5		1.20E-07	ELECTRICAL SPARKS FROM THERMOCOUPLES
12 11160A			1.0		1.00E+00	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER
13 11160C			0.01		1.00E-02	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER
14 11161B2	2E-8 H		2400 H 5		2.40E-05	ELECTRICAL SPARK FROM FAULT IN TELEDYNE H2 ANALYZER
15 11161B3	1E-6 H		1.0 H 3		1.00E-06	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF TELEDYNE VACUUM PUMP (BEARINGS)
16 11161B4	3E-5 H		2400 H 5		3.52E-02	ELECTRICAL SPARK FROM THE TELEDYNE VACUUM PUMP FAILURE (SEAL & MOTOR)
17 11161B7A			1.0		1.00E+00	ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)
18 11162B3	1E-6 H		1.0 H 3		1.00E-06	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CRYOGENIC VACUUM PUMP (BEARINGS)
19 11162B4	3E-5 H		4.0 H 5		6.00E-05	ELECTRICAL SPARK FROM THE CRYOGENIC VACUUM PUMP FAILURE (SEAL & MOTOR)
20 11163B7A			1.0		1.00E+00	ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)
21 11163B7B	1E-6 H		1.0 H 3		1.00E-06	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF AMMONIA BUBBLER VACUUM PUMP (BEARINGS)
22 11163B7C	3E-5 H		8 H 5		1.20E-04	ELECTRICAL SPARK FROM THE AMMONIA BUBBLER VACUUM PUMP FAILURE (SEAL & MOTOR)
23 11170A	1E-8 H		2400 H 5		1.20E-05	ELECTRICAL SPARKS FROM VENT HEADER THERMOCOUPLE
24 11170B	1E-8 H		2400 H 5		1.20E-05	ELECTRICAL SPARKS FROM VENT HEADER RELATIVE HUMIDITY DEVICE
25 11171A	1E-6 H		168 H 5		8.40E-05	IGNITION SOURCE FROM P-28 FAN (FAN RUNNING)
26 11171B	3E-7 H		2400 H 5		3.60E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-1 ON THE P-28 EXHAUSTER
27 11171C	3E-7 H		2400 H 5		3.60E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-2 ON THE P-28 EXHAUSTER
28 11171D	3E-7 H		2400 H 5		3.60E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-4 ON THE P-28 EXHAUSTER
29 11171E	1E-6 H		2400 H 5		1.20E-03	ELECTROSTATIC SPARKS IN THE P-28 "ELEPHANT TRUNK" CONNECTION DUE TO FAILED BOND
30 11173A	5E-8 H		2400 H 5		6.00E-05	ELECTRICAL SPARK FROM FAULT IN THE (WHITTAKER) CHEMICAL CELL H2 ANALYZER
31 11173B	1E-6 H		1.0 H 3		1.00E-06	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CHEMICAL CELL VACUUM PUMP (BEARING)
32 11173C	5E-7 H		2400 H 5		6.00E-04	ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (SEAL & MOTOR)
33 11180A			1.0		1.00E+00	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYSTEM
34 11182-1A	1E-6 H		1.0 H 3		1.00E-06	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-1 VACUUM PUMP (BEARING)
35 11182-1B	1E-6 H		1.0 H 3		1.00E-06	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-2 VACUUM PUMP (BEARING)
36 11182-1C	3E-5 H		2400 H 5		3.52E-02	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)
37 11182-1D	3E-5 H		2400 H 5		3.52E-02	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)
38 11182-3A	6E-5 H		2400 H 5		6.87E-02	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS
39 11182-3C	1E-6 H		2400 H 5		1.20E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP
40 11182-3D	1E-6 H		2400 H 5		1.20E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP
41 11182-4A			1.0		1.00E+00	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)
42 11182B	3E-7 H		2400 H 5		3.60E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYSTEM)
43 11182C	3E-7 H		2400 H 5		3.60E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYSTEM)
44 11182D	1E-7 H		12 H 4		1.20E-06	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM RADIATION DET GM TUBE RM-EXH-K
45 11183	1E-6 H		2400 H 5		1.20E-03	IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM
46 11183A-1	1E-6 H		158 H 5		8.40E-05	IGNITION SOURCE FROM K1-4-1 FAN (IN P-23 VENTILATION SYSTEM) (FAN RUNNING)
47 11184A	1E-6 H		2400 H 5		1.20E-03	ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING
48 TCFIRELA	3E-4		1		3.00E-04	ELECTRICAL RELAY CONTACTS, IR, NORMALLY ENERGIZED., FTOD
49 TCFLO-XA	3E-4		1		3.00E-04	ELECTRICAL RELAY CONTACTS, LO-X, NORMALLY ENERGIZED., FTOD
50 TFLVENTP			0.01		1.00E-02	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM
51 TOAN2COQ	1E-3		1		1.00E-03	HUMAN OPERATOR FAILS TO FILL NITROGEN BOTTLE (VIDEO CAMERA PURGE SYSTEM)
52 TOAPS-1T	1E-2		1		1.00E-02	HUMAN OPERATOR MISCALIBRATES PRESSURE SWITCH (VIDEO CAMERA PURGE SYSTEM)
53 TPAAMMOL	6E-5 H		2400 H 5		6.87E-02	AMMONIA BUBBLER PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP
54 TPALEAKL	1E-8 H		6.57E+5 H 5		3.28E-03	VIDEO CAMERA PURGE PIPING LEAKS (PER FOOT OF < 3" PIPE)
55 TPATELEL	6E-5 H		2400 H 5		6.87E-02	TELEDYNE H2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP
56 TPDVAVCL	1E-6 H		2400 H 5		1.20E-03	AMMONIA BUBBLER VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABINET
57 TPDTVACL	1E-6 H		2400 H 5		1.20E-03	TELEDYNE H2 SAMPLING SYSTEM VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABIN
58 TSIPS-1I	3E-5		1		3.00E-05	PS FAILS TO OPEN WHEN REQUIRED (VIDEO CAMERA PURGE SYSTEM)
59 TVBPR-1C	3E-6 H		720 H 5		1.08E-03	FLOW CONTROL (SELF-REGULATING) VALVE PR-1 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM)
60 TVBPR-2C	3E-6 H		720 H 5		1.08E-03	FLOW CONTROL (SELF-REGULATING) VALVE PR-2 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM)
61 TVDAMMOL	2E-8 H		2400 H 5		2.40E-05	EITHER OF (2) DOWN-STREAM VALVES IN THE AMMONIA BUBBLER CABINET LEAK

BASIC EVENT AND TYPE CODE REPORT FOR SYC9B

NAME	RATE	U	FACTOR	U C	PROB	DESC
1 IE-101			3.65 Y		3.65E+00	BURPS PER YEAR IN 101-SY
2 N422A					0.00E+00	FILTERS P28-1/P28-2 ARE PLUGGED DUE TO MOISTURE FROM AIR
3 N423			1.0		1.00E+00	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT
4 PWR2	1E-5 H	45 H 3			4.50E-04	LOSS OF POWER TO SY TANK FARM
5 PWR3	3E-6 H	24 H 4			7.20E-05	LOSS OF 120 V POWER TO P-23 CAM CAUSES P-23 EXHAUST FAN TO BE SHUTDOWN
6 PWR3-1	3E-6 H	24 H 4			7.20E-05	LOSS OF 120 V POWER TO P-28 CAM CAUSES P-28 EXHAUST FAN TO BE SHUTDOWN
7 SEASON			.17		1.70E-01	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATURE
8 ST1	1E-8 H	1.68E+4 H 4			1.68E-04	STEAM LINE TO HEATER RUPTURES
9 ST2	2E-6 H	24 H 4			4.80E-05	LOSS OF STEAM FROM POWER PLANT FACILITY
10 T1153A			0.00001		1.00E-05	ELECTROSTATIC SPARKS FROM LESS THAN SUFFICIENT BONDING/GROUNDING OF TANK RISERS
11 T1153B	6E-9 H	1.0 H 3			6.00E-09	ELECTROSTATIC SPARKS CAUSED BY LIGHTNING STRIKE; FAILS VENTILATION AND IGNITES
12 T1155A			0.0001		1.00E-04	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE
13 T1155B			0.0001		1.00E-04	MECHANICAL SPARKS FROM SLUDGE WEIGHT/ CABLE STRIKING SAMPLING TUBES
14 T1156A	5E-8 H	2400 H 5			6.00E-05	ELECTRICAL SPARKS FROM FIC LEVEL PROBE
15 T1156B	8E-10 H	2400 H 5			9.60E-07	ELECTRICAL SPARKS FROM SLACK TAPE DETECTOR FAULT
16 T1156C	5E-7 H	45 H 3			2.25E-05	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE
17 T1156D	1E-6 H	720 H 5			3.60E-04	ELECTRICAL SPARKS FROM EXPLOSION PROOF LIGHT OR LIGHT LEAD FAULTS
18 T1156F1	1E-6 H	720 H 5			3.60E-04	ELECTRICAL SPARKS FROM VIDEO CAMERA
19 T1156G	1E-8 H	45 H 3			4.50E-07	ELECTRICAL SPARKS FROM RADAR GAUGE FAULT
20 T1156H	1E-8 H	45 H 3			4.50E-07	ELECTRICAL SPARKS FROM THERMOCOUPLES
21 T1157J	4E-9 H	1.0 H 3			4.00E-09	BURNING GASOLINE SPILLS INTO TANK, FAILS VENT & IGNITES LEAKING H2
22 T1157K	4E-7 H	1.0 H 3			4.00E-07	RANGE FIRE PRODUCES SPARKS THAT FAIL VENT AND IGNITE LEAKING H2
23 T1160A			1.0		1.00E+00	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER
24 T1160C			0.01		1.00E-02	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER
25 T1161B2	2E-8 H	2400 H 5			2.40E-05	ELECTRICAL SPARK FROM FAULT IN TELEDYNE H2 ANALYZER
26 T1161B3	1E-6 H	45 H 3			4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF TELEDYNE VACUUM PUMP (BEARINGS)
27 T1161B4	3E-5 H	2400 H 5			3.52E-02	ELECTRICAL SPARK FROM THE TELEDYNE VACUUM PUMP FAILURE (SEAL & MOTOR)
28 T1161B7A			1.0		1.00E+00	ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)
29 T1162B3	1E-6 H	45 H 3			4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CRYOGENIC VACUUM PUMP (BEARINGS)
30 T1162B4	3E-5 H	45 H 3			1.35E-03	ELECTRICAL SPARK FROM THE CRYOGENIC VACUUM PUMP FAILURE (SEAL & MOTOR)
31 T1163B7A			1.0		1.00E+00	ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)
32 T1163B7B	1E-6 H	45 H 3			4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF AMMONIA BUBBLER VACUUM PUMP (BEARINGS)
33 T1163B7C	3E-5 H	45 H 3			1.35E-03	ELECTRICAL SPARK FROM THE AMMONIA BUBBLER VACUUM PUMP FAILURE (SEAL & MOTOR)
34 T1170A	1E-8 H	2400 H 5			1.20E-05	ELECTRICAL SPARKS FROM VENT HEADER THERMOCOUPLE
35 T1170B	1E-8 H	2400 H 5			1.20E-05	ELECTRICAL SPARKS FROM VENT HEADER RELATIVE HUMIDITY DEVICE
36 T1171A	1E-6 H	168 H 5			8.40E-05	IGNITION SOURCE FROM P-28 FAN (FAN RUNNING)
37 T1171B	3E-7 H	2400 H 5			3.60E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-1 ON THE P-28 EXHAUSTER
38 T1171C	3E-7 H	2400 H 5			3.60E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-2 ON THE P-28 EXHAUSTER
39 T1171D	3E-7 H	2400 H 5			3.60E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-4 ON THE P-28 EXHAUSTER
40 T1171E	1E-6 H	2400 H 5			1.20E-03	ELECTROSTATIC SPARKS IN THE P-28 "ELEPHANT TRUNK" CONNECTION DUE TO FAILED BOND
41 T1173A	5E-8 H	2400 H 5			6.00E-05	ELECTRICAL SPARK FROM FAULT IN THE (WHITTAKER) CHEMICAL CELL H2 ANALYZER
42 T1173B	1E-6 H	45 H 3			4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CHEMICAL CELL VACUUM PUMP (BEARING)
43 T1173C	5E-7 H	2400 H 5			6.00E-04	ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (SEAL & MOTOR)
44 T1176A	1E-7 H	45 H 3			4.50E-06	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF P-28 CAM BETA/GAMMA DETECTOR
45 T1176B	1E-8 H	45 H 3			4.50E-07	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF P-28 CAM ALPHA DETECTOR
46 T1176C	1E-6 H	45 H 3			4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF P-28 CAM VP-1 VACUUM PUMP (BEARINGS)
47 T1176D	3E-5 H	2400 H 5			3.52E-02	ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)
48 T1176E	1E-6 H	45 H 3			4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF P-28 CAM VP-2 VACUUM PUMP (BEARINGS)
49 T1176F	3E-5 H	2400 H 5			3.52E-02	ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)
50 T1176G	1E-6 H	45 H 3			4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF P-28 CAM VP-3 VACUUM PUMP (BEARINGS)
51 T1176H	3E-5 H	2400 H 5			3.52E-02	ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)
52 T1178-1A			1.0		1.00E+00	ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTOR)
53 T1178A	6E-5 H	2400 H 5			6.87E-02	P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS
54 T1178B	1E-6 H	2400 H 5			1.20E-03	P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-1 LEAKS ON OUTLET SIDE OF PUMP
55 T1178C	1E-6 H	2400 H 5			1.20E-03	P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-2 LEAKS ON OUTLET SIDE OF PUMP
56 T1178D	1E-6 H	2400 H 5			1.20E-03	P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-3 LEAKS ON OUTLET SIDE OF PUMP
57 T1180A			1.0		1.00E+00	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYSTEM
58 T1182-1A	1E-6 H	45 H 3			4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-1 VACUUM PUMP (BEARINGS)
59 T1182-1B	1E-6 H	45 H 3			4.50E-05	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-2 VACUUM PUMP (BEARINGS)
60 T1182-1C	3E-5 H	2400 H 5			3.52E-02	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)
61 T1182-1D	3E-5 H	2400 H 5			3.52E-02	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)
62 T1182-3A	6E-5 H	2400 H 5			6.87E-02	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS
63 T1182-3C	1E-6 H	2400 H 5			1.20E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP
64 T1182-3D	1E-6 H	2400 H 5			1.20E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP
65 T1182-4A			1.0		1.00E+00	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)
66 T1182A	3E-7 H	4 H 4			1.20E-06	FAILURE OF PRESSURE SWITCH K1-PS-1-1 FAILS VENTILATION AND CREATES SPARKS
67 T1182A-1	3E-7 H	4 H 4			1.20E-06	FAILURE OF PRESSURE SWITCH P28-PS-1 FAILS VENTILATION AND CREATES SPARKS
68 T1182A-2	3E-7 H	4 H 4			1.20E-06	FAILURE OF PRESSURE SWITCH P28-PS-2 FAILS VENTILATION AND CREATES SPARKS
69 T1182A-4	3E-7 H	4 H 4			1.20E-06	FAILURE OF PRESSURE SWITCH P28-PS-4 FAILS VENTILATION AND CREATES SPARKS
70 T1182B	3E-7 H	2400 H 5			3.60E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYSTEM)
71 T1182C	3E-7 H	2400 H 5			3.60E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYSTEM)

NAME	RATE	U	FACTOR	U C	PROB	DESC
72 T1182D	1E-7 H	45	H 3	4.50E-06	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM RADIATION DET GM TUBE RM-EXH-K	
73 T1183	1E-6 H	2400	H 5	1.20E-03	IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	
74 T1183A	1E-5 H	1.0	H 3	1.00E-05	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF K1-4-1 (P-23) FAN (IN VENTILATIO	
75 T1183A-2	1E-5 H	1.0	H 3	1.00E-05	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF P-28 FAN ON RISER 7B OF 101-SY	
76 T1183D		0.0001		1.00E-04	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAILURE	
77 T1184A	1E-6 H	2400	H 5	1.20E-03	ELECTROSTATIC SPARKS IN THE P-23 VENTILA-TION DUCTWORK DUE TO FAILED BONDING	
78 TATMOSPH	4E-9 H	1.0	H 3	4.00E-09	ATMOSPHERIC CONDI- TIONS (TORNADO) THAT PRODUCE NEGATIVE PRESSURE <- 6 IN WG	
79 TCFIRELA	3E-4	1	1	3.00E-04	ELECTRICAL RELAY CONTACTS, IR, NORMALLY ENERGIZED., FTOD	
80 TCFLO-XA	3E-4	1	1	3.00E-04	ELECTRICAL RELAY CONTACTS, LO-X, NORMALLY ENERGIZED., FTOD	
81 TCHCAM13	2E-5 H	12	H 4	2.40E-04	CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	
82 TCHCAM33	2E-5 H	12	H 4	2.40E-04	CONTINUOUS AIR MONITOR (CAM) CAM3 (P28) SPURIOUSLY ALARMS	
83 TDC-1-1E	1E-5 H	168	H 4	1.68E-03	DEENTRAINER K1-1-1 PLUGS	
84 TDC-1-1P	1E-6 H	168	H 4	1.68E-04	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	
85 TDCP281E	1E-5 H	168	H 4	1.68E-03	DEENTRAINER P28-1 PLUGS	
86 TDCP281P	1E-6 H	168	H 4	1.68E-04	DEENTRAINER P28-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	
87 TDFK1VTC	3E-7 H	168	H 4	5.04E-05	MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	
88 TFAK1-4G	3E-5 H	168	H 4	5.01E-03	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS], NO S	
89 TFAP-28F	5E-3	1	1	5.00E-03	BACKUP EXHAUST FAN P-28 FAILS TO START	
90 TFAP-28G	3E-5 H	168	H 3	5.03E-03	P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	
91 TFB-5-1E	1E-5 H	168	H 4	1.68E-03	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	
92 TFC-3-1E	1E-8 H	168	H 4	1.68E-06	HEPA FILTER K1-3-1 PLUGS, DUE TO PARTICULATES	
93 TFC-3-1L	1E-8 H	168	H 4	1.68E-06	HEPA FILTER K1-3-1 LEAKS OR RUPTURES	
94 TFC-3-2E	1E-8 H	168	H 4	1.68E-06	HEPA FILTER K1-3-2 PLUGS, DUE TO PARTICULATES	
95 TFC-3-2L	1E-8 H	168	H 4	1.68E-06	HEPA FILTER K1-3-2 LEAKS OR RUPTURES	
96 TFCP281E	1E-8 H	168	H 4	1.68E-06	HEPA FILTER P28-1 PLUGS, DUE TO PARTICULATES	
97 TFCP281L	1E-8 H	168	H 4	1.68E-06	HEPA FILTER P28-1 LEAKS OR RUPTURES	
98 TFCP282E	1E-8 H	168	H 4	1.68E-06	HEPA FILTER P28-2 PLUGS, DUE TO PARTICULATES	
99 TFCP282L	1E-8 H	168	H 4	1.68E-06	HEPA FILTER P28-2 LEAKS OR RUPTURES	
100 TFLVENTP		1.0		1.00E+00	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	
101 TGB-4-1F	3E-1	1	1	3.00E-01	DIESEL GENERATOR FOR EXHAUST FANS P-23 & P-28 FAILS TO START	
102 THA-2-14	1E-6 H	168	H 4	1.68E-04	STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	
103 THOUSE1		.01		1.00E-02	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL	
104 THOUSE2		.1		1.00E-01	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CAM	
105 TOACAM1T	1E-3	1	1	1.00E-03	HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	
106 TOACAM3T	1E-3	1	1	1.00E-03	HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW (P28)	
107 TOAN2CQO	1E-3	1	1	1.00E-03	HUMAN OPERATOR FAILS TO FILL NITROGEN BOTTLE (VIDEO CAMERA PURGE SYSTEM)	
108 TOAP-28Q	1E-3	1	1	1.00E-03	HUMAN OPERATOR FAILS TO START BACKUP FAN P-28	
109 TOAPS-1T	1E-2	1	1	1.00E-02	HUMAN OPERATOR MISCALIBRATES PRESSURE SWITCH (VIDEO CAMERA PURGE SYSTEM)	
110 TOAT1-2Q	1E-3	1	1	1.00E-03	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE LOW T1-1-2 READING	
111 TOATRANQ	1E-3	1	1	1.00E-03	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK TO ACTIVATE BACKUP POWER SOURCE	
112 TOAUCV1U	1E-2	1	1	1.00E-02	HUMAN OPERATOR FTRTCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VALVE	
113 TP28STKE	1E-10 H	24	H 4	2.40E-09	P28 EXHAUST STACK PLUGS	
114 TPAAHML	6E-5 H	2400	H 5	6.87E-02	AMMONIA BUBBLER PIP-ING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	
115 TPALAKL	1E-8 H	6.57E+5	H 5	3.28E-03	VIDEO CAMERA PURGE PIPING LEAKS (PER FOOT OF < 3" PIPE)	
116 TPATELEL	6E-5 H	2400	H 5	6.87E-02	TELEDYNE H2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	
117 TPDAVACL	1E-6 H	2400	H 5	1.20E-03	AMMONIA BUBBLER VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABINET	
118 TPDVACL	1E-6 H	2400	H 5	1.20E-03	TELEDYNE H2 SAMPLING SYSTEM VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABIN	
119 TRAKP11H	4E-7 H	168	H 4	6.72E-05	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN	
120 TRAORLYH	4E-7 H	168	H 4	6.72E-05	OVERLOAD RELAY ONLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN	
121 TRAP-28H	4E-7 H	168	H 4	6.72E-05	OVERLOAD RELAY P-28 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN	
122 TRAP281H	4E-7 H	168	H 4	6.72E-05	RELAY P28-KP-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN	
123 TRAP282H	4E-7 H	168	H 4	6.72E-05	RELAY P28-KP-2 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN	
124 TRAP284H	4E-7 H	168	H 4	6.72E-05	RELAY P28-KP-4 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN	
125 TSA-3-1L	7E-6 H	2400	H 5	8.35E-03	HEPA FILTER K1-3-1 FAILS TO FILTER DUE TO SEAL FAILURE	
126 TSA-3-2L	7E-6 H	2400	H 5	8.35E-03	HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	
127 TSAP281L	7E-6 H	2400	H 5	8.35E-03	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	
128 TSAP282L	7E-6 H	2400	H 5	8.35E-03	HEPA FILTER P28-2 FAILS TO FILTER DUE TO SEAL FAILURE	
129 TSIPS-1I	3E-5	1	1	3.00E-05	PS FAILS TO OPEN WHEN REQUIRED (VIDEO CAMERA PURGE SYSTEM)	
130 TSJ-1-13	1E-6 H	168	H 4	1.68E-04	TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOSES	
131 TVB-1-1P	1E-5 H	168	H 4	1.68E-03	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	
132 TVBPR-1C	3E-6 H	720	H 5	1.08E-03	FLOW CONTROL (SELF-REGULATING) VALVE PR-1 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM	
133 TVBPR-2C	3E-6 H	720	H 5	1.08E-03	FLOW CONTROL (SELF-REGULATING) VALVE PR-2 N.T., FTRO (VIDEO CAMERA PURGE SYSTEM	
134 TVD4501C	2E-7 H	168	H 4	3.36E-05	HAND OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.O., FTRO	
135 TVD4501D	0	0		0.00E+00	HAND OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.O., FTRO	
136 TVD4501S	1E-2	1E-2		1.00E-02	MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED	
137 TVD4502D	9E-8 H	168	H 4	1.51E-05	HAND OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTRO	
138 TVD4503D	9E-8 H	168	H 4	1.51E-05	HAND OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRO	
139 TVDAMMOL	2E-8 H	2400	H 5	2.40E-05	EITHER OF (2) DOWN-STREAM VALVES IN THE AMMONIA BUBBLER CABINET LEAK	
140 TVDP282C	2E-7 H	168	H 4	3.36E-05	HAND OPERATED (MANUAL) INLET VALVE TO P28 EXHAUSTER N.O., FTRO	
141 TVDUCV1C	2E-7 H	168	H 4	3.36E-05	HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	

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BASIC EVENT AND TYPE CODE REPORT FOR SYNC9D

NAME	RATE	U	FACTOR	U C	PROB	DESC
1 B1153A			0.00001		1.00E-05	ELECTROSTATIC SPARKS FROM LESS THAN SUFFICIENT BONDING/GROUNDING OF TANK RISERS
2 B1153C			.01		1.00E-02	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)
3 B1155A			0.00001		1.00E-05	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAILURE
4 B1156A	5E-8 H		4380 H 5		1.09E-04	ELECTRICAL SPARKS FROM FIC LEVEL PROBE
5 B1156C	5E-7 H		24 H 5		6.00E-06	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE
6 B1156H	1E-8 H		24 H 5		1.20E-07	ELECTRICAL SPARKS FROM THERMOCOUPLES
7 B1178			1.0		1.00E+00	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO2 IN THE PUMP PIT
8 B1179A			5E-4		5.00E-04	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103SY PUMP PIT
9 B1179B			0.0		0.00E+00	ELECTRICAL SPARK FROM PUMP P-103-1 IN THE 103SY PUMP PIT
10 B1180A			1.0		1.00E+00	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYSTEM
11 IE-103			2 Y		2.00E+00	BURPS PER YEAR IN 103-SY
12 N423			1.0		1.00E+00	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT
13 PWR2	1E-5 H		45 H 3		4.50E-04	LOSS OF POWER TO SY TANK FARM
14 PWR3	3E-6 H		24 H 4		7.20E-05	LOSS OF 120 V POWER TO P-23 CAM CAUSES P-23 EXHAUST FAN TO BE SHUTDOWN
15 PWR3-1	3E-6 H		24 H 4		7.20E-05	LOSS OF 120 V POWER TO P-28 CAM CAUSES P-28 EXHAUST FAN TO BE SHUTDOWN
16 SEASON			.17		1.70E-01	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATURE
17 ST1	1E-8 H		1.68E+4 H 4		1.68E-04	STEAM LINE TO HEATER RUPTURES
18 ST2	2E-6 H		24 H 4		4.80E-05	LOSS OF STEAM FROM POWER PLANT FACILITY
19 T1153B	6E-9 H		0.1 H 3		6.00E-10	ELECTROSTATIC SPARKS CAUSED BY LIGHTNING STRIKE; FAILS VENTILATION AND IGNITES
20 T1157J	4E-9 H		1.0 H 4		4.00E-09	BURNING GASOLINE SPILLS INTO TANK, FAILS VENT & IGNITES LEAKING H2
21 T1157K	4E-7 H		1.0 H 4		4.00E-07	RANGE FIRE PRODUCES SPARKS THAT FAIL VENT AND IGNITE LEAKING H2
22 T1182-1A	1E-6 H		2.8 H 3		2.80E-06	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-1 VACUUM PUMP (BEAR1
23 T1182-1B	1E-6 H		2.8 H 3		2.80E-06	IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CAM VP-EXH-K1-2 VACUUM PUMP (BEAR1
24 T1182-1C	3E-5 H		4380 H 5		6.29E-02	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)
25 T1182-1D	3E-5 H		4380 H 5		6.29E-02	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)
26 T1182-3A	6E-5 H		4380 H 5		1.21E-01	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS
27 T1182-3C	1E-6 H		4380 H 5		2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP
28 T1182-3D	1E-6 H		4380 H 5		2.19E-03	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP
29 T1182-4A			1.0		1.00E+00	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)
30 T1182A	3E-7 H		8 H 4		2.40E-06	FAILURE OF PRESSURE SWITCH K1-PS-1-1 FAILS VENTILATION AND CREATES SPARKS
31 T1182A-1	3E-7 H		8 H 4		2.40E-06	FAILURE OF PRESSURE SWITCH P28-PS-1 FAILS VENTILATION AND CREATES SPARKS
32 T1182A-2	3E-7 H		8 H 4		2.40E-06	FAILURE OF PRESSURE SWITCH P28-PS-2 FAILS VENTILATION AND CREATES SPARKS
33 T1182A-4	3E-7 H		8 H 4		2.40E-06	FAILURE OF PRESSURE SWITCH P28-PS-4 FAILS VENTILATION AND CREATES SPARKS
34 T1182B	3E-7 H		4380 H 5		6.57E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYSTEM)
35 T1182C	3E-7 H		4380 H 5		6.57E-04	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYSTEM)
36 T1182D	1E-7 H		12 H 4		1.20E-06	ELECTRICAL SPARKS FROM STRUCTURAL FAILURE OF CAM RADIATION DET GM TUBE RM-EXH-K
37 T1183	1E-6 H		2400 H 5		1.20E-03	IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM
38 T1183A	1E-5 H		0.1 H 3		1.00E-06	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF K1-4-1 (P-23) FAN (IN VENTILATIO
39 T1183A-2	1E-5 H		0.1 H 3		1.00E-06	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF P-28 FAN ON RISER 7B OF 101-SY
40 T1183D			0.0001		1.00E-04	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAILURE
41 T1184A	1E-6 H		4380 H 5		2.19E-03	ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING
42 TATMOSPH	4E-9 H		1.0 H 3		4.00E-09	ATMOSPHERIC CONDITIONS (TORNADO) THAT PRODUCE NEGATIVE PRESSURE <- 6 IN WG
43 TCHCAM13	2E-5 H		12 H 4		2.40E-04	CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS
44 TCHCAM33	2E-5 H		12 H 4		2.40E-04	CONTINUOUS AIR MONITOR (CAM) CAM3 (P28) SPURIOUSLY ALARMS
45 TDC-1-1E	1E-5 H		168 H 4		1.68E-03	DEENTRAINER K1-1-1 PLUGS
46 TDC-1-1P	1E-6 H		168 H 4		1.68E-04	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH
47 TDCP281E	1E-5 H		168 H 4		1.68E-03	DEENTRAINER P28-1 PLUGS
48 TDCP281P	1E-6 H		168 H 4		1.68E-04	DEENTRAINER P28-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH
49 TDFK1VTC	3E-7 H		168 H 4		5.04E-05	MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO
50 TFAK1-4G	3E-5 H		168 H 4		5.01E-03	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS], NO S
51 TFAP-28G	3E-5 H		168 H 3		5.03E-03	P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)
52 TFB-5-1E	1E-5 H		168 H 4		1.68E-03	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES
53 TFC-3-1E	1E-8 H		168 H 4		1.68E-06	HEPA FILTER K1-3-1 PLUGS, DUE TO PARTICULATES
54 TFC-3-1L	1E-8 H		168 H 4		1.68E-06	HEPA FILTER K1-3-1 LEAKS OR RUPTURES
55 TFC-3-2E	1E-8 H		168 H 4		1.68E-06	HEPA FILTER K1-3-2 PLUGS, DUE TO PARTICULATES
56 TFC-3-2L	1E-8 H		168 H 4		1.68E-06	HEPA FILTER K1-3-2 LEAKS OR RUPTURES
57 TFPCP281E	1E-8 H		168 H 4		1.68E-06	HEPA FILTER P28-1 PLUGS, DUE TO PARTICULATES
58 TFPCP281L	1E-8 H		168 H 4		1.68E-06	HEPA FILTER P28-1 LEAKS OR RUPTURES
59 TFPCP282E	1E-8 H		168 H 4		1.68E-06	HEPA FILTER P28-2 PLUGS, DUE TO PARTICULATES
60 TFPCP282L	1E-8 H		168 H 4		1.68E-06	HEPA FILTER P28-2 LEAKS OR RUPTURES
61 TFLVENTP			1.0		1.00E+00	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM
62 TGB-4-1F	3E-1		1		3.00E-01	DIESEL GENERATOR FOR EXHAUST FANS P-23 & P-28 FAILS TO START
63 THA-2-14	1E-6 H		168 H 4		1.68E-04	STEAM HEATER K1-2-1 LEAKS FROM THE TUBES
64 THOUSE1			.01		1.00E-02	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL
65 THOUSE2			.1		1.00E-01	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CAM
66 TOACAN1T	1E-3		1		1.00E-03	HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW
67 TOACAM3T	1E-3		1		1.00E-03	HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW (P28)
68 TOAT1-2Q	1E-3		1		1.00E-03	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE LOW TI-1-2 READING
69 TOATRANQ	1E-3		1		1.00E-03	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK TO ACTIVATE BACKUP POWER SOURCE
70 TOAUCV1U	1E-2		1		1.00E-02	HUMAN OPERATOR FTRTCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VALVE
71 TP28STKE	1E-10 H		24 H 4		2.40E-09	P28 EXHAUST STACK PLUGS

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NAME	RATE	U	FACTOR	U	C	PROB	DESC
72 TRAKP11H	4E-7	H	168	H	4	6.72E-05	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN
73 TRAORLYH	4E-7	H	168	H	4	6.72E-05	OVERLOAD RELAY ONLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN
74 TRAP-28H	4E-7	H	168	H	4	6.72E-05	OVERLOAD RELAY P-28 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN
75 TRAP281H	4E-7	H	168	H	4	6.72E-05	RELAY P28-KP-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN
76 TRAP282H	4E-7	H	168	H	4	6.72E-05	RELAY P28-KP-2 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN
77 TRAP284H	4E-7	H	168	H	4	6.72E-05	RELAY P28-KP-4 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROKEN
78 TSA-3-1L	7E-6	H	4380	H	5	1.52E-02	HEPA FILTER K1-3-1 FAILS TO FILTER DUE TO SEAL FAILURE
79 TSA-3-2L	7E-6	H	4380	H	5	1.52E-02	HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE
80 TSAP281L	7E-6	H	4380	H	5	1.52E-02	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE
81 TSAP282L	7E-6	H	4380	H	5	1.52E-02	HEPA FILTER P28-2 FAILS TO FILTER DUE TO SEAL FAILURE
82 TSJ-1-13	1E-6	H	168	H	4	1.68E-04	TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOSSES
83 TVB-1-1P	1E-5	H	168	H	4	1.68E-03	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER
84 TVD4501C	2E-7	H	168	H	4	3.36E-05	HAND OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.O., FTRO
85 TVD4501D	0		0			0.00E+00	HAND OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.T., FTRO
86 TVD4501S			1E-2			1.00E-02	MANUAL VALVE 4501 FROM TANK 101-SY ERRONEOUSLY LEFT CLOSED
87 TVD4502D	9E-8	H	168	H	4	1.51E-05	HAND OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTRO
88 TVD4503C	2E-7	H	168	H	4	3.36E-05	HAND OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.O., FTRO
89 TVD4503D	9E-8	H	168	H	4	1.51E-05	HAND OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRO
90 TVD4503S			1E-2			1.00E-02	MANUAL VALVE 4503 FROM TANK 103-SY ERRONEOUSLY LEFT CLOSED
91 TVDP282C	2E-7	H	168	H	4	3.36E-05	HAND OPERATED (MANUAL) INLET VALVE TO P28 EXHAUSTER N.O., FTRO
92 TVDUCV1C	2E-7	H	168	H	4	3.36E-05	HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO

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APPENDIX D

FAULT TREE MODELS

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Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone
IE-101	1	1	T1161B3	7	2	T1181	10	3			
SYC1A	1	2	T1161B3	7	5	T1182	10	2			
T1100A	1	2	T1161B4	6	2	T1182-1	10	1			
T1105	1	1	T1161B4	7	3	T1182-1A	10	1			
T1150	1	4	T1161B4	7	6	T1182-1B	10	1			
T1151	1	2	T1161B5	6	4	T1182-1C	10	2			
T1152	1	2	T1161B6	6	3	T1182-1D	10	2			
T1153	5	1	T1161B7	6	5	T1182-2	10	2			
T1153A	5	1	T1161B7A	6	5	T1182-2	11	2			
T1155	5	2	T1162	6	4	T1182-3	11	2			
T1155A	5	2	T1162	7	2	T1182-3A	11	1			
T1155B	5	3	T1162B1	7	2	T1182-3C	11	2			
T1156	1	2	T1162B3	7	1	T1182-3D	11	2			
T1156	2	4	T1162B4	7	2	T1182-4	11	3			
T1156A	2	1	T1163	6	5	T1182-4A	11	3			
T1156B	2	2	T1163	8	3	T1182B	3	3			
T1156C	2	3	T1163B1	8	2	T1182C	3	4			
T1156D	2	4	T1163B5	8	4	T1182D	10	1			
T1156F	2	5	T1163B6	8	3	T1183	10	3			
T1156F1	2	5	T1163B7	8	5	T1183A-1	3	3			
T1156F2	2	6	T1163B7A	8	5	T1184	3	4			
T1156F3	2	5	T1163B7B	8	1	T1184	10	4			
T1156F3	3	2	T1163B7C	8	2	T1184A	3	4			
T1156F4	2	6	T1164	6	6	TCFIRELA	4	4			
T1156F4	4	2	T1164	7	3	TCFLO-XA	4	3			
T1156F5	4	2	T1165	6	7	TFLVENTP	10	4			
T1156G	2	6	T1165	7	5	TOAN2COQ	3	2			
T1156H	2	7	T1170	1	5	TOAPS-1T	4	2			
T1157	1	3	T1170	9	2	TPAAMMOL	8	3			
T1157	5	2	T1170A	6	8	TPALEAKL	3	2			
T1160	1	4	T1170B	6	9	TPATELEL	6	3			
T1160A	1	4	T1172	9	2	TPDAVACL	8	4			
T1160B	1	4	T1173	9	2	TPDTVACL	6	4			
T1160B	6	6	T1173A	9	1	TSIPS-1I	4	1			
T1160C	1	5	T1173B	9	2	TVBPR-1C	3	1			
T1161	6	3	T1173C	9	2	TVBPR-2C	3	1			
T1161B1	6	2	T1180	1	6	TVDAMMOL	8	3			
T1161B2	6	1	T1180	10	2						
T1161B3	6	2	T1180A	10	1						
CASE 1-H2 EXP IN 101-SY WITH FAN RUNNING						SYC1A.CAF	6-04-92	Page 12			

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Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone
IE-101	1	1	PWR1	2	3	T1157	11	5	T1164	15	6
K100	1	2	PWR1	3	1	T1157	13	3	T1164	17	2
K100	2	2	PWR1	6	4	T1157J	6	1	T1165	15	7
K100A	2	1	PWR2	6	3	T1157J	13	1	T1165	17	4
K100A	3	2	PWR3	3	2	T1157K	6	2	T1170	10	3
K100B	2	3	SEASON	8	5	T1157K	13	2	T1170	11	8
K100C	2	2	ST1	8	1	T1160	11	5	T1170A	15	8
K100D	2	1	ST2	8	2	T1160	14	2	T1170B	15	9
K101	6	4	STEAM	8	2	T1160A	14	1	T1172	10	3
K110	1	2	SYC1B	1	2	T1160B	14	2	T1173	10	3
K110	7	4	T1100	1	2	T1160B	15	6	T1173A	10	2
K200	3	1	T1101	1	2	T1160C	14	2	T1173B	10	3
K200	4	3	T1105	1	1	T1161	15	3	T1173C	10	3
K250	3	1	T1125	1	2	T1161B1	15	2	T1180	11	7
K250	5	3	T1150	1	3	T1161B2	15	1	T1180	18	2
K251	5	4	T1150	11	6	T1161B3	15	2	T1180A	18	1
K275	2	4	T1151	11	4	T1161B3	17	1	T1181	18	3
K275	3	2	T1152	11	4	T1161B3	17	3	T1182	18	2
K275	6	2	T1153	13	3	T1161B4	15	2	T1182-1	18	1
K300	4	2	T1153A	13	2	T1161B4	17	2	T1182-1A	18	1
K310	4	1	T1153B	6	2	T1161B4	17	4	T1182-1B	18	1
K420	7	2	T1153B	13	3	T1161B5	15	4	T1182-1C	18	2
K422	8	4	T1155	13	5	T1161B6	15	3	T1182-1D	18	2
K422A	7	2	T1155A	13	5	T1161B7	15	5	T1182-2	18	2
K422A	7	4	T1155B	13	6	T1161B7A	15	5	T1182-2	19	2
K422A	8	4	T1156	11	4	T1162	14	3	T1182-3	19	2
K422A	9	3	T1156A	11	1	T1162	15	4	T1182-3A	19	1
K425	8	4	T1156B	11	2	T1162B1	14	3	T1182-3C	19	2
K426	8	4	T1156C	11	3	T1162B3	14	2	T1182-3D	19	2
K430	7	4	T1156D	11	4	T1162B4	14	3	T1182-4	19	3
K440	7	6	T1156F	11	5	T1163	15	5	T1182-4A	19	3
K440	9	2	T1156F1	11	5	T1163	16	3	T1182A	4	3
K441	9	2	T1156F2	11	6	T1163B1	16	2	T1182A	20	1
K442	9	2	T1156F2	12	3	T1163B5	16	4	T1182B	20	2
K60-	1	3	T1156F3	12	2	T1163B6	16	3	T1182C	20	2
K60-	10	2	T1156F4	12	5	T1163B7	16	5	T1182D	18	1
K700	5	2	T1156F5	12	4	T1163B7A	16	5	T1183	18	3
K701	5	1	T1156G	11	6	T1163B7B	16	1	T1183A	3	2
KTOP	1	2	T1156H	11	7	T1163B7C	16	2	T1183A	20	1

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Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone
T1183D	20	1	TRAKP11H	4	4						
T1184	18	4	TRAORLYH	3	2						
T1184	20	2	TSA-3-1L	9	3						
T1184A	20	2	TSA-3-2L	5	2						
TATMOSPH	4	2	TSIPS-1I	12	3						
TATMOSPH	11	7	TSJ-1-13	8	6						
TCFIRELA	12	6	TVB-1-1P	8	5						
TCFLO-XA	12	5	TVBPR-1C	12	1						
TCHCAM13	5	3	TVBPR-2C	12	1						
TDC-1-1E	7	1	TVD4501C	10	1						
TDC-1-1P	8	5	TVD4501D	4	1						
TDFK1VTC	7	5	TVD4501S	10	2						
TFAP-4G	3	1	TVD4502D	4	1						
TFAP-28F	2	2	TVD4503D	4	2						
TFAP-28G	2	2	TVDAMMOL	16	3						
TFB-5-1E	7	2	TVDUCV1C	8	3						
TFC-3-1E	7	4									
TFC-3-1L	9	2									
TFC-3-2E	9	1									
TFC-3-2L	5	1									
TFLVENTP	18	4									
TGB-4-1F	6	4									
THA-2-14	7	3									
THA-2-14	7	5									
THA-2-14	9	4									
THOUSE1	5	2									
THOUSE2	5	5									
TOACAM1T	5	4									
TOAN2COQ	12	2									
TOAP-28Q	2	1									
TOAPS-1T	12	4									
TOAT1-2Q	8	4									
TOATRANQ	6	4									
TOAUCV1U	8	3									
TPAAMMOL	16	3									
TPALEAKL	12	2									
TPATELEL	15	3									
TPDAVACL	16	4									
TPDTVACL	15	4									
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Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone
B1100A	1	2	T1182-3A	5	1						
B1105	1	1	T1182-3C	5	2						
B1150	1	4	T1182-3D	5	2						
B1151	1	2	T1182-4	5	3						
B1152	1	2	T1182-4A	5	3						
B1153	2	3	T1182B	3	3						
B1153A	2	3	T1182C	3	4						
B1153C	2	4	T1182D	4	1						
B1155	2	5	T1183	4	3						
B1155A	2	5	T1183A-1	3	3						
B1156	1	2	T1184	3	4						
B1156	2	2	T1184	4	4						
B1156A	2	1	T1184A	3	4						
B1156C	2	2	TFLVENTP	4	4						
B1156H	2	2									
B1157	1	3									
B1157	2	4									
B1170	1	4									
B1177	1	4									
B1178	1	4									
B1179	1	5									
B1179	3	2									
B1179A	3	1									
B1179B	3	2									
B1180	1	5									
B1180	4	2									
B1180A	4	1									
IE-103	1	1									
SYC1C	1	2									
T1181	4	3									
T1182	4	2									
T1182-1	4	1									
T1182-1A	4	1									
T1182-1B	4	1									
T1182-1C	4	2									
T1182-1D	4	2									
T1182-2	4	2									
T1182-2	5	2									
T1182-3	5	2									
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Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone
B1100	1	2	K110	1	2	SYC1D	1	2	TDFK1VTC	7	5
B1101	1	2	K110	7	4	T1153B	6	2	TFAP1-4G	3	1
B1105	1	1	K200	3	1	T1153B	10	4	TFAP-28F	2	2
B1125	1	2	K200	4	3	T1157J	6	1	TFAP-28G	2	2
B1150	1	3	K250	3	1	T1157J	11	3	TFB-5-1E	7	2
B1150	11	4	K250	5	3	T1157K	6	2	TFC-3-1E	7	4
B1151	11	3	K251	5	4	T1157K	11	3	TFC-3-1L	9	2
B1152	11	3	K275	2	4	T1181	13	3	TFC-3-2E	9	1
B1153	10	4	K275	3	2	T1182	13	2	TFC-3-2L	5	1
B1153	11	4	K275	6	2	T1182-1	13	1	TFLVENTP	13	4
B1153A	10	3	K300	4	2	T1182-1A	13	1	TGB-4-1F	6	4
B1153C	10	4	K310	4	1	T1182-1B	13	1	THA-2-14	7	3
B1155	10	5	K420	7	2	T1182-1C	13	2	THA-2-14	7	5
B1155	11	4	K422	8	4	T1182-1D	13	2	THA-2-14	9	4
B1155A	10	5	K422A	7	2	T1182-2	13	2	THOUSE1	5	2
B1156	11	2	K422A	7	4	T1182-2	14	2	THOUSE2	5	5
B1156A	11	1	K422A	8	4	T1182-3	14	2	TOACAM1T	5	4
B1156C	11	2	K422A	9	3	T1182-3A	14	1	TOAP-28Q	2	1
B1156H	11	2	K425	8	4	T1182-3C	14	2	TOAT1-2Q	8	4
B1157	11	4	K426	8	4	T1182-3D	14	2	TOATRANQ	6	4
B1170	11	4	K430	7	4	T1182-4	14	3	TOAUCV1U	8	3
B1170	12	2	K440	7	6	T1182-4A	14	3	TRAKP11H	4	4
B1177	12	2	K440	9	2	T1182A	4	3	TRAORLYH	3	2
B1178	12	1	K441	9	2	T1182A	15	1	TSA-3-1L	9	3
B1179	12	2	K442	9	2	T1182B	15	2	TSA-3-2L	5	2
B1179A	12	2	K60-	1	3	T1182C	15	2	TSJ-1-13	8	6
B1179B	12	3	K60-	10	2	T1182D	13	1	TVB-1-1P	8	5
B1180	11	6	K700	5	2	T1183	13	3	TVD4501D	4	1
B1180	13	2	K701	5	1	T1183A	3	2	TVD4502D	4	1
B1180A	13	1	KTOP	1	2	T1183A	15	1	TVD4503C	10	1
IE-103	1	1	PWR1	2	3	T1183D	15	1	TVD4503D	4	2
K100	1	2	PWR1	3	1	T1184	13	4	TVD4503S	10	2
K100	2	2	PWR1	6	4	T1184	15	2	TVDUCV1C	8	3
K100A	2	1	PWR2	6	3	T1184A	15	2			
K100A	3	2	PWR3	3	2	TATMOSPH	4	2			
K100B	2	3	SEASON	8	5	TATMOSPH	11	4			
K100C	2	2	ST1	8	1	TCHCAM13	5	3			
K100D	2	1	ST2	8	2	TDC-1-1E	7	1			
K101	6	4	STEAM	8	2	TDC-1-1P	8	5			
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Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone
B1100A	1	5	B1182-3	4	2						
B1105	1	5	B1182-3A	4	1						
B1105	5	1	B1182-3C	4	2						
B1150	1	4	B1182-3D	4	1						
B1151	1	3	B1182-3E	4	2						
B1152	1	3	B1182-4	4	3						
B1153	1	3	B1182-4A	4	3						
B1153	2	2	B1182A-A	5	2						
B1153A	2	1	B1182B-B	5	2						
B1153C	2	2	B1182C-C	5	2						
B1155	1	4	B1182D	3	1						
B1155	2	3	B1182E	3	1						
B1155A	2	3	B1183A-1	5	3						
B1156	1	2	B1184	3	3						
B1156A	1	1	B1184	5	2						
B1156C	1	2	B1184A	5	3						
B1156H	1	2	BFLVENTP	3	4						
B1157	1	4	IE-103	5	1						
B1170	1	5	SYC2C	1	5						
B1177	1	5									
B1178	1	5									
B1179	1	6									
B1179	2	4									
B1179A	2	4									
B1179B	2	5									
B1180	1	6									
B1180	3	2									
B1180A	3	1									
B1181	3	2									
B1182	3	2									
B1182-1	3	1									
B1182-1A	3	1									
B1182-1B	3	2									
B1182-1C	3	2									
B1182-1D	3	1									
B1182-1E	3	2									
B1182-1F	3	2									
B1182-2	3	2									
B1182-2	4	2									
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AIM

Association for Information and Image Management

1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910
301/587-8202

Centimeter

Inches

MANUFACTURED TO AIM STANDARDS
BY APPLIED IMAGE, INC.

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Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone
B1100	1	3	B1182-2	17	2	BOACAM2T	8	4	M422A	10	2
B1101	1	2	B1182-3	17	2	BRAKP11H	4	4	M422A	11	3
B1105	1	1	B1182-3A	17	1	BRAKP12H	3	4	M430	1	2
B1125	1	4	B1182-3C	17	2	BRAKP14H	5	3	M430	9	4
B1150	1	3	B1182-3D	17	1	BRAKP14H	6	6	M440	1	3
B1150	13	3	B1182-3E	17	2	BRAORLYH	2	2	M440	11	2
B1151	13	3	B1182-4	17	3	BSA-3-1L	6	4	M441	11	2
B1152	13	3	B1182-4A	17	3	BSA-3-1L	11	3	M442	11	2
B1153	13	5	B1182A	4	3	BSA-3-2L	8	2	M500	5	1
B1153	14	2	B1182A	18	1	BSTACKE	6	6	M60-	1	4
B1153A	14	1	B1182B	3	3	BVD450XC	12	1	M600	6	3
B1153C	14	2	B1182B	18	2	BVD450XS	12	2	M601	6	2
B1155	13	6	B1182C	5	2	BVDP29ZC	12	3	M602	6	4
B1155A	13	6	B1182C	6	5	BVDP29ZS	12	4	M70-	1	5
B1156	13	2	B1182C	18	2	IE-103	1	1	M70-	12	2
B1156A	13	1	B1182D	16	1	K101	7	2	M700	8	2
B1156C	13	2	B1182E	16	1	M100	1	1	M701	8	1
B1156H	13	2	B1183A	2	2	M100	2	2	M80-	1	6
B1157	13	5	B1183A	18	1	M1001	6	4	M80-	12	4
B1170	13	4	B1183D	18	1	M110	1	2	MTOP	1	4
B1170	15	2	B1184	16	3	M200	2	1	PWR1	2	2
B1177	15	2	B1184	18	2	M200	4	3	PWR1	7	2
B1178	15	1	B1184A	18	2	M201	2	1	PWR2	7	1
B1179	15	2	B275	2	2	M201	3	3	PWR3	3	5
B1179A	15	2	B275	9	2	M202	2	1	SEASON	10	1
B1179B	15	3	BCHCAM13	8	3	M202	5	2	SYC2D	1	3
B1180	13	5	BDC-1-1E	1	2	M203	2	1	T1153B	9	2
B1180	16	2	BDC-1-1P	10	3	M203	6	5	T1153B	14	2
B1180A	16	1	BFAK1-4G	2	2	M250	2	2	T1157J	9	1
B1181-3	16	2	BFC-3-1E	5	1	M250	8	3	T1157J	13	3
B1182	16	2	BFC-3-1E	9	3	M251	2	1	T1157K	9	2
B1182-1	16	1	BFC-3-1L	6	4	M251	3	5	T1157K	13	4
B1182-1A	16	1	BFC-3-1L	11	2	M252	8	4	TATMOSPH	3	2
B1182-1B	16	2	BFC-3-2E	11	1	M300	4	2	TATMOSPH	4	2
B1182-1C	16	2	BFC-3-2L	8	1	M302	3	2	TATMOSPH	13	1
B1182-1D	16	1	BFLVENTP	16	4	M310	4	1	TGB-4-1F	7	3
B1182-1E	16	2	BHOUSE1	8	2	M320	3	1	TOATRANQ	7	2
B1182-1F	16	2	BHOUSE2	8	5	M422	10	2	TVD4502C	6	3
B1182-2	16	2	BHTS1&2L	10	2	M422A	9	4	TVD4502D	3	2
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TVD4502D	4	2									
TVD4502S	6	4									
TVD4503C	1	4									
TVD4503C	6	1									
TVD4503D	3	1									
TVD4503D	4	1									
TVD4503S	1	5									
TVD4503S	6	2									
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B1100A	1	5	B1182-3	4	2						
B1105	1	5	B1182-3A	4	1						
B1105	5	1	B1182-3C	4	2						
B1150	1	4	B1182-3D	4	1						
B1151	1	3	B1182-3E	4	2						
B1152	1	3	B1182-4	4	3						
B1153	1	3	B1182-4A	4	3						
B1153	2	2	B1182A-A	5	2						
B1153A	2	1	B1182B-B	5	2						
B1153C	2	2	B1182C-C	5	2						
B1155	1	4	B1182D	3	1						
B1155	2	3	B1182E	3	1						
B1155A	2	3	B1183A-1	5	3						
B1156	1	2	B1184	3	3						
B1156A	1	1	B1184	5	2						
B1156C	1	2	B1184A	5	3						
B1156H	1	2	BFLVENTP	3	4						
B1157	1	4	IE-103	5	1						
B1170	1	5	SYC3C	1	5						
B1177	1	5									
B1178	1	5									
B1179	1	6									
B1179	2	4									
B1179A	2	4									
B1179B	2	5									
B1180	1	6									
B1180	3	2									
B1180A	3	1									
B1181	3	2									
B1182	3	2									
B1182-1	3	1									
B1182-1A	3	1									
B1182-1B	3	2									
B1182-1C	3	2									
B1182-1D	3	1									
B1182-1E	3	2									
B1182-1F	3	2									
B1182-2	3	2									
B1182-2	4	2									
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Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone
B1100	1	2	B1182-2	15	2	BOACAM2T	8	4	M430	9	2
B1101	1	2	B1182-3	15	2	BRAKPI1H	5	3	M440	1	2
B1105	1	1	B1182-3A	15	1	BRAKPI2H	4	3	M440	11	2
B1125	1	2	B1182-3C	15	2	BRAKPI4H	6	3	M441	11	2
B1150	1	3	B1182-3D	15	1	BRAKPI4H	7	4	M442	11	2
B1150	12	3	B1182-3E	15	2	BRAORLYH	2	2	M500	6	1
B1151	12	3	B1182-4	15	3	BSA-3-1L	7	1	M60-	1	4
B1152	12	3	B1182-4A	15	3	BSA-3-1L	11	3	M700	8	2
B1153	9	4	B1182A	5	2	BSA-3-2L	8	2	M701	8	1
B1153	12	5	B1182A	16	1	BSTACKE	7	2	MTOP	1	2
B1153A	9	3	B1182B	4	2	BVDP29ZC	1	4	PWR1	2	2
B1153C	9	4	B1182B	16	2	BVDP29ZC	7	2	PWR1	3	4
B1155	12	6	B1182C	6	2	BVDP29ZS	1	5	PWR2	3	4
B1155A	12	6	B1182C	7	3	IE-103	1	1	PWR3	3	3
B1156	12	2	B1182C	16	2	K101	3	5	SEASON	10	1
B1156A	12	1	B1182D	14	1	M100	1	1	SYC3D	1	2
B1156C	12	2	B1182E	14	1	M100	2	2	T1153B	3	2
B1156H	12	2	B1183A	2	2	M1001	7	2	T1153B	9	4
B1157	12	5	B1183A	16	1	M110	1	2	T1157J	3	1
B1170	12	4	B1183D	16	1	M200	2	1	T1157J	12	3
B1170	13	2	B1184	14	3	M200	5	2	T1157K	3	2
B1177	13	2	B1184	16	2	M201	2	1	T1157K	12	4
B1178	13	1	B1184A	16	2	M201	4	2	TATMOSPH	4	1
B1179	13	2	B275	2	2	M202	2	1	TATMOSPH	5	1
B1179A	13	2	B275	3	2	M202	6	2	TATMOSPH	12	1
B1179B	13	3	BCHCAM13	8	3	M203	2	1	TGB-4-1F	3	6
B1180	12	5	BDC-1-1E	1	1	M203	7	2	TOATRANQ	3	4
B1180	14	2	BDC-1-1P	10	3	M250	2	2			
B1180A	14	1	BFAK1-4G	2	2	M250	8	3			
B1181-3	14	2	BFC-3-1E	6	1	M251	2	1			
B1182	14	2	BFC-3-1E	9	1	M251	3	3			
B1182-1	14	1	BFC-3-1L	7	1	M252	8	4			
B1182-1A	14	1	BFC-3-1L	11	2	M300	5	1			
B1182-1B	14	2	BFC-3-2E	11	1	M302	4	1			
B1182-1C	14	2	BFC-3-2L	8	1	M422	10	2			
B1182-1D	14	1	BFLVENTP	14	4	M422A	9	2			
B1182-1E	14	2	BHOUSE1	8	2	M422A	10	2			
B1182-1F	14	2	BHOUSE2	8	5	M422A	11	3			
B1182-2	14	2	BHTS1&2L	10	2	M430	1	2			
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Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone
IE-101	1	1	K430	11	4	T1156D	14	4	T1162B4	17	3
K100	1	2	K440	11	6	T1156F	14	5	T1163	18	5
K100	2	2	K440	13	2	T1156F1	14	5	T1163	19	3
K100A	2	1	K441	13	2	T1156F2	14	6	T1163B1	19	2
K100A	3	2	K442	13	2	T1156F2	15	3	T1163B5	19	4
K100B	2	2	K60-	1	3	T1156F3	15	2	T1163B6	19	3
K100B	8	2	K60-	6	2	T1156F4	15	5	T1163B7	19	5
K100B1	8	1	K700	5	2	T1156F5	15	4	T1163B7A	19	5
K100B1	10	2	K701	5	1	T1156G	14	6	T1163B7B	19	1
K100B2	10	1	KTOP	1	2	T1156H	14	7	T1163B7C	19	2
K100B6	10	2	PWR1	3	1	T1157	14	5	T1164	18	6
K100C	8	1	PWR1	7	4	T1157	16	3	T1164	20	2
K100C	9	2	PWR1	8	1	T1157J	7	1	T1165	18	7
K100D	9	2	PWR2	7	3	T1157J	16	1	T1165	20	4
K101	7	4	PWR3	3	2	T1157K	7	2	T1170	14	8
K110	1	2	SEASON	12	5	T1157K	16	2	T1170	24	2
K110	11	4	ST1	12	1	T1160	14	5	T1170A	18	8
K200	3	1	ST2	12	2	T1160	17	2	T1170B	18	9
K200	4	2	STEAM	12	2	T1160A	17	1	T1172	24	2
K250	3	1	SYC5B	1	2	T1160B	17	2	T1173	24	2
K250	5	3	T1100	1	2	T1160B	18	6	T1173A	24	1
K251	5	4	T1101	1	2	T1160C	17	2	T1173B	24	2
K251	6	4	T1105	1	1	T1161	18	3	T1173C	24	2
K251	10	2	T1125	1	2	T1161B1	18	2	T1180	14	7
K275	3	2	T1150	1	3	T1161B2	18	1	T1180	21	2
K275	7	2	T1150	14	6	T1161B3	18	2	T1180A	21	1
K275	8	1	T1151	14	4	T1161B3	20	1	T1181	21	3
K300	4	2	T1152	14	4	T1161B3	20	3	T1182	21	2
K310	2	4	T1153	16	3	T1161B4	18	2	T1182-1	21	1
K310	4	1	T1153A	16	2	T1161B4	20	2	T1182-1A	21	1
K310	10	1	T1153B	7	2	T1161B4	20	4	T1182-1B	21	1
K420	11	2	T1153B	16	3	T1161B5	18	4	T1182-1C	21	2
K422	12	4	T1155	16	5	T1161B6	18	3	T1182-1D	21	2
K422A	11	2	T1155A	16	5	T1161B7	18	5	T1182-2	21	2
K422A	11	4	T1155B	16	6	T1161B7A	18	5	T1182-2	22	2
K422A	12	4	T1156	14	4	T1162	17	3	T1182-3	22	2
K422A	13	3	T1156A	14	1	T1162	18	4	T1182-3A	22	1
K425	12	4	T1156B	14	2	T1162B1	17	3	T1182-3C	22	2
K426	12	4	T1156C	14	3	T1162B3	17	2	T1182-3D	22	2
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Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone
T1182-4	22	3	TOAP-28Q	9	1						
T1182-4A	22	3	TOAPS-1T	15	4						
T1182A	4	3	TOAT1-2Q	12	4						
T1182A	23	1	TOATRANQ	7	4						
T1182B	23	2	TOAUCV1U	12	3						
T1182C	23	2	TPAAMMOL	19	3						
T1182D	21	1	TPALEAKL	15	2						
T1183	21	3	TPATELEL	18	3						
T1183A	3	2	TPDAVACL	19	4						
T1183A	23	1	TPDTVACL	18	4						
T1183D	23	1	TRAKP11H	4	4						
T1184	21	4	TRAORLYH	3	2						
T1184	23	2	TSA-3-1L	13	3						
T1184A	23	2	TSA-3-2L	5	2						
TATMOSPH	4	2	TSIPS-1I	15	3						
TATMOSPH	14	7	TSJ-1-13	12	6						
TCFIRELA	15	6	TVB-1-1P	12	5						
TCFLO-XA	15	5	TVBPR-1C	15	1						
TCHCAM13	5	3	TVBPR-2C	15	1						
TDC-1-1E	11	1	TVD4501C	6	1						
TDC-1-1P	12	5	TVD4501D	2	3						
TDFK1VTC	11	5	TVD4501S	6	2						
TFAK1-4G	3	1	TVD4502D	2	4						
TFAP-28F	9	2	TVD4503D	2	4						
TFAP-28G	9	3	TVDAMMOL	19	3						
TFB-5-1E	11	2	TVDSY-1B	8	2						
TFC-3-1E	11	4	TVDSY-1C	3	2						
TFC-3-1L	13	2	TVDSY-1S	8	2						
TFC-3-2E	13	1	TVDSY-2A	8	2						
TFC-3-2L	5	1	TVDSY-2S	8	2						
TFLVENTP	21	4	TVDUCV1C	12	3						
TGB-4-1F	7	4									
THA-2-14	11	3									
THA-2-14	11	5									
THA-2-14	13	4									
THOUSE1	5	2									
THOUSE2	6	4									
TOACAM1T	6	3									
TOAN2COQ	15	2									
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Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone
B1100	1	2	K101	4	4	PWR2	4	3	TATMOSPH	2	3
B1101	1	2	K110	1	4	PWR3	2	10	TATMOSPH	10	4
B1105	1	1	K20	2	11	ST1	7	1	TCHCAM13	3	3
B1125	1	3	K20	5	2	ST2	7	2	TDC-1-1E	1	3
B1150	1	3	K200	2	3	STEAM	7	2	TDC-1-1P	7	4
B1150	10	5	K250	2	4	SYC5D	1	2	TDFK1VTC	1	4
B1151	10	3	K250	3	3	T1153B	4	2	TFAP-4G	2	6
B1152	10	3	K251	3	4	T1153B	10	5	TFAP-28F	6	2
B1153	10	5	K275	2	8	T1157J	4	1	TFAP-28G	6	3
B1153A	10	5	K275	4	2	T1157J	10	3	TFB-5-1E	5	5
B1153C	10	6	K275	6	4	T1157K	4	2	TFC-3-1E	8	1
B1155	10	6	K280	6	5	T1157K	10	4	TFC-3-1L	8	3
B1155	11	3	K285	6	7	T1181	12	4	TFC-3-2E	8	3
B1155A	11	3	K290	5	4	T1182	12	3	TFC-3-2L	3	1
B1156	10	2	K290	6	8	T1182-1	12	2	TFLVENTP	12	4
B1156A	10	1	K300	2	2	T1182-1A	12	1	TGB-4-1F	4	4
B1156C	10	2	K310	2	2	T1182-1B	12	2	THA-2-14	7	1
B1156H	10	2	K420	1	3	T1182-1C	12	2	THOUSE1	3	2
B1157	10	5	K420	5	6	T1182-1D	12	2	THOUSE2	3	5
B1170	10	5	K422	5	6	T1182-2	12	4	TOACAM1T	3	4
B1170	11	2	K422	7	3	T1182-3	12	3	TOAP-28Q	6	1
B1177	11	2	K422	8	2	T1182-3	13	2	TOAT1-2Q	7	4
B1178	11	1	K422	8	4	T1182-3A	13	1	TOATRANQ	4	4
B1179	11	2	K425	7	4	T1182-3C	13	2	TOAUCV1U	7	3
B1179A	11	2	K426	7	4	T1182-3D	13	2	TRAKP11H	2	4
B1179B	11	3	K430	1	4	T1182-4	12	4	TRAORLYH	2	9
B1180	10	6	K430	8	2	T1182-4A	12	4	TSA-3-1L	8	4
B1180	12	3	K440	1	4	T1182A	2	3	TSA-3-2L	3	2
B1180A	12	1	K440	8	4	T1182A	13	3	TSJ-1-13	7	6
BVDP28ZA	6	7	K441	8	3	T1182B	13	4	TVB-1-1P	7	5
BVDP28ZS	6	7	K442	8	4	T1182C	13	4	TVD4501D	2	1
IE-103	1	1	K60-	1	5	T1182D	12	1	TVD4502D	2	2
K100	1	2	K60-	9	2	T1183	12	4	TVD4503C	9	1
K100A	1	1	K700	3	2	T1183A	2	7	TVD4503D	2	2
K100A	2	7	K701	3	1	T1183A	13	3	TVD4503S	9	2
K100B	1	2	KTOP	1	3	T1183D	13	3	TVDSY-1B	5	3
K100B	6	5	PWR1	2	5	T1184	12	4	TVDSY-1C	5	1
K100C	6	2	PWR1	4	4	T1184	13	4	TVDSY-1S	5	2
K100D	6	2	PWR1	6	3	T1184A	13	4	TVDSY-1T	5	4
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TVDSY-2A	6	5									
TVDSY-2S	6	6									
TVDUCV1C	7	3

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IE-101	1	1	T1161B3	8	1	T1173	10	2	TPDTVACL	6	4
SYC9A	1	2	T1161B3	8	3	T1173A	10	1	TSIPS-1I	4	1
T1100A	1	2	T1161B4	6	2	T1173B	10	2	TVBPR-1C	3	1
T1105	1	1	T1161B4	8	2	T1173C	10	2	TVBPR-2C	3	1
T1150	1	4	T1161B4	8	4	T1180	1	6	TVDAMMOL	7	3
T1151	1	2	T1161B5	6	4	T1180	11	2			
T1152	1	2	T1161B6	6	3	T1180A	11	1			
T1153	5	1	T1161B7	6	5	T1181	11	3			
T1153A	5	1	T1161B7A	6	5	T1182	11	2			
T1155	5	2	T1162	3	4	T1182-1	11	1			
T1155A	5	2	T1162	6	4	T1182-1A	11	1			
T1155B	5	3	T1162B1	3	4	T1182-1B	11	1			
T1156	1	2	T1162B3	3	3	T1182-1C	11	2			
T1156	2	4	T1162B4	3	4	T1182-1D	11	2			
T1156A	2	1	T1163	6	5	T1182-2	11	2			
T1156B	2	2	T1163	7	3	T1182-2	12	2			
T1156C	2	3	T1163B1	7	2	T1182-3	12	2			
T1156D	2	4	T1163B5	7	4	T1182-3A	12	1			
T1156F	2	5	T1163B6	7	3	T1182-3C	12	2			
T1156F1	2	5	T1163B7	7	5	T1182-3D	12	2			
T1156F2	2	6	T1163B7A	7	5	T1182-4	12	3			
T1156F3	2	5	T1163B7B	7	1	T1182-4A	12	3			
T1156F3	3	2	T1163B7C	7	2	T1182B	10	3			
T1156F4	2	6	T1164	6	6	T1182C	10	4			
T1156F4	4	2	T1164	8	2	T1182D	11	1			
T1156F5	4	2	T1165	6	7	T1183	11	3			
T1156G	2	6	T1165	8	4	T1183A-1	10	3			
T1156H	2	7	T1170	1	5	T1184	10	4			
T1157	1	3	T1170	9	2	T1184	11	4			
T1157	5	2	T1170A	6	8	T1184A	10	4			
T1160	1	4	T1170B	6	9	TCFIRELA	4	4			
T1160A	1	4	T1171	9	2	TCFLO-XA	4	3			
T1160B	1	4	T1171A	9	1	TFLVENTP	11	4			
T1160B	6	6	T1171B	9	1	TOAN2COQ	3	2			
T1160C	1	5	T1171C	9	2	TOAPS-1T	4	2			
T1161	6	3	T1171D	9	2	TPAAMMOL	7	3			
T1161B1	6	2	T1171E	9	2	TPALEAKL	3	2			
T1161B2	6	1	T1172	9	3	TPATELEL	6	3			
T1161B3	6	2	T1173	9	3	TPDAVACL	7	4			
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IE-101	1	1	N210	15	2	ST1	8	1	T1157K	6	2
K100A	1	1	N220	11	2	ST2	8	2	T1157K	14	2
K100A	2	2	N220	16	2	STEAM	8	2	T1157K	21	2
K101	5	2	N230	11	2	SYC9B	1	2	T1160	19	5
K110	1	2	N230	17	3	T1100	1	2	T1160	22	2
K110	7	4	N250	11	1	T1101	1	2	T1160A	22	1
K200	2	1	N250	13	3	T1105	1	1	T1160B	22	2
K200	3	3	N251	13	4	T1125	1	2	T1160B	23	6
K250	2	1	N275	11	2	T1150	1	3	T1160C	22	2
K250	4	3	N275	14	2	T1150	19	6	T1161	23	3
K251	4	4	N300	12	1	T1151	19	4	T1161B1	23	2
K275	2	2	N310	15	1	T1152	19	4	T1161B2	23	1
K275	6	2	N320	16	2	T1153	21	3	T1161B3	23	2
K300	3	2	N330	17	2	T1153A	21	2	T1161B3	25	1
K310	3	1	N331	17	1	T1153B	6	2	T1161B3	26	1
K420	7	2	N422	14	3	T1153B	14	2	T1161B4	23	2
K422	8	4	N422A	10	2	T1153B	21	3	T1161B4	25	2
K422A	7	2	N422A	10	5	T1155	21	5	T1161B4	26	2
K422A	7	4	N422A	14	4	T1155A	21	5	T1161B5	23	4
K422A	8	4	N423	14	3	T1155B	21	6	T1161B6	23	3
K422A	9	3	N430	10	2	T1156	19	4	T1161B7	23	5
K425	8	4	N440	10	4	T1156A	19	1	T1161B7A	23	5
K426	8	4	N441	10	4	T1156B	19	2	T1162	22	3
K430	7	4	N442	10	4	T1156C	19	3	T1162	23	4
K440	7	6	N442	18	2	T1156D	19	4	T1162B1	22	3
K440	9	2	N60-	10	4	T1156F	19	5	T1162B3	22	2
K441	9	2	N60-	18	4	T1156F1	19	5	T1162B4	22	3
K442	9	2	N700	13	2	T1156F2	19	6	T1163	23	5
K60-	1	2	N701	13	1	T1156F2	20	3	T1163	24	3
K60-	6	4	NTOP	1	3	T1156F3	20	2	T1163B1	24	2
K700	4	2	NTOP	10	2	T1156F4	20	5	T1163B5	24	4
K701	4	1	PWR1	2	1	T1156F5	20	4	T1163B6	24	3
KTOP	1	2	PWR1	5	2	T1156G	19	6	T1163B7	24	5
N100	10	1	PWR1	11	1	T1156H	19	7	T1163B7A	24	5
N100	11	2	PWR2	5	1	T1157	19	5	T1163B7B	24	1
N110	10	2	PWR3	2	2	T1157	21	3	T1163B7C	24	2
N200	11	1	PWR3-1	11	2	T1157J	6	1	T1164	23	6
N200	12	2	SEASON	8	5	T1157J	14	1	T1164	25	2
N210	11	2	SEASON	14	4	T1157J	21	1	T1165	23	7

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T1165	26	2	T1180A	27	1	TCFLO-XA	20	5	TPALEAKL	20	2
T1170	19	8	T1181	27	3	TCHCAM13	4	3	TPATELEL	23	3
T1170	29	2	T1182	27	2	TCHCAM33	13	3	TPDAVACL	24	4
T1170A	23	8	T1182-1	27	1	TDC-1-1E	7	1	TPDTVACL	23	4
T1170B	23	9	T1182-1A	27	1	TDC-1-1P	8	5	TRAKP11H	3	4
T1171	29	2	T1182-1B	27	1	TDCP281E	10	1	TRAORLYH	2	2
T1171A	29	1	T1182-1C	27	2	TDCP281P	14	4	TRAP-28H	11	2
T1171B	29	1	T1182-1D	27	2	TDFK1VTC	7	5	TRAP281H	12	3
T1171C	29	1	T1182-2	25	4	TFAK1-4G	2	1	TRAP282H	15	3
T1171D	29	2	T1182-2	27	2	TFAP-28G	11	1	TRAP284H	16	4
T1171E	29	2	T1182-3	25	3	TFB-5-1E	7	2	TRAP284H	17	4
T1172	26	3	T1182-3A	25	3	TFC-3-1E	7	4	TSA-3-1L	9	3
T1172	29	3	T1182-3C	25	3	TFC-3-1L	9	2	TSA-3-2L	4	2
T1173	26	3	T1182-3D	25	4	TFC-3-2E	9	1	TSAP281L	17	3
T1173A	26	2	T1182-4	25	5	TFC-3-2L	4	1	TSAP281L	18	2
T1173B	26	3	T1182-4A	25	5	TFCP281E	10	1	TSAP282L	13	2
T1173C	26	3	T1182A	3	3	TFCP281E	16	1	TSIPS-1I	20	3
T1175	29	4	T1182A	28	1	TFCP281L	17	2	TSJ-1-13	8	6
T1175	30	2	T1182A-1	12	2	TFCP281L	18	1	TVB-1-1P	8	5
T1176	30	1	T1182A-2	15	2	TFCP282E	10	3	TVBPR-1C	20	1
T1176	31	2	T1182A-4	16	3	TFCP282L	13	1	TVBPR-2C	20	1
T1176A	31	1	T1182A-4	17	3	TFLVENTP	27	4	TVD4501C	6	3
T1176B	31	1	T1182B	28	2	TGB-4-1F	5	3	TVD4501C	18	3
T1176C	31	1	T1182C	28	2	THA-2-14	7	3	TVD4501D	3	1
T1176D	31	1	T1182D	27	1	THA-2-14	7	5	TVD4501S	6	4
T1176E	31	2	T1183	27	3	THA-2-14	9	4	TVD4501S	18	4
T1176F	31	2	T1183A	2	2	THOUSE1	4	2	TVD4502D	3	1
T1176G	31	2	T1183A	28	1	THOUSE1	13	2	TVD4503D	3	2
T1176H	31	2	T1183A-2	11	1	THOUSE2	4	5	TVDAMMOL	24	3
T1177	30	2	T1183A-2	29	2	THOUSE2	13	5	TVDP28ZC	17	1
T1178	30	2	T1183D	28	1	TOACAM1T	4	4	TVDUCV1C	8	3
T1178-1	30	3	T1184	27	4	TOACAM3T	13	4			
T1178-1A	30	3	T1184	28	2	TOAN2COQ	20	2			
T1178A	30	1	T1184A	28	2	TOAPS-1T	20	4			
T1178B	30	1	TATMOSPH	3	2	TOAT1-2Q	8	4			
T1178C	30	2	TATMOSPH	12	1	TOATRANQ	5	2			
T1178D	30	2	TATMOSPH	15	1	TOAUCV1U	6	3			
T1180	19	7	TATMOSPH	19	7	TP28STKE	16	2			
T1180	27	2	TCFIRELA	20	6	TPAAMMOL	24	3			
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Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone
B1100	1	2	K251	4	4	N300	12	1	T1157J	19	3
B1101	1	2	K275	2	2	N310	14	1	T1157K	5	2
B1105	1	1	K275	5	2	N320	15	2	T1157K	9	4
B1125	1	2	K300	3	2	N330	16	2	T1157K	19	3
B1150	1	3	K310	3	1	N331	16	1	T1181	21	3
B1150	19	4	K420	6	2	N422	17	2	T1182	21	2
B1151	19	3	K422	7	4	N422A	10	2	T1182-1	21	1
B1152	19	3	K422A	6	2	N422A	10	5	T1182-1A	21	1
B1153	18	4	K422A	6	4	N422A	17	2	T1182-1B	21	1
B1153	19	4	K422A	7	4	N423	17	1	T1182-1C	21	2
B1153A	18	3	K422A	8	3	N430	10	2	T1182-1D	21	2
B1153C	18	4	K425	7	4	N440	10	4	T1182-2	21	2
B1155	18	5	K426	7	4	N441	10	4	T1182-2	22	2
B1155	19	4	K430	6	4	N442	10	4	T1182-3	22	2
B1155A	18	5	K440	6	6	N442	17	4	T1182-3A	22	1
B1156	19	2	K440	8	2	N60-	10	4	T1182-3C	22	2
B1156A	19	1	K441	8	2	N60-	18	2	T1182-3D	22	2
B1156C	19	2	K442	8	2	N700	13	2	T1182-4	22	3
B1156H	19	2	K60-	1	2	N701	13	1	T1182-4A	22	3
B1170	19	4	K60-	9	2	NTOP	1	3	T1182A	3	3
B1170	20	2	K700	4	2	NTOP	10	2	T1182A	23	1
B1174	20	2	K701	4	1	PWR1	2	1	T1182A-1	12	2
B1178	20	1	KTOP	1	2	PWR1	5	4	T1182A-2	14	2
B1179	20	2	N100	10	1	PWR1	11	1	T1182A-4	15	3
B1179A	20	2	N100	11	2	PWR2	5	3	T1182A-4	16	3
B1179B	20	3	N110	10	2	PWR3	2	2	T1182B	23	2
B1180	19	6	N200	11	1	PWR3-1	11	2	T1182C	23	2
B1180	21	2	N200	12	2	SEASON	7	5	T1182D	21	1
B1180A	21	1	N210	11	2	SEASON	17	3	T1183	21	3
IE-103	1	1	N210	14	2	ST1	7	1	T1183A	2	2
K100A	1	1	N220	11	2	ST2	7	2	T1183A	23	1
K100A	2	2	N220	15	2	STEAM	7	2	T1183A-2	11	1
K101	5	4	N230	11	2	SYC9D	1	2	T1183D	23	1
K110	1	2	N230	16	3	T1153B	5	2	T1184	21	4
K110	6	4	N250	11	1	T1153B	9	4	T1184	23	2
K200	2	1	N250	13	3	T1153B	18	4	T1184A	23	2
K200	3	3	N251	13	4	T1157	19	4	TATMOSPH	3	2
K250	2	1	N275	9	4	T1157J	5	1	TATMOSPH	12	1
K250	4	3	N275	11	2	T1157J	9	3	TATMOSPH	14	1
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Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone	Gate/Event Name	Page	Zone
TATMOSPH	19	4	TRAP281H	12	3						
TCHCAM13	4	3	TRAP282H	14	3						
TCHCAM33	13	3	TRAP284H	15	4						
TDC-1-1E	6	1	TRAP284H	16	4						
TDC-1-1P	7	5	TSA-3-1L	8	3						
TDCP281E	10	1	TSA-3-2L	4	2						
TDCP281P	17	2	TSAP281L	16	3						
TDFK1VTC	6	5	TSAP281L	17	5						
TFAP-28G	2	1	TSAP282L	13	2						
TFAP-28G	11	1	TSJ-1-13	7	6						
TFB-5-1E	6	2	TVB-1-1P	7	5						
TFC-3-1E	6	4	TVD4501D	3	1						
TFC-3-1L	8	2	TVD4502D	3	1						
TFC-3-2E	8	1	TVD4503C	9	1						
TFC-3-2L	4	1	TVD4503C	18	1						
TFPCP281E	10	1	TVD4503D	3	2						
TFPCP281E	15	1	TVD4503S	9	2						
TFPCP281L	16	2	TVD4503S	18	2						
TFPCP281L	17	4	TVDP28ZC	16	1						
TFPCP282E	10	3	TVDUCV1C	7	3						
TFPCP282L	13	1									
TFLVENTP	21	4									
TGB-4-1F	5	4									
THA-2-14	6	3									
THA-2-14	6	5									
THA-2-14	8	4									
THOUSE1	4	2									
THOUSE1	13	2									
THOUSE2	4	5									
THOUSE2	13	5									
TOACAM1T	4	4									
TOACAM3T	13	4									
TOAT1-2Q	7	4									
TOATRANQ	5	4									
TOAUCV1U	7	3									
TP28STKE	15	2									
TRAKP11H	3	4									
TRAORLYH	2	2									
TRAP-28H	11	2									
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APPENDIX E

CUTSET FILES

NOTE: The table at the end of this appendix gives frequency and subtotal values. The normalized values given in Table 6-1 were obtained by taking the subtotal of Case X and dividing it by the subtotal of Case 5.

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CUTSET REPORT FOR SYC1A

SYCIA.CUT
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CUTSET REPORT

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
1) SYCIA				*1.62E-02
1) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.51E-03
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		0.01	1.00E-02	
2) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.51E-03
T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1161B7A ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TPATELEL TELEDYNE H2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
3) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.51E-03
T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1161B7A ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TPAAMMOL AMMONIA BUBBLER PIP-ING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
4) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.19E-03
T1173C ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (SEAL & MOTOR)	5E-7	2400	6.00E-04	
5) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.31E-03
T1156D ELECTRICAL SPARKS FROM EXPLOSION PROOF LIGHT OR LIGHT LEAD FAULTS	1E-6	720	3.60E-04	
6) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.28E-03
T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1161B4 ELECTRICAL SPARK FROM THE TELEDYNE VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
7) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.28E-03
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		0.01	1.00E-02	
8) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.28E-03
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		0.01	1.00E-02	
9) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.65E-04
T1135A MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAI		0.0001	1.00E-04	
10) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.65E-04
T1155B MECHANICAL SPARKS FROM SLUDGE WEIGHT/ CABLE STRIKING SAMPLING TUBES		0.0001	1.00E-04	
11) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.19E-04
T1156A ELECTRICAL SPARKS FROM FIC LEVEL PROBE	5E-8	2400	6.00E-05	
12) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.19E-04
T1173A ELECTRICAL SPARK FROM FAULT IN THE (WHITTAKER) CHEMICAL CELL H2 ANALYZER	5E-8	2400	6.00E-05	
13) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-05
T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1163B7A ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TPDAVACL AMMONIA BUBBLER VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABINET	1E-6	2400	1.20E-03	
14) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		0.01	1.00E-02	
15) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-05
T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1161B7A ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TPDTVACL TELEDYNE H2 SAMPLING SYSTEM VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO	1E-6	2400	1.20E-03	
16) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING	1E-6	2400	1.20E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		0.01	1.00E-02	
17) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		0.01	1.00E-02	
18) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		0.01	1.00E-02	

CUTSET REPORT FOR SYC1B

SYC1B.CUT
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CUTSET REPORT

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
1) SYC1B				*2.23E-03
1) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-04
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
2) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-04
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
3) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.16E-04
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
4) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.16E-04
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
5) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.16E-04
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
6) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.16E-04
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
7) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-05
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03	
8) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
9) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-05
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03	
10) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-05
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03	
11) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.51E-05
T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1163B7A ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TPAAMHOL AMMONIA BUBBLER PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
12) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.19E-05
T1173C ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (SEAL & MOTOR)	5E-7	2400	6.00E-04	
TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
13) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.16E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
14) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.16E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
15) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.31E-05
T1156D ELECTRICAL SPARKS FROM EXPLOSION PROOF LIGHT OR LIGHT LEAD FAULTS	1E-6	720	3.60E-04	
TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONEOUSLY LEFT CLOSED		1E-2	1.00E-02	
16) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.26E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
17) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
18) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
19) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING	1E-6	2400	1.20E-03	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
20) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
21) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING	1E-6	2400	1.20E-03	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
22) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
23) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
24) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
25) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-06
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSJ-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
26) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-06
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1P	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
27) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-06
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST1	STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
28) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.47E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDFK1VTC	MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
29) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.47E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDFK1VTC	MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
30) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.32E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING	3E-5	168	5.03E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
31) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.28E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
TFAP-28F	BACKUP EXHAUST FAN P-28 FAILS TO START	5E-3	1	5.00E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
32) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-06
T1160A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1161B7A	ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TPATELEL	TELEDYNE H2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
33) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-06
T1160A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1161B7A	ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TPATELEL	TELEDYNE H2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
34) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-06
T1160A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1163B7A	ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TPAAMHOL	AMMONIA BUBBLER PIP-ING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
35) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-06
T1160A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1163B7A	ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TPAAMHOL	AMMONIA BUBBLER PIP-ING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
36) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.68E-06
T1173C	ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (SEAL & MOTOR)	5E-7	2400	6.00E-04	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
37) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.68E-06
T1173C	ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (SEAL & MOTOR)	5E-7	2400	6.00E-04	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
38) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1P	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
39) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST1 STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
40) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST1 STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
41) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSJ-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
42) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1P DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
43) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSJ-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
44) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.65E-06
T1155B MECHANICAL SPARKS FROM SLUDGE WEIGHT/ CABLE STRIKING SAMPLING TUBES		0.0001	1.00E-04	
TV4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED	1E-2	1.00E-02		
45) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.65E-06
T1155A MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAI		0.0001	1.00E-04	
TV4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED	1E-2	1.00E-02		
46) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.23E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TF4K1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TF4P-28G P-28 FAILS TO CONTINUE RUNNING	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
47) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.23E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TF4K1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TF4P-28G P-28 FAILS TO CONTINUE RUNNING	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
48) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.21E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TF4K1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TF4P-28F BACKUP EXHAUST FAN P-28 FAILS TO START	5E-3	1	5.00E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
49) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.21E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TF4K1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TF4P-28F BACKUP EXHAUST FAN P-28 FAILS TO START	5E-3	1	5.00E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
50) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.34E-06
T1157K RANGE FIRE PRODUCES SPARKS THAT FAIL VENT AND IGNITE LEAKING H2	4E-7	1.6	6.40E-07	
51) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.21E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182B ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYST	3E-7	2400	3.60E-04	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
52) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.21E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
T1182C ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYST	3E-7	2400	3.60E-04	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
53) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.21E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182C ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYST	3E-7	2400	3.60E-04	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
54) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.21E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182B ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYST	3E-7	2400	3.60E-04	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
55) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.21E-06
T1156D ELECTRICAL SPARKS FROM EXPLOSION PROOF LIGHT OR LIGHT LEAD FAULTS	1E-6	720	3.60E-04	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
56) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.21E-06
T1156D ELECTRICAL SPARKS FROM EXPLOSION PROOF LIGHT OR LIGHT LEAD FAULTS	1E-6	720	3.60E-04	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
57) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.19E-06
T1156A ELECTRICAL SPARKS FROM FIC LEVEL PROBE	5E-8	2400	6.00E-05	
TV04501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
58) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.19E-06
T1173A ELECTRICAL SPARK FROM FAULT IN THE (WHITTAKER) CHEMICAL CELL H2 ANALYZER	5E-8	2400	6.00E-05	
TV04501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
59) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.16E-06
T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1161B4 ELECTRICAL SPARK FROM THE TELEDYNE VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
60) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.16E-06
T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1161B4 ELECTRICAL SPARK FROM THE TELEDYNE VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
61) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.04E-06
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
STZ LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
62) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.64E-06
T1173B IGNITION SOURCE FROM CATASTROPHIC FAILURE OF CHEMICAL CELL VACUUM PUMP (BEAR	1E-6	45	4.50E-05	
TV04501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
63) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.43E-06
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TV0UCVIC HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
64) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.26E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TOAP-28Q HUMAN OPERATOR FAILS TO START BACKUP FAN P-28	1E-3	1	1.00E-03	
65) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
66) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
67)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
	T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
68)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	2400	1.20E-03	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
69)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.05E-06
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	ST2 LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
	T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
70)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.05E-06
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	ST2 LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
	T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
71)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	8.21E-07
	T1156C ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE	5E-7	45	2.25E-05	
	TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONEOUSLY LEFT CLOSED		1E-2	1.00E-02	
72)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-07
	T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	2400	1.20E-03	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
73)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-07
	T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
	T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
74)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-07
	T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
75)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-07
	T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
	T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
76)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.33E-07
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TVDUCV1C HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
77)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.33E-07
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TVDUCV1C HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
78)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-07
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
	T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
	T1163B7A ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TPAAMMOL AMMONIA BUBBLER PIP-ING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
79) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-07
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T116187A ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TPATELEL TELEDYNE H2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
80) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.43E-07
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TOAP-28Q HUMAN OPERATOR FAILS TO START BACKUP FAN P-28	1E-3	1	1.00E-03	
81) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.43E-07
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TOAP-28Q HUMAN OPERATOR FAILS TO START BACKUP FAN P-28	1E-3	1	1.00E-03	
82) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.25E-07
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1173C ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (SEAL & MOTOR)	5E-7	2400	6.00E-04	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
83) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.13E-07
T1155A MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAI		0.0001	1.00E-04	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
84) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.13E-07
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183D MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAI		0.0001	1.00E-04	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
85) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.13E-07
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183D MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAI		0.0001	1.00E-04	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
86) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.13E-07
T1155B MECHANICAL SPARKS FROM SLUDGE WEIGHT/ CABLE STRIKING SAMPLING TUBES		0.0001	1.00E-04	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
87) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.13E-07
T1155A MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAI		0.0001	1.00E-04	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
88) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.13E-07
T1155B MECHANICAL SPARKS FROM SLUDGE WEIGHT/ CABLE STRIKING SAMPLING TUBES		0.0001	1.00E-04	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
89) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	5.91E-07
PWR2 LOSS OF POWER TO SY TANK FARM	1E-5	45	4.50E-04	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TGB-4-1F DIESEL GENERATOR FOR EXHAUST FANS P-23 & P-28 FAILS TO START	3E-1	1	3.00E-01	
90) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	5.91E-07
PWR2 LOSS OF POWER TO SY TANK FARM	1E-5	45	4.50E-04	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	2400	1.20E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TGB-4-1F DIESEL GENERATOR FOR EXHAUST FANS P-23 & P-28 FAILS TO START	3E-1	1	3.00E-01	
91) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.93E-07
T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T116387C ELECTRICAL SPARK FROM THE AMMONIA BUBBLER VACUUM PUMP FAILURE (SEAL & MOTO	3E-5	45	1.35E-03	
TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
92) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-07
T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T116387A ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TPDAVACL AMMONIA BUBBLER VACUUM PUMP LEAKS ON OUTLET SIDEOF PUMP INTO CABINET	1E-6	2400	1.20E-03	
TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
93) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.26E-07

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TOAT1-2Q	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE LOW T1-1-2 READING	1F-3	1	1.00E-03	
TOAUCV1U	HUMAN OPERATOR FTRTCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VAL	1E-2	1	1.00E-02	
94) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-07
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFC-3-1E	HEPA FILTER K1-3-1 PLUGS, DUE TO PARTICULATES	1E-8	168	1.68E-06	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
95) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-07
T1160A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T116187A	ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
THA-2-14	STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
TPATELEL	TELEDYNE H2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
96) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-07
T1160A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T116387A	ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
THA-2-14	STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
TPAAMHOL	AMMONIA BUBBLER PIP-ING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	

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MODULE/EVENT NAME DESCRIPTION
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RATE EXPOSURE S.E. MOD./CS.
..... PROB.

1) SYC1C					*2.60E-02
1) 81153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	2.00E-02
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
2) 81180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.41E-03
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1187-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		0.01	1.00E-02	
3) 81180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.26E-03
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		0.01	1.00E-02	
4) 81180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.26E-03
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		0.01	1.00E-02	
5) 81178	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE PUMP PIT		1.0	1.00E+00	1.00E-03
81179A	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN THE 103SY PUMP PIT		5E-4	5.00E-04	
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
6) 81156A	ELECTRICAL SPARKS FROM FIC LEVEL PROBE	5E-8	4380	1.09E-04	2.18E-04
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	

CUTSET REPORT FOR SYC1D

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
1) SYCID				*2.34E-03
1) 81180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	4.05E-04
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
2) 81180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	4.05E-04
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
3) 81180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.11E-04
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
4) 81180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.11E-04
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
5) 81180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.11E-04
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
6) 81180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.11E-04
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
7) 81153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		0.01	1.00E-02	2.00E-04
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
TV045038 MANUAL VALVE 4503 FROM TANK 103-SY ERRONOUSLY LEFT CLOSED	1E-2	1	1.00E-02	
8) 81180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.89E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03	
9) 81180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	4.05E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
10) 81180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.59E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03	
11) 81180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.59E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03	
12) 81153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		0.01	1.00E-02	3.36E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03	
13) 81153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		0.01	1.00E-02	3.36E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03	
14) 81180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.11E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	S.E. PROB.	MOD./CS. PROB.
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TNA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
15) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.11E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TNA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
16) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.22E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDPK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
17) B1178 FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO2 IN THE PUMP PIT		1.0	1.00E+00	1.00E-05
B1179A ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103SY PUMP PIT		5E-4	5.00E-04	
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
TV045038 MANUAL VALVE 4503 FROM TANK 103-SY ERROROUSLY LEFT CLOSED	1E-2	1	1.00E-02	
18) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
19) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
20) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
21) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	4380	2.19E-03<	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
22) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	4380	2.19E-03<	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
23) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	4380	2.19E-03<	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
24) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	4380	2.19E-03<	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
25) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
26) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.89E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TBJ-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
27) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.89E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	

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MODULE/EVENT NAME DESCRIPTION		RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER			.17	1.70E-01	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS		6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)			1.0	1.00E+00	
TDC-1-1P DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH		1E-6	168	1.68E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM			1.0	1.00E+00	
28) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.89E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER			.17	1.70E-01	
ST1 STEAM LINE TO HEATER RUPTURES		1E-8	1.68E+4	1.68E-04	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS		6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)			1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM			1.0	1.00E+00	
29) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.34E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)		3E-5	4380	6.29E-02	
TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO		3E-7	168	5.04E-05	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM			1.0	1.00E+00	
30) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.34E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)		3E-5	4380	6.29E-02	
TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO		3E-7	168	5.04E-05	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM			1.0	1.00E+00	
31) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.08E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS		6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)			1.0	1.00E+00	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),		3E-5	168	5.01E-03	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING		3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM			1.0	1.00E+00	
32) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.04E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS		6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)			1.0	1.00E+00	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),		3E-5	168	5.01E-03	
TFAP-28F BACKUP EXHAUST FAN P-28 FAILS TO START		5E-3	1	5.00E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM			1.0	1.00E+00	
33) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		0.01	1.00E-02	5.71E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER			.17	1.70E-01	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER		1E-5	168	1.68E-03	
34) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.59E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER			.17	1.70E-01	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)		3E-5	4380	6.29E-02	
TDC-1-1P DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH		1E-6	168	1.68E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM			1.0	1.00E+00	
35) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.59E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER			.17	1.70E-01	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)		3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM			1.0	1.00E+00	
TSJ-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS		1E-6	168	1.68E-04	
36) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.59E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER			.17	1.70E-01	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)		3E-5	4380	6.29E-02	
TDC-1-1P DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH		1E-6	168	1.68E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM			1.0	1.00E+00	
37) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.59E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER			.17	1.70E-01	
ST1 STEAM LINE TO HEATER RUPTURES		1E-8	1.68E+4	1.68E-04	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)		3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM			1.0	1.00E+00	
38) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.59E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER			.17	1.70E-01	
ST1 STEAM LINE TO HEATER RUPTURES		1E-8	1.68E+4	1.68E-04	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)		3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM			1.0	1.00E+00	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
39) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.59E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
T3J-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
40) B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		0.01	1.00E-02	3.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
41) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.17E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
42) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.17E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
43) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.15E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFAP-28F BACKUP EXHAUST FAN P-28 FAILS TO START	5E-3	1	5.00E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
44) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.15E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFAP-28F BACKUP EXHAUST FAN P-28 FAILS TO START	5E-3	1	5.00E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
45) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.21E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182C ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYST	3E-7	4380	6.57E-04	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
46) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.21E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182C ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYST	3E-7	4380	6.57E-04	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
47) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.21E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182B ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYST	3E-7	4380	6.57E-04	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
48) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.21E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182B ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYST	3E-7	4380	6.57E-04	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
49) B1156A ELECTRICAL SPARKS FROM FIC LEVEL PROBE	5E-8	4380	1.09E-04<	2.18E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
TVD4503S MANUAL VALVE 4503 FROM TANK 103-SY ERRONOUSLY LEFT CLOSED	1E-2	1	1.00E-02	
50) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.97E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST2 LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
51) B1178 FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO2 IN THE PUMP PIT		1.0	1.00E+00	1.68E-06
B1179A ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103SY PUMP PIT		5E-4	5.00E-04	
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
52) B1178 FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO2 IN THE PUMP PIT		1.0	1.00E+00	1.68E-06
B1179A ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103SY PUMP PIT		5E-4	5.00E-04	
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
53) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.38E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PLMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDUCV1C HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
54) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BOWDIN	1E-6	4380	2.19E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
55) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	4380	2.19E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
56) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
57) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
58) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.21E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS])	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TDAP-28Q HUMAN OPERATOR FAILS TO START BACKUP FAN P-28	1E-3	1	1.00E-03	
59) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.03E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST2 LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
60) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.03E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST2 LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
61) B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		0.01	1.00E-02	1.01E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	

CUTSET REPORT FOR SYC2C

SYC2C.CUT
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MODULE/EVENT NAME DESCRIPTION

		RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
1) SYC2C					*2.72E-02
1) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHT		0.01	1.00E-02	2.00E-02
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
2) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	2.41E-03
B1182-3A	CAM SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
B1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		0.01	1.00E-02	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
3) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.26E-03
B1182-1D	ELECTRICAL SPARKS FROM CAM VP-1 (SEAL & MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		0.01	1.00E-02	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
4) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.26E-03
B1182-1F	ELECTRICAL SPARKS FROM CAM VP-3 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		0.01	1.00E-02	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
5) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.26E-03
B1182-1E	ELECTRICAL SPARKS FROM CAM VP-2 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		0.01	1.00E-02	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
6) B1178	FLAMMABLE MIXTURE OF H2, AIR AND NO2 IN PUMP PIT		1.0	1.00E+00	1.00E-03
B1179A	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103-SYPUMP PIT		5E-4	5.00E-04	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
7) B1156A	ELECTRICAL SPARKS FROM FIC LEVEL PROBE	5E-8	4380	1.09E-04	2.18E-04
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	

WHC-EP-0579

CUTSET REPORT FOR SYC2D

SYC20.CUT
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CUTSET REPORT

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MODULE/EVENT NAME DESCRIPTION

RATE EXPOSURE B.E. MOD./CS.
PROB. PROB.

1) SYC20

1) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	*1.66E-01
B1182-3A	CAM SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	4.10E-02
B1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BHTS1&2L	ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
SEASON	FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
2) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	4.10E-02
B1182-3A	CAM SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
B1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BHTS1&2L	ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
SEASON	FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
3) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	2.14E-02
B1182-1F	ELECTRICAL SPARKS FROM CAM VP-3 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BHTS1&2L	ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
SEASON	FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
4) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	2.14E-02
B1182-1D	ELECTRICAL SPARKS FROM CAM VP-1 (SEAL & MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BHTS1&2L	ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
SEASON	FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
5) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	2.14E-02
B1182-1E	ELECTRICAL SPARKS FROM CAM VP-2 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BHTS1&2L	ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
SEASON	FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
6) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	3.66E-03
B1182-3A	CAM SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
B1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BSA-3-1L	HEPA FILTER P29-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
7) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHT		0.01	1.00E-02	3.40E-03
BHTS1&2L	ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
SEASON	FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COL) TEMPERATU		1.7E-1	1.70E-01	
8) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	2.41E-03
B1182-3A	CAM SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
B1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BVDP292S	HAND OPERATED (MANUAL) VALVE FROM P29 EXHAUSTER ERRONOUSLY CLOSED	1E-2	1	1.00E-02	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
9) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	2.41E-03
B1182-3A	CAM SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
B1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BVD450XS	HAND OPERATED (MANUAL) VALVE TEED INTO LINE FROM P29 EXHAUS-EK ERRONOUSLYC	1E-2	1	1.00E-02	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
10) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.91E-03
B1182-1E	ELECTRICAL SPARKS FROM CAM VP-2 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BSA-3-1L	HEPA FILTER P29-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
11) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.91E-03
B1182-1D	ELECTRICAL SPARKS FROM CAM VP-1 (SEAL & MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BSA-3-1L	HEPA FILTER P29-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
12) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.91E-03
B1182-1F	ELECTRICAL SPARKS FROM CAM VP-3 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BSA-3-1L	HEPA FILTER P29-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
13) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.26E-03
B1182-1D ELECTRICAL SPARKS FROM CAM VP-1 (SEAL & MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BVD450XS HAND OPERATED (MANUAL) VALVE TEED INTO LINE FROM P29 EXHAUS-ER ERRONOUSLYC	1E-2	1	1.00E-02	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
14) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.26E-03
B1182-1F ELECTRICAL SPARKS FROM CAM VP-3 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BVDP29ZS HAND OPERATED (MANUAL) VALVE FROM P29 EXHAUSTER ERRONOUSLY CLOSED	1E-2	1	1.00E-02	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
15) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.26E-03
B1182-1E ELECTRICAL SPARKS FROM CAM VP-2 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BVDP29ZS HAND OPERATED (MANUAL) VALVE FROM P29 EXHAUSTER ERRONOUSLY CLOSED	1E-2	1	1.00E-02	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
16) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.26E-03
B1182-1E ELECTRICAL SPARKS FROM CAM VP-2 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BVD450XS HAND OPERATED (MANUAL) VALVE TEED INTO LINE FROM P29 EXHAUS-ER ERRONOUSLYC	1E-2	1	1.00E-02	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
17) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.26E-03
B1182-1D ELECTRICAL SPARKS FROM CAM VP-1 (SEAL & MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BVDP29ZS HAND OPERATED (MANUAL) VALVE FROM P29 EXHAUSTER ERRONOUSLY CLOSED	1E-2	1	1.00E-02	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
18) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.26E-03
B1182-1F ELECTRICAL SPARKS FROM CAM VP-3 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BVD450XS HAND OPERATED (MANUAL) VALVE TEED INTO LINE FROM P29 EXHAUS-ER ERRONOUSLYC	1E-2	1	1.00E-02	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
19) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.21E-03
B1182-3A CAM SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
B1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFAK1-4G P29 FAN FAILS TO CONTINUE RUNNING (NON-CATASTROHIC)[E.G.FAN BELTS BREAK]	3E-5	168	5.01E-03	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
20) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	7.45E-04
B1184A ELECTRICAL SPARKS IN P29 VENTILATION DUCTWORK DUE TO FAILED BONDING	1E-6	4380	2.19E-03<	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BHTS1&2L ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
SEASON FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
21) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	7.45E-04
B1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
B1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BHTS1&2L ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
SEASON FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
22) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	7.45E-04
B1182-3E CAM SAMPLING SYSTEM VACUUM PUMP VP-3 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
B1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BHTS1&2L ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
SEASON FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
23) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	7.45E-04
B1182-3D CAM SAMPLING SYSTEM VACUUM PUMPS VP-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
B1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BHTS1&2L ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
SEASON FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
24) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	6.30E-04
B1182-1F ELECTRICAL SPARKS FROM CAM VP-3 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	
BFAK1-4G P29 FAN FAILS TO CONTINUE RUNNING (NON-CATASTROHIC)[E.G.FAN BELTS BREAK]	3E-5	168	5.01E-03	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
25) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	6.30E-04
B1182-1E ELECTRICAL SPARKS FROM CAM VP-2 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
BFAK1-4G P29 FAN FAILS TO CONTINUE RUNNING (NON-CATASTROHIC)[E.G.FAN BELTS BREAK]	3E-5	168	5.01E-03	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
26) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	6.30E-04
B1182-1D ELECTRICAL SPARKS FROM CAM VP-1 (SEAL & MOTOR)	3E-5	4380	6.29E-02	
BFAK1-4G P29 FAN FAILS TO CONTINUE RUNNING (NON-CATASTROHIC)[E.G.FAN BELTS BREAK]	3E-5	168	5.01E-03	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
27) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	4.05E-04
B1182-3A CAM SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
B1182-6A ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BDC-1-1E DEENTRAINER P-29 PLUGS	1E-5	168	1.68E-03<	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
28) B1153C ELECTOSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHT		0.01	1.00E-02	3.03E-04
BSA-3-1L HEPA FILTER P29-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
29) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	2.11E-04
B1182-1F ELECTRICAL SPARKS FROM CAM VP-3 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	
BDC-1-1E DEENTRAINER P-29 PLUGS	1E-5	168	1.68E-03<	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
30) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	2.11E-04
B1182-1E ELECTRICAL SPARKS FROM CAM VP-2 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	
BDC-1-1E DEENTRAINER P-29 PLUGS	1E-5	168	1.68E-03<	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
31) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	2.11E-04
B1182-1D ELECTRICAL SPARKS FROM CAM VP-1 (SEAL & MOTOR)	3E-5	4380	6.29E-02	
BDC-1-1E DEENTRAINER P-29 PLUGS	1E-5	168	1.68E-03<	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
32) B1153C ELECTOSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHT		0.01	1.00E-02	2.00E-04
BVDP29ZS HAND OPERATED (MANUAL) VALVE FROM P29 EXHAUSTER ERRONOUSLY CLOSED	1E-2	1	1.00E-02	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
33) B1153C ELECTOSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHT		0.01	1.00E-02	2.00E-04
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
YVD4503S HAND OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY ERRONOUS-LY LEFT CLOSED	1E-2	1	1.00E-02	
34) B1153C ELECTOSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHT		0.01	1.00E-02	2.00E-04
BVD450XS HAND OPERATED (MANUAL) VALVE TEED INTO LINE FROM P29 EXHAUS-ER ERRONOUSLYC	1E-2	1	1.00E-02	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
35) B1178 FLAMMABLE MIXTURE OF H2, AIR AND NO2 IN PUMP PIT		1.0	1.00E+00	1.70E-04
B1179A ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103-SYPUMP PIT	5E-4		5.00E-04	
BHTS1&2L ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
SEASON FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
36) B1153C ELECTOSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHT		0.01	1.00E-02	1.00E-04
BFAK1-4G P29 FAN FAILS TO CONTINUE RUNNING (NON-CATASTROHIC)[E.G.FAN BELTS BREAK]	3E-5	168	5.01E-03	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	

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PROB.MOD./CS.
PROB.

1) SYC3C

1) 81180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	*5.12E-01
81182-3A	CAM SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	2.41E-01
81182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
2) 81180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.26E-01
81182-1F	ELECTRICAL SPARKS FROM CAM VP-3 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
3) 81180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.26E-01
81182-1D	ELECTRICAL SPARKS FROM CAM VP-1 (SEAL & MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
4) 81180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.26E-01
81182-1E	ELECTRICAL SPARKS FROM CAM VP-2 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
5) 81153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHT		0.01	1.00E-02	2.00E-02
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
6) 81180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	4.38E-03
81184A	ELECTROSTATIC SPARKS IN P29 VENTILATION DUCTWORK DUE TO FAILED BONDING	1E-6	4380	2.19E-03<	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
7) 81180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	4.38E-03
81182-3C	CAM SAMPLING SYSTEM VACUUM PUMP VP-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
81182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
8) 81180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	4.38E-03
81182-3E	CAM SAMPLING SYSTEM VACUUM PUMP VP-3 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
81182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
9) 81180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	4.38E-03
81182-3D	CAM SAMPLING SYSTEM VACUUM PUMPS VP-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
81182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
10) 81178	FLAMMABLE MIXTURE OF H2, AIR AND NO2 IN PUMP PIT		1.0	1.00E+00	1.00E-03
81179A	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103-SYPUMP PIT	5E-4		5.00E-04	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	

CUTSET REPORT FOR SYC3D

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
1) 3YC3D					*1.25E-01
1) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	4.10E-02
B1182-3A	CAM SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
B1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BHTS1&2L	ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
SEASON	FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
2) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	2.14E-02
B1182-1D	ELECTRICAL SPARKS FROM CAM VP-1 (SEAL & MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BHTS1&2L	ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
SEASON	FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
3) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	2.14E-02
B1182-1E	ELECTRICAL SPARKS FROM CAM VP-2 (SEAL & MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BHTS1&2L	ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
SEASON	FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
4) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	2.14E-02
B1182-1F	ELECTRICAL SPARKS FROM CAM VP-3 (SEAL & MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BHTS1&2L	ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
SEASON	FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
5) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	3.66E-03
B1182-3A	CAM SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
B1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BSA-3-1L	HEPA FILTER P29-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
6) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHT		0.01	1.00E-02	3.40E-03
BHTS1&2L	ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
SEASON	FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
7) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	2.41E-03
B1182-3A	CAM SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
B1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BVDP29ZS	HAND OPERATED (MANUAL) VALVE P29 EXHAUSTER ERRONOUSLY CLOSED	1E-2	1	1.00E-02	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
8) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.91E-03
B1182-1F	ELECTRICAL SPARKS FROM CAM VP-3 (SEAL & MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BSA-3-1L	HEPA FILTER P29-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
9) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.91E-03
B1182-1E	ELECTRICAL SPARKS FROM CAM VP-2 (SEAL & MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BSA-3-1L	HEPA FILTER P29-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
10) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.91E-03
B1182-1D	ELECTRICAL SPARKS FROM CAM VP-1 (SEAL & MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BSA-3-1L	HEPA FILTER P29-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
11) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.26E-03
B1182-1D	ELECTRICAL SPARKS FROM CAM VP-1 (SEAL & MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BVDP29ZS	HAND OPERATED (MANUAL) VALVE P29 EXHAUSTER ERRONOUSLY CLOSED	1E-2	1	1.00E-02	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
12) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.26E-03
B1182-1E	ELECTRICAL SPARKS FROM CAM VP-2 (SEAL & MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BVDP29ZS	HAND OPERATED (MANUAL) VALVE P29 EXHAUSTER ERRONOUSLY CLOSED	1E-2	1	1.00E-02	
IE-103	BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
13) B1180A	FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.26E-03
B1182-1F	ELECTRICAL SPARKS FROM CAM VP-3 (SEAL & MOTOR)	3E-5	4380	6.29E-02	
BFLVENTP	FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	S.E. PROB.	MOD./CS. PROB.
BVDP2928 HAND OPERATED (MANUAL) VALVE P29 EXHAUSTER ERROROUSLY CLOSED	1E-2	1	1.00E-02	
1E-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
14) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	1.21E-03
B1182-3A CAN SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
B1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFAK1-4G P29 FAN FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)(E.G.FAN BELTS BREAK)	3E-5	168	5.01E-03	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
1E-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
15) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	7.45E-04
B1184A ELECTRICAL SPARKS IN P29 VENTILATION DUCTWORK DUE TO FAILED BONDING	1E-6	4380	2.19E-03	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BHTS1&2L ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
1E-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
16) SEASON FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	7.45E-04
B1182-3D CAN SAMPLING SYSTEM VACUUM PUMPS VP-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03	
B1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BHTS1&2L ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
1E-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
17) SEASON FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	7.45E-04
B1182-3C CAN SAMPLING SYSTEM VACUUM PUMP VP-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03	
B1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BHTS1&2L ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
1E-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
18) SEASON FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	7.45E-04
B1182-3E CAN SAMPLING SYSTEM VACUUM PUMP VP-3 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03	
B1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
BHTS1&2L ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
1E-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
19) SEASON FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	6.30E-04
B1182-1E ELECTRICAL SPARKS FROM CAM VP-2 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	
BFAK1-4G P29 FAN FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)(E.G.FAN BELTS BREAK)	3E-5	168	5.01E-03	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
1E-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
20) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	6.30E-04
B1182-1F ELECTRICAL SPARKS FROM CAM VP-3 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	
BFAK1-4G P29 FAN FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)(E.G.FAN BELTS BREAK)	3E-5	168	5.01E-03	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
1E-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
21) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	6.30E-04
B1182-1D ELECTRICAL SPARKS FROM CAM VP-1 (SEAL & MOTOR)	3E-5	4380	6.29E-02	
BFAK1-4G P29 FAN FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)(E.G.FAN BELTS BREAK)	3E-5	168	5.01E-03	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
1E-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
22) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	4.05E-04
B1182-3A CAN SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
B1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMPS OPERATION (MOTOR)		1.0	1.00E+00	
BDC-1-1E DEENTRAINER P-29 PLUGS	1E-5	168	1.68E-03	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
1E-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
23) B1153C ELECTOSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHT		0.01	1.00E-02	3.03E-04
BBA-3-1L HEPA FILTER P29-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
1E-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
24) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	2.11E-04
B1182-1F ELECTRICAL SPARKS FROM CAM VP-3 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	
BDC-1-1E DEENTRAINER P-29 PLUGS	1E-5	168	1.68E-03	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
1E-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
25) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	2.11E-04
B1182-1E ELECTRICAL SPARKS FROM CAM VP-2 (SEAL AND MOTOR)	3E-5	4380	6.29E-02	
BDC-1-1E DEENTRAINER P-29 PLUGS	1E-5	168	1.68E-03	
BFLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
1E-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
26) B1180A FLAMMABLE MIXTURE ON H2, AIR AND NO2 IN THE P29 VENT. SYSTEM		1.0	1.00E+00	2.11E-04

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
B1182-1D ELECTRICAL SPARKS FROM CAM VP-1 (SEAL & MOTOR)	3E-5	4380	6.29E-02	
BDC-1-1E DEENTRAINER P-29 PLUGS	1E-5	168	1.68E-03	
SPLVENTP FLAME PROPAGES BACK TO TANK FROM P-29 VENTILATION SYSTEM		1.0	1.00E+00	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
27) B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHT		0.01	1.00E-02	2.00E-04
BVDP2928 HAND OPERATED (MANUAL) VALVE P29 EXHAUSTER ERRONOUSLY CLOSED	1E-2	1	1.0E-02	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
28) B1178 FLAMMABLE MIXTURE OF H2, AIR AND NO2 IN PUMP PIT		1.0	1.00E+00	1.70E-04
B1179A ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103-SYPUMP PIT		5E-4	5.00E-04	
BHTS182L ELECTRICAL HEATERS HTS-1 AND HTS-2 ARE LOCKED OUT		1.0	1.00E+00	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	
SEASON FRACTION/YEAR THE WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPERATU		1.7E-1	1.70E-01	
29) B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHT		0.01	1.00E-02	1.00E-04
BFAK1-4G P29 FAN FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC) [E.G. FAN BELTS BREAK]	3E-5	168	5.01E-03	
IE-103 BURPS/YEAR IN TANK 103-SY		2.0	2.00E+00	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
1) SYCSB				*2.33E-03
1) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-04
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
2) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-04
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
3) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.16E-04
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
4) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.16E-04
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
5) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.16E-04
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
6) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.16E-04
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
7) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-05
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
8) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
9) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-05
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
10) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-05
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
11) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.51E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE2 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
TOACAM1T HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
12) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.51E-05
T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1163B7A ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TPAAMHOL AMMONIA BUBBLER PIP-ING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
13) TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.19E-05
T1173C ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (SEAL & MOTOR)	5E-7	2400	6.00E-04	
TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
14) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.16E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
15) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.16E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
16) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.31E-05
T11560 ELECTRICAL SPARKS FROM EXPLOSION PROOF LIGHT OR LIGHT LEAD FAULTS	1E-6	720	3.60E-04	
TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
17) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.28E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE2 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
TOACAM1T HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
18) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.28E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE2 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
TOACAM1T HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
19) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.26E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
20) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.26E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [E.G. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVD5Y-2S HAND OPERATED (MANUAL) VALVE MV-K1-SY-2 TO P-28 FAN ERRONEOUSLY LEFT CLOSE		1E-2	1.00E-02	
21) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
22) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
23) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	2400	1.20E-03	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
24) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
25) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
26) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183' IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
27) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183' IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
28) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	2400	1.20E-03	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
29) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-06
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1P DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
30) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-06
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSJ-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
31) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-06
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST1 STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
32) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.47E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
33) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.47E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
34) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.43E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDSY-2S HAND OPERATED (MANUAL) VALVE MV-K1-SY-2 TO P-28 FAN ERRONEOUSLY LEFT CLOSE	1E-2	1.00E-02		
35) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.43E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDSY-2S HAND OPERATED (MANUAL) VALVE MV-K1-SY-2 TO P-28 FAN ERRONEOUSLY LEFT CLOSE	1E-2	1.00E-02		
36) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.32E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFAP-2BG P-28 FAILS TO CONTINUE RUNNING	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
37) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.28E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFAP-28F	BACKUP EXHAUST FAN P-28 FAILS TO START	5E-3	1	5.00E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
38) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-06
T1160A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1163B7A	ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TPAAMHOL	AMMONIA BUBBLER PIP-ING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
39) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-06
T1160A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1161B7A	ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TPATELEL	TELEDYNE H2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
40) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-06
T1160A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1163B7A	ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TPAAMHOL	AMMONIA BUBBLER PIP-ING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
41) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-06
T1160A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1161B7A	ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TPATELEL	TELEDYNE H2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
42) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.78E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVD4502D	HAND OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTRC	9E-8	168	1.51E-05<	
43) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.78E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVD4503D	HAND OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRC	9E-8	168	1.51E-05<	
44) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.68E-06
T1173C	ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (SEAL & MOTOR)	5E-7	2400	6.00E-04	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
45) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.68E-06
T1173C	ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (SEAL & MOTOR)	5E-7	2400	6.00E-04	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
46) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1P	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
47) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST1	STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
48) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST1	STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
49) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSJ-1-13	TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
50) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1P	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
51) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSJ-1-13	TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
52) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.65E-06
T1155B	MECHANICAL SPARKS FROM SLUDGE WEIGHT/ CABLE STRIKING SAMPLING TUBES		0.0001	1.00E-04	
TV4501S	MANUAL VALVE 4501 FROM TANK 101-SY ERRONEOUSLY LEFT CLOSED		1E-2	1.00E-02	
53) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.65E-06
T1155A	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAI		0.0001	1.00E-04	
TV4501S	MANUAL VALVE 4501 FROM TANK 101-SY ERRONEOUSLY LEFT CLOSED		1E-2	1.00E-02	
54) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.23E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TF4K1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING	3E-5	168	5.03E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
55) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.23E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TF4K1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING	3E-5	168	5.03E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
56) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.21E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TF4K1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
TFAP-28F	BACKUP EXHAUST FAN P-28 FAILS TO START	5E-3	1	5.00E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
57) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.21E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TF4K1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
TFAP-28F	BACKUP EXHAUST FAN P-28 FAILS TO START	5E-3	1	5.00E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
58) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.34E-06
T1157K	RANGE FIRE PRODUCES SPARKS THAT FAIL VENT AND IGNITE LEAKING H2	4E-7	1.6	6.40E-07	
59) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.21E-06
T1156D	ELECTRICAL SPARKS FROM EXPLOSION PROOF LIGHT OR LIGHT LEAD FAULTS	1E-6	720	3.60E-04	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
60) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.21E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182B	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYST	3E-7	2400	3.60E-04	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
61) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.21E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182B	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYST	3E-7	2400	3.60E-04	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
62) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.21E-06
T1156D	ELECTRICAL SPARKS FROM EXPLOSION PROOF LIGHT OR LIGHT LEAD FAULTS	1E-6	720	3.60E-04	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
63) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.21E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182C	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYST	3E-7	2400	3.60E-04	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
64) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.21E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182C	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYST	3E-7	2400	3.60E-04	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
65) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.19E-06

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
T1173A	ELECTRICAL SPARK FROM FAULT IN THE (WHITTAKER) CHEMICAL CELL H2 ANALYZER	5E-8	2400	6.00E-05	
TV04501S	MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
66) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.19E-06
T1156A	ELECTRICAL SPARKS FROM FIC LEVEL PROBE	5E-8	2400	6.00E-05	
TV04501S	MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
67) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.16E-06
T1160A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1161B4	ELECTRICAL SPARK FROM THE TELEDYNE VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
68) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.16E-06
T1160A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1161B4	ELECTRICAL SPARK FROM THE TELEDYNE VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
69) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.04E-06
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST2	LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
70) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.94E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TV04503D	HAND OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRC	9E-8	168	1.51E-05<	
71) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.94E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TV04502D	HAND OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTRC	9E-8	168	1.51E-05<	
72) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.94E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TV04503D	HAND OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRC	9E-8	168	1.51E-05<	
73) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.94E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TV04502D	HAND OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTRC	9E-8	168	1.51E-05<	
74) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.64E-06
T1173B	IGNITION SOURCE FROMCATASTROPHIC FAILUREOF CHEMICAL CELL VACUUM PUMP (BEAR	1E-6	45	4.50E-05	
TV04501S	MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
75) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.43E-06
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TV0UCV1C	HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
76) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.26E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS])	3E-5	168	5.01E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TOAP-28Q	HUMAN OPERATOR FAILS TO START BACKUP FAN P-28	1E-3	1	1.00E-03	
77) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183	IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
78) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3D	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03	
79) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BOND IN	1E-6	2400	1.20E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03	
80) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03	
81) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.05E-06
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST2 LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
82) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.05E-06
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST2 LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
83) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	8.21E-07
T1156C ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE	5E-7	45	2.25E-05	
TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERROROUSLY LEFT CLOSED		1E-2	1.00E-02	
84) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-07
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
85) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-07
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
86) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-07
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVN) SYSTEM	1E-6	2400	1.20E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
87) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.36E-07
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BOND IN	1E-6	2400	1.20E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
88) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.33E-07
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDUCV1C HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
89) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.33E-07
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDUCV1C HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
90) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-07
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T116187A ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TPATELEL TELEDYNE H2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	

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		RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
TVB-1-1P	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
91) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-07
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1160A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1163B7A	ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TPAAMOL	AMMONIA BUBBLER PIP-ING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
TVB-1-1P	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
92) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.43E-07
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TOAP-2BQ	HUMAN OPERATOR FAILS TO START BACKUP FAN P-28	1E-3	1	1.00E-03	
93) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.43E-07
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TOAP-2BQ	HUMAN OPERATOR FAILS TO START BACKUP FAN P-28	1E-3	1	1.00E-03	
94) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.25E-07
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1173C	ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (SEAL & MOTOR)	5E-7	2400	6.00E-04	
TVB-1-1P	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
95) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.13E-07
T1155B	MECHANICAL SPARKS FROM SLUDGE WEIGHT/ CABLE STRIKING SAMPLING TUBES		0.0001	1.00E-04	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
96) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.13E-07
T1155A	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAI		0.0001	1.00E-04	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
97) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.13E-07
T1155A	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAI		0.0001	1.00E-04	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
98) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.13E-07
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183D	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAI		0.0001	1.00E-04	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
99) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.13E-07
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183D	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAI		0.0001	1.00E-04	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
100) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.13E-07
T1155B	MECHANICAL SPARKS FROM SLUDGE WEIGHT/ CABLE STRIKING SAMPLING TUBES		0.0001	1.00E-04	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
101) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.01E-07
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TCNCAM13	CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDSY-2S	HAND OPERATED (MANUAL) VALVE MV-K1-SY-2 TO P-28 FAN ERRONEOUSLY LEFT CLOSE		1E-2	1.00E-02	
102) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	5.91E-07
PWR2	LOSS OF POWER TO SY TANK FARM	1E-5	45	4.50E-04	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1184A	ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	2400	1.20E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TGB-4-1F	DIESEL GENERATOR FOR EXHAUST FANS P-23 & P-28 FAILS TO START	3E-1	1	3.00E-01	
103) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	5.91E-07
PWR2	LOSS OF POWER TO SY TANK FARM	1E-5	45	4.50E-04	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183	IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TGB-4-1F	DIESEL GENERATOR FOR EXHAUST FANS P-23 & P-28 FAILS TO START	3E-1	1	3.00E-01	
104) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	5.84E-07
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183A	MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF K1-4-1 (P-23) FAN (IN VENTI	1E-5	1.6	1.60E-05	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDSY-2S	HAND OPERATED (MANUAL) VALVE MV-K1-SY-2 TO P-28 FAN ERRONEOUSLY LEFT CLOSE		1E-2	1.00E-02	

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105)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.93E-07
	T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
	T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
	T1163B7C ELECTRICAL SPARK FROM THE AMMONIA BUBBLER VACUUM PUMP FAILURE (SEAL & MOTO	3E-5	43	1.35E-03	
	TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
106)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-07
	T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	THOUSE2 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
	TOACAM1T HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
107)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-07
	T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	2400	1.20E-03	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	THOUSE2 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
	TOACAM1T HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
108)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-07
	T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
	T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	THOUSE2 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
	TOACAM1T HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
109)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-07
	T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
	T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	THOUSE2 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
	TOACAM1T HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
110)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-07
	T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
	T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
	T1163B7A ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TPDAYACL AMMONIA BUBBLER VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABINET	1E-6	2400	1.20E-03	
	TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
111)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.26E-07
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
	T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TOAT1-20 HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE LOW TI-1-2 READING	1E-3	1	1.00E-03	
	TOAUCV1U HUMAN OPERATOR FTRTCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VAL	1E-2	1	1.00E-02	
112)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-07
	T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
	T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFC-3-1E HEPA FILTER K1-3-1 PLUGS, DUE TO PARTICULATES	1E-8	168	1.68E-06	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
113)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-07
	T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
	T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
	T1161B7A ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
	TPATELEL TELEDYNE H2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
114)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.21E-07
	T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
	T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
	T1163B7A ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
	TPAAMHOL AMMONIA BUBBLER PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
115)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.77E-07
	T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
	T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TVDSY-2A HAND OPERATED (MANUAL) VALVE MV-K1-SY-2 TO P-28 FAN W.C., FTOD	3E-4	1	3.00E-04	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
116) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.77E-07
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDSY-1B HAND OPERATED (MANUAL) VALVE MV-K1-SY-1 TO P-23 FAN N.O., FTCD	3E-4	1	3.00E-04	
117) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.75E-07
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1156D ELECTRICAL SPARKS FROM EXPLOSION PROOF LIGHT OR LIGHT LEAD FAULTS	1E-6	720	3.60E-04	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
118) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.75E-07
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182C ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYST	3E-7	2400	3.60E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
119) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.75E-07
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182B ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYST	3E-7	2400	3.60E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
120) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.68E-07
T1173C ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (SEAL & MOTOR)	5E-7	2400	6.00E-04	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
121) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.68E-07
T1173A ELECTRICAL SPARK FROM FAULT IN THE (WHITTAKER) CHEMICAL CELL H2 ANALYZER	5E-8	2400	6.00E-05	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
122) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.68E-07
T1173A ELECTRICAL SPARK FROM FAULT IN THE (WHITTAKER) CHEMICAL CELL H2 ANALYZER	5E-8	2400	6.00E-05	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
123) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.68E-07
T1156A ELECTRICAL SPARKS FROM FIC LEVEL PROBE	5E-8	2400	6.00E-05	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
124) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.68E-07
T1156A ELECTRICAL SPARKS FROM FIC LEVEL PROBE	5E-8	2400	6.00E-05	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
125) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-07
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1161B4 ELECTRICAL SPARK FROM THE TELEDYNE VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
126) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.65E-07
T1153A ELECTROSTATIC SPARKS FROM LESS THAN SUFFICIENT BONDING/GROUNDING OF TANK R		0.00001	1.00E-05	
TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONEOUSLY LEFT CLOSED		1E-2	1.00E-02	
127) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.08E-07
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TCHCAM13 CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDSY-2S HAND OPERATED (MANUAL) VALVE MV-K1-SY-2 TO P-28 FAN ERRONEOUSLY LEFT CLOSE		1E-2	1.00E-02	
128) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.08E-07
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TCHCAM13 CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDSY-2S HAND OPERATED (MANUAL) VALVE MV-K1-SY-2 TO P-28 FAN ERRONEOUSLY LEFT CLOSE		1E-2	1.00E-02	
129) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.03E-07
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TCHCAM13 CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
130) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.01E-07
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	

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RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
2E-5	12	2.40E-6	
5E-3	1	5.00E-03	
	1.0	1.00E+00	

TCHCAM13 CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS
TFAP-28F BACKUP EXHAUST FAN P-28 FAILS TO START
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM

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MODULE/EVENT NAME DESCRIPTION

RATE
....EXPOSURE
.....B.E.
PROB.
.....MOD./CS.
PROB.
.....

1) SYCSO

1) 81180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.00E+00	*4.93E-03
IE-103	BURPS PER YEAR IN 103-SY	2	2.00E+00	1.26E-03
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1.0	1.00E+00	
TVDSY-1S	MANUAL VALVE MV-K1-SY-1 ERROROUSLY LEFT CLOSED	1E-2	1	1.00E-02
2) 81180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.00E+00	4.05E-04
IE-103	BURPS PER YEAR IN 103-SY	2	2.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)	1.0	1.00E+00	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1.0	1.00E+00	
3) 81180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.00E+00	4.05E-04
IE-103	BURPS PER YEAR IN 103-SY	2	2.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)	1.0	1.00E+00	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1.0	1.00E+00	
4) 81180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.00E+00	4.05E-04
IE-103	BURPS PER YEAR IN 103-SY	2	2.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)	1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1.0	1.00E+00	
TVB-1-1P	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<
5) 81180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.00E+00	2.11E-04
IE-103	BURPS PER YEAR IN 103-SY	2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1.0	1.00E+00	
TVB-1-1P	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<
6) 81180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.00E+00	2.11E-04
IE-103	BURPS PER YEAR IN 103-SY	2	2.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1.0	1.00E+00	
7) 81180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.00E+00	2.11E-04
IE-103	BURPS PER YEAR IN 103-SY	2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1.0	1.00E+00	
8) 81180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.00E+00	2.11E-04
IE-103	BURPS PER YEAR IN 103-SY	2	2.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1.0	1.00E+00	
9) 81180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.00E+00	2.11E-04
IE-103	BURPS PER YEAR IN 103-SY	2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1.0	1.00E+00	
10) 81180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.00E+00	2.11E-04
IE-103	BURPS PER YEAR IN 103-SY	2	2.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1.0	1.00E+00	
TVB-1-1P	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<
11) 81153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)	0.01	1.00E-02	2.00E-04
IE-103	BURPS PER YEAR IN 103-SY	2	2.00E+00	
TVDSY-1S	MANUAL VALVE 4503 FROM TANK 103-SY ERROROUSLY LEFT CLOSED	1E-2	1	1.00E-02
12) 81153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)	0.01	1.00E-02	2.00E-04
IE-103	BURPS PER YEAR IN 103-SY	2	2.00E+00	
TVDSY-1S	MANUAL VALVE MV-K1-SY-1 ERROROUSLY LEFT CLOSED	1E-2	1	1.00E-02
13) 81180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.00E+00	4.38E-05
IE-103	BURPS PER YEAR IN 103-SY	2	2.00E+00	
T1184A	ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	4380	2.19E-03<
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1.0	1.00E+00	
TVDSY-1S	MANUAL VALVE MV-K1-SY-1 ERROROUSLY LEFT CLOSED	1E-2	1	1.00E-02
14) 81180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.00E+00	4.05E-05
IE-103	BURPS PER YEAR IN 103-SY	2	2.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)	1.0	1.00E+00	
TDC-1-1P	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
15) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	4.05E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
ST1 STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
16) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	4.05E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
17) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	4.05E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSJ-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
18) B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		0.01	1.00E-02	3.36E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03	
19) B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		0.01	1.00E-02	3.36E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03	
20) B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		0.01	1.00E-02	3.36E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03	
21) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.11E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
ST1 STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
22) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.11E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
23) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.11E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSJ-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
24) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.11E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDC-1-1P DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
25) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.11E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
26) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.11E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSJ-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
27) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.11E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
ST1 STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
28) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.11E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDC-1-1P DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
29) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.22E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
30) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.21E-05
BVDP28ZS MANUAL VALVE P28Z FROM P28 EXHAUSTER ERRONOUSLY LEFT CLOSED	1E-2	1	1.00E-02	
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
31) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.21E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDSY-2S MANUAL VALVE MV-K1-SY-2 TEED INTO SY MAIN VENT. HEADER ERRONOUSLY LEFT	1E-2	1	1.00E-02	
32) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.21E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDSY-1T MANUAL VALVE MV-K1-SY-1 ERRONOUSLY LEFT OPEN	1E-2	1	1.00E-02	
33) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.16E-05
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
ST2 LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
34) B1178 FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO2 IN THE PUMP PIT		1.0	1.00E+00	1.00E-05
B1179A ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103SY PUMP PIT		5E-4	5.00E-04	
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
TVD4503S MANUAL VALVE 4503 FROM TANK 103-SY ERRONOUSLY LEFT CLOSED	1E-2	1	1.00E-02	
35) B1178 FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO2 IN THE PUMP PIT		1.0	1.00E+00	1.00E-05
B1179A ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103SY PUMP PIT		5E-4	5.00E-04	
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
TVDSY-1S MANUAL VALVE MV-K1-SY-1 ERRONOUSLY LEFT CLOSED	1E-2	1	1.00E-02	
36) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	8.10E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDUCV1C HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
37) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	4380	2.19E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
38) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
39) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	4380	2.19E-03<	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
40) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
41) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	4380	2.19E-03<	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
42) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	4380	2.19E-03<	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
43) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
44) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING	1E-6	4380	2.19E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
45) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING	1E-6	4380	2.19E-03<	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
46) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
47) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
48) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.36E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
49) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.34E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS M.O., FTRO	3E-7	168	5.04E-05	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
50) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.34E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS M.O., FTRO	3E-7	168	5.04E-05	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
51) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.30E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS])	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDSY-1T MANUAL VALVE MV-K1-SY-1 ERRONEOUSLY LEFT OPEN	1E-2	1	1.00E-02	
52) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.30E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS])	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDSY-2S MANUAL VALVE MV-K1-SY-2 TEED INTO SY MAIN VENT. HEADER ERRONEOUSLY LEFT	1E-2	1	1.00E-02	
53) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.30E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS])	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDSY-2S MANUAL VALVE MV-K1-SY-2 TEED INTO SY MAIN VENT. HEADER ERRONEOUSLY LEFT	1E-2	1	1.00E-02	
54) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.30E-06

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDSY-1T	MANUAL VALVE MV-K1-SY-1 ERRONOUSLY LEFT OPEN	1E-2	1	1.00E-02	
55) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.30E-06
BVDP28ZS	MANUAL VALVE P28Z FROM P28 EXHAUSTER FRRRONOUSLY LEFT CLOSED	1E-2	1	1.00E-02	
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
56) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.30E-06
BVDP28ZS	MANUAL VALVE P28Z FROM P28 EXHAUSTER FRRRONOUSLY LEFT CLOSED	1E-2	1	1.00E-02	
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
57) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.08E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING	3E-5	168	5.03E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
58) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.04E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFAP-28F	BACKUP EXHAUST FAN P-28 FAILS TO START	5E-3	1	5.00E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
59) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.04E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
ST2	LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
60) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.04E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
ST2	LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
61) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	4.23E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDUCV1C	HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
62) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	4.23E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDUCV1C	HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
63) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		0.01	1.00E-02	3.36E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
THA-2-14	STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
64) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		0.01	1.00E-02	3.36E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
TDC-1-1P	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
65) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		0.01	1.00E-02	3.36E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
ST1	STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
66) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		0.01	1.00E-02	3.36E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
TSJ-1-13	TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
67) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.17E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING	3E-5	168	5.03E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
68) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.17E-06

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING	3E-5	168	5.03E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
69) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.15E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFAP-28F	BACKUP EXHAUST FAN P-28 FAILS TO START	5E-3	1	5.00E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
70) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.15E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFAP-28F	BACKUP EXHAUST FAN P-28 FAILS TO START	5E-3	1	5.00E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
71) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.41E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TOAT1-2Q	HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE LOW TI-1-2 READING	1E-3	1	1.00E-03	
TOAUCV1U	HUMAN OPERATOR FTRTCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VAL	1E-2	1	1.00E-02	
72) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.21E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182B	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYST	3E-7	4380	6.57E-04	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
73) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.21E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182C	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYST	3E-7	4380	6.57E-04	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
74) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.21E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182C	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYST	3E-7	4380	6.57E-04	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
75) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.21E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182C	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYST	3E-7	4380	6.57E-04	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
76) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.21E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182B	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYST	3E-7	4380	6.57E-04	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
77) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.21E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182B	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYST	3E-7	4380	6.57E-04	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
78) B1156A	ELECTRICAL SPARKS FROM FIC LEVEL PROBE	5E-8	4380	1.09E-04<	2.18E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
TVDSY-1S	MANUAL VALVE MV-K1-SY-1 ERRONOUSLY LEFT CLOSED	1E-2	1	1.00E-02	
79) B1156A	ELECTRICAL SPARKS FROM FIC LEVEL PROBE	5E-8	4380	1.09E-04<	2.18E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
TVD4503S	MANUAL VALVE 4503 FROM TANK 103-SY ERRONOUSLY LEFT CLOSED	1E-2	1	1.00E-02	
80) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.00E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1183D	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAI		0.0001	1.00E-04	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDSY-1S	MANUAL VALVE MV-K1-SY-1 ERRONOUSLY LEFT CLOSED	1E-2	1	1.00E-02	
81) B1178	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO2 IN THE PUMP PIT		1.0	1.00E+00	1.68E-06
B1179A	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103SY PUMP PIT		5E-4	5.00E-04	
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
82) B1178	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO2 IN THE PUMP PIT		1.0	1.00E+00	1.68E-06

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
83)	B1179A ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103SY PUMP PIT		5E-4	5.00E-04	
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
	B1178 FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO2 IN THE PUMP PIT		1.0	1.00E+00	1.68E-06
	B1179A ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103SY PUMP PIT		5E-4	5.00E-04	
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
84)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MA. SY VENTILATION SYST		1.0	1.00E+00	1.26E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TOAT1-2Q HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE LOW TI-1-2 READING	1E-3	1	1.00E-03	
	TOAUCV1U HUMAN OPERATOR FTRTCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VAL	1E-2	1	1.00E-02	
85)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.26E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TOAT1-2Q HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE LOW TI-1-2 READING	1E-3	1	1.00E-03	
	TOAUCV1U HUMAN OPERATOR FTRTCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VAL	1E-2	1	1.00E-02	
86)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.21E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
	T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TOAP-28Q HUMAN OPERATOR FAILS TO START BACKUP FAN P-28	1E-3	1	1.00E-03	
87)	B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		0.01	1.00E-02	1.01E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
88)	B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		0.01	1.00E-02	1.00E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
	TVDSY-1T MANUAL VALVE MV-K1-SY-1 ERRONOUSLY LEFT OPEN	1E-2	1	1.00E-02	
89)	B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		0.01	1.00E-02	1.00E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
	TVDSY-2S MANUAL VALVE MV-K1-SY-2 TEED INTO SY MAIN VENT. HEADER ERRONOUSLY LEF	1E-2	1	1.00E-02	
90)	B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		0.01	1.00E-02	1.00E-06
	BVDP28ZS MANUAL VALVE P28Z FROM P28 EXHAUSTER FRRRONOUSLY LEFT CLOSED	1E-2	1	1.00E-02	
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
1) SYC9A				*2.46E-02
1) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-03
T1171E ELECTROSTATIC SPARKS IN THE P-28 "ELEPHANT TRUNK" CONNECTION DUE TO FAILED	1E-6	2400	1.20E-03	
2) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.51E-03
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		0.01	1.00E-02	
3) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.51E-03
T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T116387A ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TPAAMMOL AMMONIA BUBBLER PIP-ING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
4) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.51E-03
T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T116187A ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TPATELEL TELEDYNE H2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
5) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.19E-03
T1173C ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (SEAL & MOTOR)	5E-7	2400	6.00E-04	
6) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.31E-03
T1171D ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-4 ON THE P-28 EXHAUSTER	3E-7	2400	3.60E-04	
7) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.31E-03
T1171B ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-1 ON THE P-28 EXHAUSTER	3E-7	2400	3.60E-04	
8) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.31E-03
T1156D ELECTRICAL SPARKS FROM EXPLOSION PROOF LIGHT OR LIGHT LEAD FAULTS	1E-6	720	3.60E-04	
9) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.31E-03
T1171C ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-2 ON THE P-28 EXHAUSTER	3E-7	2400	3.60E-04	
10) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.28E-03
T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T116184 ELECTRICAL SPARK FROM THE TELEDYNE VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
11) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.28E-03
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		0.01	1.00E-02	
12) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.28E-03
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		0.01	1.00E-02	
13) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.65E-04
T1155A MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAI		0.0001	1.00E-04	
14) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.65E-04
T1155B MECHANICAL SPARKS FROM SLUDGE WEIGHT/ CABLE STRIKING SAMPLING TUBES		0.0001	1.00E-04	
15) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.07E-04
T1171A IGNITION SOURCE FROM P-28 FAN (FAN RUNNING)	1E-6	168	8.40E-05	
16) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.19E-04
T1173A ELECTRICAL SPARK FROM FAULT IN THE (WHITTAKER) CHEMICAL CELL H2 ANALYZER	5E-8	2400	6.00E-05	
17) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.19E-04
T1156A ELECTRICAL SPARKS FROM FIC LEVEL PROBE	5E-8	2400	6.00E-05	
18) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		0.01	1.00E-02	
19) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		0.01	1.00E-02	
20) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	2400	1.20E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		0.01	1.00E-02	
21) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-05
T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T116187A ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TPDTVACL TELEDYNE H2 SAMPLING SYSTEM VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO	1E-6	2400	1.20E-03	
22) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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T1182-3C	CAN SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A	ELECTRICAL SPARK FROM CAN VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		0.01	1.00E-02	
23) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-05
T1160A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1163B7A	ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TPDAVACL	AMMONIA BUBBLER VACUUM PUMP LEAKS ON OUTLET SIDE OF PUMP INTO CABINET	1E-6	2400	1.20E-03	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
1) SYC9B				*9.09E-03
1) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.51E-03
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TV4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
7) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.28E-03
T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TVL 501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
3) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.28E-03
T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TV4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
4) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.28E-03
T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TV4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
5) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.13E-04
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TF4K1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
6) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.13E-04
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TF4K1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
7) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.09E-04
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TF4K1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
8) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.09E-04
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TF4K1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
9) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.09E-04
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TF4K1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
10) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.09E-04
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TF4K1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
11) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.09E-04
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TF4K1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
12) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-05
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
13) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-05
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
14) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-05
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
15) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-05
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
16) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-05
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
17) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-05
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
18) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-05
T1171E ELECTROSTATIC SPARKS IN THE P-28 "ELEPHANT TRUNK" CONNECTION DUE TO FAILED	1E-6	2400	1.20E-03	
TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
19) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-05
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178D P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-3 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
20) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-05
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178C P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
21) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.38E-05
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178B P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
22) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-05
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
23) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-05
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
24) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-05
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
25) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-05
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
26) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-05
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
27)	TDC-1-1E DEENTRAINER K1-1-1 PLUGS IE-101 BURPS PER YEAR IN 101-SY N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR) TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1E-5	168 3.65 1.0 .17 1.0 2400 168	1.68E-03< 3.65E+00 1.00E+00 1.70E-01 1.00E+00 3.51E-02 1.68E-03<	3.66E-05
28)	IE-101 BURPS PER YEAR IN 101-SY N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR) TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1E-5	3.65 1.0 .17 1.0 2400 168 1.0	3.65E+00 1.00E+00 1.70E-01 1.00E+00 3.51E-02 1.68E-03< 1.00E+00	3.66E-05
29)	IE-101 BURPS PER YEAR IN 101-SY N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR) TDC-1-1E DEENTRAINER K1-1-1 PLUGS TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1E-5	3.65 1.0 .17 1.0 2400 168 1.0	3.65E+00 1.00E+00 1.70E-01 1.00E+00 3.51E-02 1.68E-03< 1.00E+00	3.66E-05
30)	IE-101 BURPS PER YEAR IN 101-SY N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR) TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	3.65 1.0 .17 2400 168	3.65E+00 1.00E+00 1.70E-01 3.51E-02 1.68E-03<	3.66E-05
31)	IE-101 BURPS PER YEAR IN 101-SY N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR) TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	3.65 1.0 .17 2400 168	3.65E+00 1.00E+00 1.70E-01 3.51E-02 1.68E-03<	3.66E-05
32)	IE-101 BURPS PER YEAR IN 101-SY N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR) TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	3.65 1.0 .17 1.0 2400 168 1.0	3.65E+00 1.00E+00 1.70E-01 1.00E+00 3.51E-02 1.68E-03< 1.00E+00	3.66E-05
33)	IE-101 BURPS PER YEAR IN 101-SY N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR) TDC-1-1E DEENTRAINER K1-1-1 PLUGS TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1E-5	3.65 1.0 .17 1.0 2400 168 1.0	3.65E+00 1.00E+00 1.70E-01 1.00E+00 3.51E-02 1.68E-03< 1.00E+00	3.66E-05
34)	IE-101 BURPS PER YEAR IN 101-SY N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR) TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	3.65 1.0 .17 2400 168	3.65E+00 1.00E+00 1.70E-01 3.51E-02 1.68E-03<	3.66E-05
35)	IE-101 BURPS PER YEAR IN 101-SY N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR) TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	3.65 1.0 .17 2400 168	3.65E+00 1.00E+00 1.70E-01 3.51E-02 1.68E-03<	3.66E-05
36)	IE-101 BURPS PER YEAR IN 101-SY N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR) TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	3.65 1.0 .17 2400 168	3.65E+00 1.00E+00 1.70E-01 3.51E-02 1.68E-03<	3.66E-05
37)	IE-101 BURPS PER YEAR IN 101-SY T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER T1163B7A ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR) TPAAMOL AMMONIA BUBBLER PIP-ING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED	6E-5	3.65 1.0 0.01 1.0 2400 1E-2	3.65E+00 1.00E+00 1.00E-02 1.00E+00 6.87E-02 1.00E-02	2.51E-05
38)	IE-101 BURPS PER YEAR IN 101-SY T1173C ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (SEAL & MOTOR) TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED	5E-7	3.65 2400 1E-2	3.65E+00 6.00E-04 1.00E-02	2.19E-05

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
39) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.31E-05
T1171C ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-2 ON THE P-28 EXHAUSTER	3E-7	2400	3.60E-04	
TV4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
40) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.31E-05
T1171D ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-4 ON THE P-28 EXHAUSTER	3E-7	2400	3.60E-04	
TV4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
41) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.31E-05
T1171B ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-1 ON THE P-28 EXHAUSTER	3E-7	2400	3.60E-04	
TV4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
42) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.31E-05
T1156D ELECTRICAL SPARKS FROM EXPLOSION PROOF LIGHT OR LIGHT LEAD FAULTS	1E-6	720	3.60E-04	
TV4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
43) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.05E-05
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TF4K1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
44) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.05E-05
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TF4K1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
45) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.02E-05
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TCHCAM13 CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
46) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.02E-05
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TCHCAM13 CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
47) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	8.42E-06
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TV4501C HAND OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.O., FTRO	2E-7	168	3.36E-05	
48) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1P DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
49) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TSJ-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
50) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST1 STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
51) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST1 STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
52) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TDC-1-1P DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
53) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSJ-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
54) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
55) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
56) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.32E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
57) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.32E-06
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
58) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	6.21E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183A MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF K1-4-1 (P-23) FAN (IN VENTI	1E-5	1.0	1.00E-05	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
59) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	5.37E-06
T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
60) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	5.37E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
61) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	5.37E-06
T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
62) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	5.37E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
63) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	5.37E-06
T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
64) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	5.23E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TCHCAM13 CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
65) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	5.23E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TCHCAM13 CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
66) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	5.23E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TCHCAM13 CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
67) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	5.23E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TCHCAM13 CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
68) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	5.23E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TCHCAM13 CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
69) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.31E-06
T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TVD4501C HAND OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.O., FTRO	2E-7	168	3.36E-05	
70) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.31E-06
T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TVD4501C HAND OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.O., FTRO	2E-7	168	3.36E-05	
71) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.31E-06
T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TVD4501C HAND OPERATED (MANUAL) VALVE 4501 FROM TANK 101-SY N.O., FTRO	2E-7	168	3.36E-05	
72) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.26E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE2 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
TOACAM1T HUMAN OPERATOR MISALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
73) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	4.26E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
THOUSE2 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
TOACAM1T HUMAN OPERATOR MISALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
74) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.73E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
75) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.73E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
76) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.73E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178D P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-3 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
77) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.73E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1171E ELECTROSTATIC SPARKS IN THE P-28 "ELEPHANT TRUNK" CONNECTION DUE TO FAILED	1E-6	2400	1.20E-03	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
78) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.73E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	2400	1.20E-03	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
79) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.73E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178B P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
80) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.73E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178C P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
81) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.73E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
82) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1P DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
83) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST1 STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
84) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST1 STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
85) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TSJ-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
86) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1P DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
87) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
TSJ-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
88) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
89) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST1 STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
90) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
91) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T11.6F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TSJ-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
92) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
93) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
94) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSJ-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
95) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1P DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
96) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TSJ-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
97) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1P DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
98) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
99) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST1 STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	

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	T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
	TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
100)	IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
	N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1176D	ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
	TDC-1-1P	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
101)	IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
	N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	ST1	STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
	T1176H	ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
102)	IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.66E-06
	T1155B	MECHANICAL SPARKS FROM SLUDGE WEIGHT/ CABLE STRIKING SAMPLING TUBES		0.0001	1.00E-04	
	TV4501S	MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
103)	IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.65E-06
	T1155A	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAI		0.0001	1.00E-04	
	TV4501S	MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
104)	IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.56E-06
	N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1178-1A	ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
	T1178A	P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
	THOUSE1	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
	TSA-3-2L	HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
105)	IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.56E-06
	N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
	T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	THOUSE1	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
	TSA-3-2L	HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
106)	IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.52E-06
	T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
	T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03	
	TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TSAP281L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
107)	IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.52E-06
	T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
	T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03	
	TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TSAP281L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
108)	IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.52E-06
	T1178-1A	ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
	T1178A	P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
	TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03	
	TSAP281L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
109)	IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.52E-06
	T1178-1A	ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
	T1178A	P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
	TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03	
	TSAP281L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
110)	IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.23E-06
	T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
	TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS])	3E-5	168	5.01E-03	
	TFAP-28G	P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
	TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
111)	IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.23E-06
	T1176F	ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
	TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS])	3E-5	168	5.01E-03	
	TFAP-28G	P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
112)	IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.23E-06

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
T1176D	ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC (e.g. FAN BELT BREAKS),	3E-5	168	5.01E-03	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
113) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.23E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC (e.g. FAN BELT BREAKS),	3E-5	168	5.01E-03	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
114) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.23E-06
T1176H	ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC (e.g. FAN BELT BREAKS),	3E-5	168	5.01E-03	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
115) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.07E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
PWR3	LOSS OF 120 V POWER TO P-23 CAM CAUSES P-23 EXHAUST FAN TO BE SHUTDOWN	3E-6	24	7.20E-05	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A	ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A	P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
116) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	3.07E-06
T1171A	IGNITION SOURCE FROM P-28 FAN (FAN RUNNING)	1E-6	168	8.40E-05	
TVD4501S	MANUAL VALVE 4501 FROM TANK 101-SY ERRORNOUSLY LEFT CLOSED		1E-2	1.00E-02	
117) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.86E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TRAORLYH	OVERLOAD RELAY ONLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS	4E-7	168	6.72E-05	
118) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.86E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TRAKP11H	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROK	4E-7	168	6.72E-05	
119) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.86E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A	ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A	P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TRAORLYH	OVERLOAD RELAY ONLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS	4E-7	168	6.72E-05	
120) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.86E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A	ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A	P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TRAKP11H	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROK	4E-7	168	6.72E-05	
121) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.19E-06
T1156A	ELECTRICAL SPARKS FROM FIC LEVEL PROBE	5E-8	2400	6.00E-05	
TVD4501S	MANUAL VALVE 4501 FROM TANK 101-SY ERRORNOUSLY LEFT CLOSED		1E-2	1.00E-02	
122) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.19E-06
T1173A	ELECTRICAL SPARK FROM FAULT IN THE (WHITTAKER) CHEMICAL CELL H2 ANALYZER	5E-8	2400	6.00E-05	
TVD4501S	MANUAL VALVE 4501 FROM TANK 101-SY ERRORNOUSLY LEFT CLOSED		1E-2	1.00E-02	
123) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.18E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE2	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
TOACAM1T	HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
124) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.18E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176F	ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
THOUSE2	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
TOACAM1T	HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
125) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.18E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176H	ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
THOUSE2	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
TOACAM1T	HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
126) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.18E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE2	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
TOACAM1T	HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
127) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.18E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176D	ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
THOUSE2	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
TOACAM1T	HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
128) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.15E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDFK1VTC	MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
129) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.15E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A	ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A	P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TDFK1VTC	MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
130) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.13E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1160A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T116187A	ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TPATELEL	TELEDYNE H2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
131) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.13E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1160A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C	PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T116387A	ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TPAAMMOL	AMMONIA BUBBLER PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
132) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.12E-06
T1178-1A	ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A	P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
133) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.12E-06
T1178-1A	ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A	P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
134) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.12E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
135) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.12E-06
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFAP-280 P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
136) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.11E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDCP281E DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
137) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.11E-06
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TDCP281E DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
138) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.04E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST2 LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
139) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	2.04E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST2 LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
140) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.87E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1173C ELECTRICAL SPARK FROM CHEMICAL CELL VACUUM PUMP FAILURE (SEAL & MOTOR)	5E-7	2400	6.00E-04	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
141) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.82E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
THOUSE1 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
TSA-3-2L HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
142) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.82E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE1 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
TSA-3-2L HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
143) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.82E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE1 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
TSA-3-2L HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
144) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.82E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
THOUSE1 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
TSA-3-2L HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
145) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.82E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
THOUSE1 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
TSA-3-2L HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
146) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.80E-06

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
147) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.80E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
148) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.80E-06
T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
149) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.80E-06
T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
150) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.80E-06
T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
151) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.80E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
152) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.80E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
153) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.80E-06
T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
154) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.80E-06
T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
155) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.80E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	2400	8.35E-03	
156) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.64E-06
T1176E IGNITION SOURCE FROMCATASTROPHIC FAILURE OF P-28 CAM VP-2 VACUUM PUMP (BEA	1E-6	45	4.50E-05	
TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
157) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.64E-06
T1176G IGNITION SOURCE FROMCATASTROPHIC FAILURE OF P-28 CAM VP-3 VACUUM PUMP (BEA	1E-6	45	4.50E-05	
TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
158) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.64E-06
T1176C IGNITION SOURCE FROMCATASTROPHIC FAILURE OF P-28 CAM VP-1 VACUUM PUMP (BEA	1E-6	45	4.50E-05	
TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
159) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.64E-06
T1173B IGNITION SOURCE FROMCATASTROPHIC FAILUREOF CHEMICAL CELL VACUUM PUMP (BEAR	1E-6	45	4.50E-05	
TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
160) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.57E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
PWR3 LOSS OF 120 V POWER TO P-23 CAM CAUSES P-23 EXHAUST FAN TO BE SHUTDOWN	3E-6	24	7.20E-05	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
161) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.57E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
PWR3 LOSS OF 120 V POWER TO P-23 CAM CAUSES P-23 EXHAUST FAN TO BE SHUTDOWN	3E-6	24	7.20E-05	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
162) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.57E-06

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
PWR3	LOSS OF 120 V POWER TO P-23 CAM CAUSES P-23 EXHAUST FAN TO BE SHUTDOWN	3E-6	24	7.20E-05	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176D	ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
165) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.47E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176D	ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TRAKP11H	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROK	4E-7	168	6.72E-05	
164) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.47E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176D	ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TRAKP11H	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROK	4E-7	168	6.72E-05	
165) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.47E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TRAKP11H	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROK	4E-7	168	6.72E-05	
166) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.47E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176H	ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TRAKP11H	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROK	4E-7	168	6.72E-05	
167) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.47E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TRAKP11H	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROK	4E-7	168	6.72E-05	
168) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.47E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176H	ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TRAKP11H	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROK	4E-7	168	6.72E-05	
169) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.47E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176F	ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TRAKP11H	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROK	4E-7	168	6.72E-05	
170) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.47E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TRAKP11H	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROK	4E-7	168	6.72E-05	
171) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.47E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TRAKP11H	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROK	4E-7	168	6.72E-05	
172) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.47E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176F	ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TRAKP11H	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROK	4E-7	168	6.72E-05	
173) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.46E-06
T1157K	RANGE FIRE PRODUCES SPARKS THAT FAIL VENT AND IGNITE LEAKING H2	4E-7	1.0	4.00E-07	
174) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.43E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A	ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178A	P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TYDUCV1C	HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	

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175) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.43E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDUCV1C	HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
176) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183	IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM		2400	1.20E-03	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
177) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3C	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
178) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1184A	ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	2400	1.20E-03	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
179) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A	ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178C	P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
180) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3C	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
181) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A	ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178C	P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
TVB-1-1P	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
182) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1184A	ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	2400	1.20E-03	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
183) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A	ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178C	P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
184) IE-101	BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3C	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
185) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
186) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178B P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
187) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
188) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1171E ELECTROSTATIC SPARKS IN THE P-28 "ELEPHANT TRUNK" CONNECTION DUE TO FAILED	1E-6	2400	1.20E-03	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
189) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
190) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178B P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
191) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	2400	1.20E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
192) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
193) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1171E ELECTROSTATIC SPARKS IN THE P-28 "ELEPHANT TRUNK" CONNECTION DUE TO FAILED	1E-6	2400	1.20E-03	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
194) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1171E ELECTROSTATIC SPARKS IN THE P-28 "ELEPHANT TRUNK" CONNECTION DUE TO FAILED	1E-6	2400	1.20E-03	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
195) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178D P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-3 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
196) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178D P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-3 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
197) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
198) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178D P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-3 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
199) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.25E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1178-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T1178D P-28 CAM SAMPLING SYSTEM VACUUM PUMP VP-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	2400	1.20E-03	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
200) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.12E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182B ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYST	3E-7	2400	3.60E-04	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
201) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.12E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1171D ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-4 ON THE P-28 EXHAUSTER	3E-7	2400	3.60E-04	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
202) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.12E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182C ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYST	3E-7	2400	3.60E-04	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
203) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.12E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1171C ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-2 ON THE P-28 EXHAUSTER	3E-7	2400	3.60E-04	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
204) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.12E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1156D ELECTRICAL SPARKS FROM EXPLOSION PROOF LIGHT OR LIGHT LEAD FAULTS	1E-6	720	3.60E-04	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
205) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.12E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1171B ELECTRICAL SPARKS FROM PRESSURE SWITCH P28-PS-1 ON THE P-28 EXHAUSTER	3E-7	2400	3.60E-04	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
206) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.10E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
207) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.10E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
208) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.10E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
209) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.10E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
210) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.10E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
211) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.09E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T116184 ELECTRICAL SPARK FROM THE TELEDYNE VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFAP-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
212) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.08E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
213) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.08E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
214) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.08E-06
T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
215) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.08E-06
T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
216) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.08E-06
T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
217) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.08E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
218) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.08E-06
T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
219) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.08E-06
T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
220) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.08E-06
T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
221) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.08E-06

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
222) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.0E-06
T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDCP281E DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
223) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.08E-06
T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDCP281E DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
224) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.08E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDCP281E DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
225) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.08E-06
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDCP281E DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
226) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.08E-06
T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TDCP281E DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
227) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.05E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST2 LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
228) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.05E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST2 LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
229) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.05E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST2 LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
230) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.05E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST2 LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
231) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	1.05E-06
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST2 LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
232) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	8.21E-07
T1156C ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE	5E-7	45	2.25E-05	
TVD4501S MANUAL VALVE 4501 FROM TANK 101-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
233) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.45E-07
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182A FAILURE OF PRESSURE SWITCH K1-PS-1-1 FAILS VENTILATION AND CREATES SPARKS	3E-7	4	1.20E-06	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
234) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.33E-07
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
	T1176H ELECTRICAL SPARK FROM P-28 CAM VP-3 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
	TVDUCV1C HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
235)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.33E-07
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1176F ELECTRICAL SPARK FROM P-28 CAM VP-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
	TVDUCV1C HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
236)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.33E-07
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TVDUCV1C HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
237)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.33E-07
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1176D ELECTRICAL SPARK FROM P-28 CAM VP-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
	TVDUCV1C HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
238)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.33E-07
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
	T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	2400	3.51E-02	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TVDUCV1C HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
239)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-07
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
	T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
	T1161B7A ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
	TPATELEL TELEDYNE H2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
240)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-07
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
	T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
	T1161B7A ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TDC-1-1E DEENTRANER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
	TPATELEL TELEDYNE H2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
241)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-07
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
	T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
	T1163B7A ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TPAAMHOL AMMONIA BUBBLER PIP-ING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
	TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
242)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-07
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
	T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
	T1161B7A ELECTRICAL SPARK FROM TELEDYNE VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TPATELEL TELEDYNE H2 SAMPLE PIPING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
	TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
243)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-07
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	
	T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
	T1163B7A ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
	TPAAMHOL AMMONIA BUBBLER PIP-ING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
244)	IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.16E-07
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1160A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE 101SY VENTILATION HEADER		1.0	1.00E+00	

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MODULE/EVENT NAME DESCRIPTION

RATE

EXPOSURE

S.E.
PROB.MOD./CS.
PROB.

MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	S.E. PROB.	MOD./CS. PROB.
T1160C PROPAGATION OF FLAME THROUGH SAMPLE LINE TO 101SY VENT HEADER		0.01	1.00E-02	
T1163B7A ELECTRICAL SPARK FROM AMMONIA BUBBLER VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TPAAMMOL AMMONIA BUBBLER PIP-ING IN CABINET LEAKS DOWNSTREAM OF VACUUM PUMP	6E-5	2400	6.87E-02	
245) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.07E-07
T117B-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T117B-1A P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TDCP281E DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
246) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.07E-07
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TDCP281E DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
247) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.07E-07
T117B-1A ELECTRICAL SPARK FROM P-28 CAM VACUUM PUMP OPERATION (MOTORS)		1.0	1.00E+00	
T117B-1A P-28 CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
TDCP281E DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
248) IE-101 BURPS PER YEAR IN 101-SY		3.65	3.65E+00	7.07E-07
T1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	2400	6.87E-02	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDCP281E DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	

CUTSET REPORT FOR SYC9D

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
1) SYC9D					*1.37E-03
1) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.0	1.00E+00	2.05E-04
IE-103	BURPS PER YEAR IN 103-SY	2	2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT	1.0	1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER	.17	.17	1.70E-01	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)	1.0	1.0	1.00E+00	
TFBK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1.0	1.0	1.00E+00	
2) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)	.01	.01	1.00E-02	2.00E-04
IE-103	BURPS PER YEAR IN 103-SY	2	2	2.00E+00	
TYD4503S	MANUAL VALVE 4503 FROM TANK 103-SY ERRORNOUSLY LEFT CLOSED	1E-2	1E-2	1.00E-02	
3) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.0	1.00E+00	1.07E-04
IE-103	BURPS PER YEAR IN 103-SY	2	2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT	1.0	1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER	.17	.17	1.70E-01	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFBK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1.0	1.0	1.00E+00	
4) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.0	1.00E+00	1.07E-04
IE-103	BURPS PER YEAR IN 103-SY	2	2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT	1.0	1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER	.17	.17	1.70E-01	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFBK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1.0	1.0	1.00E+00	
5) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.0	1.00E+00	6.89E-05
IE-103	BURPS PER YEAR IN 103-SY	2	2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT	1.0	1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER	.17	.17	1.70E-01	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)	1.0	1.0	1.00E+00	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1.0	1.0	1.00E+00	
6) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.0	1.00E+00	6.89E-05
IE-103	BURPS PER YEAR IN 103-SY	2	2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT	1.0	1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER	.17	.17	1.70E-01	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)	1.0	1.0	1.00E+00	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1.0	1.0	1.00E+00	
7) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.0	1.00E+00	6.89E-05
IE-103	BURPS PER YEAR IN 103-SY	2	2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT	1.0	1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER	.17	.17	1.70E-01	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)	1.0	1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1.0	1.0	1.00E+00	
TVB-1-1P	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03	
8) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.0	1.00E+00	3.59E-05
IE-103	BURPS PER YEAR IN 103-SY	2	2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT	1.0	1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER	.17	.17	1.70E-01	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1.0	1.0	1.00E+00	
9) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.0	1.00E+00	3.59E-05
IE-103	BURPS PER YEAR IN 103-SY	2	2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT	1.0	1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER	.17	.17	1.70E-01	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM	1.0	1.0	1.00E+00	
TVB-1-1P	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03	
10) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST	1.0	1.0	1.00E+00	3.59E-05
IE-103	BURPS PER YEAR IN 103-SY	2	2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT	1.0	1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER	.17	.17	1.70E-01	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
11) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.59E-05
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TOC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
12) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.59E-05
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TVB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
13) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.59E-05
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03	
14) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.83E-05
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP2B1L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
15) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	1.70E-05
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
16) B1178	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO2 IN THE PUMP PIT		1.0	1.00E+00	1.00E-05
B1179A	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103SY PUMP PIT		5E-4	5.00E-04	
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
TV045038	MANUAL VALVE 4503 FROM TANK 103-SY ERROROUSLY LEFT CLOSED		1E-2	1.00E-02	
17) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	9.84E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TCNCAM13	CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
18) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	9.56E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP2B1L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
19) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	9.56E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP2B1L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
20) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.89E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14	STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
21) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.89E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
ST1	STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
22) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN BY VENTILATION SYST		1.0	1.00E+00	6.89E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TBJ-1-13	TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
23) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN BY VENTILATION SYST		1.0	1.00E+00	6.89E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1P	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
24) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN BY VENTILATION SYST		1.0	1.00E+00	6.22E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TNCUSE1	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
25) T8A-3-2L	HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN BY VENTILATION SYST		1.0	1.00E+00	6.15E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
T8AP281L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
26) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN BY VENTILATION SYST		1.0	1.00E+00	6.15E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
T8AP281L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
27) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN BY VENTILATION SYST		1.0	1.00E+00	6.08E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAP1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
28) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	5.71E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
29) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	5.71E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
TVB-1-1P	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
30) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	5.71E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
31) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN BY VENTILATION SYST		1.0	1.00E+00	5.13E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	R.E. PROB.	MOD./CS. PROB.
					
	TCHCAM13 CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
32)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	5.13E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
	TCHCAM13 CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
33)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	4.10E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
	T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	THOUSE2 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
	TOACAM17 HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
34)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.73E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
	T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
35)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.73E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
	T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
36)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.73E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BOND IN	1E-6	4380	2.19E-03<	
	TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
37)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.59E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	T8J-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
38)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.59E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	T8J-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
39)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.59E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	ST1 STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
	T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
40)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.59E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	ST1 STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
	T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
41)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.59E-06

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
1E-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14	STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
42) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.59E-06
1E-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14	STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
43) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.59E-06
1E-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDC-1-1P	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
44) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.59E-06
1E-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDC-1-1P	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
45) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.24E-06
1E-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDC-1-1P	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE1	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
TSA-3-2L	HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
46) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.24E-06
1E-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE1	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
TSA-3-2L	HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
47) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.21E-06
1E-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
48) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.21E-06
1E-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
49) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.21E-06
1E-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
50) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.21E-06
1E-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
51) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.17E-06
1E-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
	TFK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
	TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
52)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.17E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
	TFK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
	TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
53)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.76E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
	T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TRACORLYH OVERLOAD RELAY ONLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS	4E-7	168	6.72E-05	
54)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.76E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
	T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TRAKP11H RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROK	4E-7	168	6.72E-05	
55)	B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	2.70E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	PWR2 LOSS OF POWER TO SY TANK FARM	1E-5	45	4.50E-04	
	TGB-4-1F DIESEL GENERATOR FOR EXHAUST FANS P-23 & P-28 FAILS TO START	3E-1	1	3.00E-01	
56)	B1156A ELECTRICAL SPARKS FROM FIC LEVEL PROBE	5E-8	4380	1.09E-04	2.18E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	TV04503S MANUAL VALVE 4503 FROM TANK 103-SY ERRONOUSLY LEFT CLOSED		1E-2	1.00E-02	
57)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.14E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	THOUSE2 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
	TOACAM1T HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
58)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.14E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	THOUSE2 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
	TOACAM1T HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
59)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.07E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
	T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
60)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.04E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
	TFK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
61)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.04E-06
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
	T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03	
	TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
62) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.04E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.01E-03	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
63) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.03E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDCP2B1E	DEENTRAINER P2B-1 PLUGS	1E-5	168	1.68E-03<	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
64) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.97E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST2	LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
65) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	1.52E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TSAP2B1L	HEPA FILTER P2B-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
66) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.44E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TRARLYH	OVERLOAD RELAY ONLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS	4E-7	168	6.72E-05	
67) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.44E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TRAKP11H	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROK	4E-7	168	6.72E-05	
68) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.44E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TRARLYH	OVERLOAD RELAY ONLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS	4E-7	168	6.72E-05	
69) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.44E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TRAKP11H	RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROK	4E-7	168	6.72E-05	
70) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.38E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDOUCV1C	HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
71) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3C	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
72) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
73) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
74) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	4380	2.19E-03<	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
75) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	4380	2.19E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
76) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
77) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	4380	2.19E-03<	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
78) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
79) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
80) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.12E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182B ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYST	3E-7	4380	6.57E-04	
TFBK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS])	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
81) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.12E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182C ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYST	3E-7	4380	6.57E-04	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
IFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
82) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.08E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
83) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.08E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
84) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.06E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
85) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.06E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
86) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.06E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
87) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.06E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
88) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.06E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDCP281E DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
89) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.06E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDCP281E DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS],	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
90) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.05E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
91) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.03E-06
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST2 LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
92) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.03E-06
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST2	LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
93) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	8.78E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TCHCAM13	CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
94) B1178	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO2 IN THE PUMP PIT		1.0	1.00E+00	8.52E-07
B1179A	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103SY PUMP PIT		5E-4	5.00E-04	
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
TFK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS])	3E-5	168	5.01E-03	
95) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	8.16E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
TCHCAM13	CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
96) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	8.16E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182A	FAILURE OF PRESSURE SWITCH K1-PS-1-1 FAILS VENTILATION AND CREATES SPARKS	3E-7	8	2.40E-06	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
97) IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	8.00E-07
T1157K	RANGE FIRE PRODUCES SPARKS THAT FAIL VENT AND IGNITE LEAKING H2	4E-7	1.0	4.00E-07	
98) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.19E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDUCV1C	HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
99) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	7.19E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVDUCV1C	HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
100) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.85E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1183	IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
101) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.85E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1183	IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
102) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.85E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1183	IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
103) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.81E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TDCP281E DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
104) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.81E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.1E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDCP281E DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
105) B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	6.72E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
TVD4503C HAND OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.O., FTRO	2E-7	168	3.36E-05	
106) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.19E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVD4502D HAND OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTRC	9E-8	168	1.51E-05<	
107) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.19E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVD4503D HAND OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRC	9E-8	168	1.51E-05<	
108) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	6.15E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
109) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	5.91E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
PWR2 LOSS OF POWER TO SY TANK FARM	1E-5	45	4.50E-04	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	4380	2.19E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TGB-4-1F DIESEL GENERATOR FOR EXHAUST FANS P-23 & P-28 FAILS TO START	3E-1	1	3.00E-01	
110) B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	5.71E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST1 STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
111) B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	5.71E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
112) B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	5.71E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
TSJ-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
113) B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	5.71E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
TDC-1-1P DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
114) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	5.55E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE1 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
TSA-3-2L HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
TSAP282L HEPA FILTER P28-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
115) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	5.55E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE1 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
TSA-3-2L HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
116) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	5.45E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
117) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	5.45E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
118) B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	5.16E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
THOUSE1 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
TSA-3-2L HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
119) B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	5.10E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
120) B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	5.10E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
121) B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	5.04E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
122) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	4.58E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TCHCAM13 CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
123) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	4.58E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TCHCAM13 CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
124) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	4.10E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TOAT1-20 HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE LOW TI-1-2 READING	1E-3	1	1.00E-03	
TOAUCV1U HUMAN OPERATOR FTRTCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VAL	1E-2	1	1.00E-02	
125) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.75E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182B ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYST	3E-7	4380	6.57E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
126) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.75E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182B	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYST	3E-7	4380	6.57E-04	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
127) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.75E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182C	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYST	3E-7	4380	6.57E-04	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
128) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.75E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182C	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYST	3E-7	4380	6.57E-04	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
129) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.75E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182C	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-3-1 (IN P-23 VENTILATION SYST	3E-7	4380	6.57E-04	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
130) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.75E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182B	ELECTRICAL SPARKS FROM PRESSURE SWITCH K1-PS-2-1 (IN P-23 VENTILATION SYST	3E-7	4380	6.57E-04	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
131) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.66E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE2	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
TOACAM1T	HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
TSAP2B1L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
132) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.55E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDCP2B1E	DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
133) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.55E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDCP2B1E	DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
134) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.55E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TDCP2B1E	DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
135) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.55E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TDCP2B1E	DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
136) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.47E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAP-280 P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TV8-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03	
137) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.40E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1183A MECHANICAL SPARKS FROM CATASTROPHIC FAILURE OF K1-4-1 (P-23) FAN (IN VENTI	1E-5	0.1	1.00E-06	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
138) B1193C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	3.40E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
THOUSE2 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
TOACAM1T HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
139) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.33E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC (e.g. FAN BELT BREAKS),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
140) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.33E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	4380	2.19E-03	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC (e.g. FAN BELT BREAKS),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
141) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.33E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC (e.g. FAN BELT BREAKS),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
142) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.24E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
PWR2 LOSS OF POWER TO SY TANK FARM	1E-5	45	4.50E-04	
T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TGB-4-1F DIESEL GENERATOR FOR EXHAUST FANS P-23 & P-28 FAILS TO START	3E-1	1	3.00E-01	
143) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.23E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVD4502D HAND OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY N.T., FTRC	9E-8	168	1.51E-05	
144) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.23E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVD4503D HAND OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRC	9E-8	168	1.51E-05	
145) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.23E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVD4503D HAND OPERATED (MANUAL) VALVE 4503 FROM TANK 103-SY N.T., FTRC	9E-8	168	1.51E-05	
146) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.23E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	S.E. PROB.	MOD./CS. PROB.
147) TVD4502D	HAND OPERATED (MANUAL) VALVE 4502 FROM TANK 102-SY W.T., FTRC	9E-8	168	1.51E-05	
B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.21E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
YHA-2-14	STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
TSAP281L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
148) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	3.21E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
YHA-2-14	STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
TSAP281L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
149) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.91E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TCNCAM13	CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
150) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.90E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TCNCAM33	CONTINUOUS AIR MONITOR (CAM) CAM3 (P28) SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS])	3E-5	168	5.01E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
151) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.90E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE1	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
YSA-3-2L	HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
TSAP281L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
152) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.90E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE1	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
YSA-3-2L	HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
TSAP282L	HEPA FILTER P28-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
153) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.90E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE1	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
YSA-3-2L	HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
TSAP282L	HEPA FILTER P28-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
154) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	2.90E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE1	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
YSA-3-2L	HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
TSAP281L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
155) B1178	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO2 IN THE PUMP PIT		1.0	1.00E+00	2.86E-07
B1179A	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103SY PUMP PIT		5E-4	5.00E-04	
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
TFB-5-1E	HBB PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03	
156) B1178	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO2 IN THE PUMP PIT		1.0	1.00E+00	2.86E-07
B1179A	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103SY PUMP PIT		5E-4	5.00E-04	
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03	
157) B1178	FLAMMABLE MIXTURE OF HYDROGEN, AIR, AND NO2 IN THE PUMP PIT		1.0	1.00E+00	2.86E-07
B1179A	ELECTRICAL SPARKS FROM THE LEAK DETECTOR LDE-03A-1 IN 103SY PUMP PIT		5E-4	5.00E-04	
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	S.E. PROB.	MOD./CS. PROB.
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	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03	
158)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN BY VENTILATION SYST		1.0	1.00E+00	2.46E-07
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
	T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TRAKP11H RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROK	4E-7	168	6.72E-05	
	TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
159)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN BY VENTILATION SYST		1.0	1.00E+00	2.46E-07
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
	T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TRAO11H OVERLOAD RELAY ONLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS	4E-7	168	6.72E-05	
	TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
160)	B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	2.45E-07
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	PUR3 LOSS OF 120 V POWER TO P-23 CAM CAUSES P-23 EXHAUST FAN TO BE SHUTDOWN	3E-6	24	7.20E-05	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
161)	B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	2.28E-07
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	TRAKP11H RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROK	4E-7	168	6.72E-05	
162)	B1153C ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	2.28E-07
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	TRAO11H OVERLOAD RELAY ONLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS	4E-7	168	6.72E-05	
163)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN BY VENTILATION SYST		1.0	1.00E+00	2.14E-07
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TOAT1-20 HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE LOW T1-1-2 READING	1E-3	1	1.00E-03	
	TOAUCV1U HUMAN OPERATOR FTRTCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VAL	1E-2	1	1.00E-02	
164)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN BY VENTILATION SYST		1.0	1.00E+00	2.14E-07
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
	SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
	T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	TOAT1-20 HUMAN OPERATOR FAILS TO PERFORM A KNOWN TASK, NOTICE LOW T1-1-2 READING	1E-3	1	1.00E-03	
	TOAUCV1U HUMAN OPERATOR FTRTCP FOLLOWING TEST OR MAINTENANCE OF UPSTREAM MANUAL VAL	1E-2	1	1.00E-02	
165)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN BY VENTILATION SYST		1.0	1.00E+00	2.04E-07
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
	T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
	TFAP-28Q P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
166)	B1155A MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE TANK DUE TO SUPPORT FAI		0.00001	1.00E-05	2.00E-07
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	TVD4503B MANUAL VALVE 4503 FROM TANK 103-SY ERRORNOUSLY LEFT CLOSED		1E-2	1.00E-02	
167)	B1153A ELECTROSTATIC SPARKS FROM LESS THAN SUFFICIENT BONDING/GROUNDING OF TANK R		0.00001	1.00E-05	2.00E-07
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	TVD4503B MANUAL VALVE 4503 FROM TANK 103-SY ERRORNOUSLY LEFT CLOSED		1E-2	1.00E-02	
168)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN BY VENTILATION SYST		1.0	1.00E+00	1.91E-07
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
	T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
	TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
	THOUSE2 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
	TOACAM1T HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
	TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
169)	B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN BY VENTILATION SYST		1.0	1.00E+00	1.91E-07
	IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	S.E. PROB.	MOD./CS. PROB.
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE2 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
TOACAM1T HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
170) B1180A ELECTRICAL SPARKS FROM PIC LEVEL FAOBE	5E-8	4380	1.09E-04	1.86E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
171) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.84E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDFK1VTC MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., FTRO	3E-7	168	5.04E-05	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
172) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.84E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE1 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
78A-3-2L HEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
173) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.83E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE1 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
TSAP282L HEPA FILTER P28-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
174) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.82E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1183 IGNITION FROM THE ORGANIC VAPOR MONITOR (OVM) SYSTEM	1E-6	2400	1.20E-03	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
175) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.81E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03	
176) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.81E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TVB-1-1P TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03	
177) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.79E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TCHCAM13 CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
178) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.79E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BOND IN	1E-6	4380	2.19E-03	
TCHCAM13 CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
179) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.79E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3D	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TCHCAM13	CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
180) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	1.71E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
TOPK1VTC	MANUAL DAMPER IN THE K1 VENTILATION SYSTEM BETWEEN HEPAS N.O., PTRO	3E-7	168	5.04E-05	
181) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.70E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1183D	MECHANICAL SPARKS FROM METAL STRIKING METAL INSIDE VENT DUE TO SUPPORT FAI		0.0001	1.00E-04	
TFAP-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS])	3E-5	168	5.01E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
182) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	1.69E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFB-5-1E	NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03	
183) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	1.69E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
TDC-1-1E	DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
184) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	1.68E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
TDCP281E	DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03	
TFAP-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS])	3E-5	168	5.01E-03	
185) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	1.63E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST2	LOSS OF STEAM FROM POWER PLANT FACILITY	2E-6	24	4.80E-05	
186) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.52E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TCHCAM13	CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
187) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.52E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TCHCAM13	CONTINUOUS AIR MONITOR (CAM) CAM1 SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
188) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.51E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TCHCAM33	CONTINUOUS AIR MONITOR (CAM) CAM3 (P28) SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFAP-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS])	3E-5	168	5.01E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
189) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.51E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TCHCAM33	CONTINUOUS AIR MONITOR (CAM) CAM3 (P28) SPURIOUSLY ALARMS	2E-5	12	2.40E-04	
TFAP-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS])	3E-5	168	5.01E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
190) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.28E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D	ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TRACORLYH	OVERLOAD RELAY ONLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS	4E-7	168	6.72E-05	
TSAP281L	HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
191) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.28E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C	ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TRACORLYH	OVERLOAD RELAY ONLY SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS	4E-7	168	6.72E-05	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	S.E. PROB.	MOD./CS. PROB.
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
192) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.28E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TRAKP11H RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROK	4E-7	168	6.72E-05	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
193) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.28E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TRAKP11H RELAY KP-1-1 SPURIOUSLY CHANGES STATE, SO FAN OPERATING CIRCUIT IS BROK	4E-7	168	6.72E-05	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
194) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSJ-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
195) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
196) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1P DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
197) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1P DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
198) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
199) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST1 STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
200) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	4380	2.19E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
201) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	S.E. PROB.	MOD./CS. PROB.
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST1	STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
T1182-30	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
202) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST1	STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
T1184A	ELECTROSTATIC SPARKS IN THE P-23 VENTILA-TION DUCTWORK DUE TO FAILED BONDIN	1E-6	4380	2.19E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
203) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1184A	ELECTROSTATIC SPARKS IN THE P-23 VENTILA-TION DUCTWORK DUE TO FAILED BONDIN	1E-6	4380	2.19E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
T8J-1-13	TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
204) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3C	CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
T8J-1-13	TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	
205) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.25E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1184A	ELECTROSTATIC SPARKS IN THE P-23 VENTILA-TION DUCTWORK DUE TO FAILED BONDIN	1E-6	4380	2.19E-03<	
TDC-1-1P	DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
206) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.21E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAP-28G	P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE2	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
TOACAM1T	HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW	1E-3	1	1.00E-03	
207) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.21E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAK1-4G	K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC (e.g. FAN BELT BREAKS))	3E-5	168	5.01E-03	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE2	ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO REGISTER HI ON MISCAL. CA		.1	1.00E-01	
TOACAM3T	HUMAN OPERATOR MISCALIBRATES CONTINUOUS AIR MONITOR (CAM) SETPOINT LOW (P2	1E-3	1	1.00E-03	
208) B1156C	ELECTRICAL SPARKS FROM MANUAL LEVEL PROBE	5E-7	24	6.00E-06	1.20E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
TV04503S	MANUAL VALVE 4503 FROM TANK 103-SY ERRORNOUSLY LEFT CLOSED		1E-2	1.00E-02	
209) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.16E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3A	CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A	ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDCP281E	DEENTRAINER P28-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP	FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TV0-1-1P	TEMPERATURE FLOW CONTROL (SELF-REGULATING) VALVE TCV-1-1 FAILS TO TRANSFER	1E-5	168	1.68E-03<	
210) B1153C	ELECTROSTATIC SPARKS FROM REMOVAL OF SLUDGE WEIGHTS (7)		.01	1.00E-02	1.14E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON	FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
TV0UCV1C	HAND OPERATED (MANUAL) VALVE UPSTREAM OF TCV-1-1 N.O., FTRO	2E-7	168	3.36E-05	
211) B1180A	FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.13E-07
IE-103	BURPS PER YEAR IN 103-SY		2	2.00E+00	
N423	P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE1 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
TSA-3-2L NEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
212) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.13E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
M423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	4380	2.19E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE1 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
TSA-3-2L NEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
213) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.13E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
M423 P28 HEATERS HTS-1 AND HTS-2 ARE ELECTRICALLY LOCKED OUT		1.0	1.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THOUSE1 ENOUGH RADIOACTIVE MATERIAL IS BEING RELEASED TO GIVE HI RADIATION SIGNAL		.01	1.00E-02	
TSA-3-2L NEPA FILTER K1-3-2 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
214) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.12E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L NEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
215) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.12E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L NEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
216) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.12E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	4380	2.19E-03<	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L NEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
217) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.12E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDIN	1E-6	4380	2.19E-03<	
TDC-1-1E DEENTRAINER K1-1-1 PLUGS	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L NEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
218) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.12E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L NEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
219) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.12E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFB-5-1E NBS PREFILTER K1-5-1 PLUGS, DUE TO PARTICULATES	1E-5	168	1.68E-03<	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L NEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
220) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.10E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3C CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-1 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03<	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS])	3E-5	168	5.01E-03	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	

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MODULE/EVENT NAME DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
221) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.10E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1184A ELECTROSTATIC SPARKS IN THE P-23 VENTILATION DUCTWORK DUE TO FAILED BONDING	1E-6	4380	2.19E-03	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
222) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.10E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-3D CAM SAMPLING SYSTEM VACUUM PUMP VP-EXH-K1-2 LEAKS ON OUTLET SIDE OF PUMP	1E-6	4380	2.19E-03	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFAK1-4G K1-4-1 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC [e.g. FAN BELT BREAKS]),	3E-5	168	5.01E-03	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
223) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.06E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1D ELECTRICAL SPARK FROM CAM VP-EXH-K1-2 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
224) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.06E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
T1182-1C ELECTRICAL SPARK FROM CAM VP-EXH-K1-1 VACUUM PUMP FAILURE (SEAL & MOTOR)	3E-5	4380	6.29E-02	
TFAP-28G P-28 FAILS TO CONTINUE RUNNING (NON-CATASTROPHIC)	3E-5	168	5.03E-03	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
THA-2-14 STEAM HEATER K1-2-1 LEAKS FROM THE TUBES	1E-6	168	1.68E-04	
225) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.05E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TDC-1-1P DEENTRAINER K1-1-1 FAILS AND ALLOWS EXCESSIVE WATER THROUGH	1E-6	168	1.68E-04	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
226) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.05E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
ST1 STEAM LINE TO HEATER RUPTURES	1E-8	1.68E+4	1.68E-04	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
227) B1180A FLAMMABLE MIXTURE OF HYDROGEN, AIR AND NO2 IN THE MAIN SY VENTILATION SYST		1.0	1.00E+00	1.05E-07
IE-103 BURPS PER YEAR IN 103-SY		2	2.00E+00	
SEASON FRACTION OF YEAR THAT WEATHER CONDITIONS ARE HIGH HUMIDITY AND COLD TEMPER		.17	1.70E-01	
T1182-3A CAM CABINET SAMPLE PIPING LEAKS DOWNSTREAM OF VACUUM PUMPS	6E-5	4380	1.21E-01	
T1182-4A ELECTRICAL SPARK FROM CAM VACUUM PUMP OPERATION (MOTOR)		1.0	1.00E+00	
TFLVENTP FLAME PROPAGATES BACK TO TANK FROM VENTILATION SYSTEM		1.0	1.00E+00	
TSAP281L HEPA FILTER P28-1 FAILS TO FILTER DUE TO SEAL FAILURE	7E-6	4380	1.52E-02	
TSJ-1-13 TEMPERATURE CONTROL SWITCH TC-1-1 FAILS SPURIOUSLY, SUCH THAT TCV-1-1 CLOS	1E-6	168	1.68E-04	

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Frequency and Subtotal Values (3 sheets)

Case	Frequency
1A	1.62E-02
1B	2.23E-03
1C	2.60E-02
1D	2.34E-03
Case 1 frequency (mincut upper bound) subtotal	4.61E-02
2A	1.62E-02
2B	2.23E-03
2C	2.72E-02
2D	1.66E-01
Case 2 frequency (mincut upper bound) subtotal	2.04E-01
3A	1.62E-02
3B	2.23E-03
3C	5.12E-01
3D	1.25E-01
Case 3 frequency (mincut upper bound) subtotal	5.81E-01
4A	1.62E-02
4B	2.23E-03
4C	2.60E-02
4D	2.34E-03
Case 4 frequency (mincut upper bound) subtotal	4.61E-02
5A	1.62E-02
5B	2.33E-03
5C	2.60E-02
5D	4.93E-03
Case 5 frequency (mincut upper bound) subtotal	4.87E-02

Frequency and Subtotal Values (3 sheets)

Case	Frequency
6A	1.62E-02
6B	2.23E-03
6C	2.72E-02
6D	1.66E-01
Case 6 frequency (mincut upper bound) subtotal	2.04E-01
7A	1.62E-02
7B	2.23E-03
7C	5.12E-01
7D	1.25E-01
Case 7 frequency (mincut upper bound) subtotal	5.81E-01
8A	1.62E-02
8B	2.23E-03
8C	2.60E-02
8D	4.93E-03
Case 8 frequency (mincut upper bound) subtotal	4.86E-02
9A	2.46E-02
9B	9.09E-03
9C	2.60E-02
9D	1.37E-03
Case 9 frequency (mincut upper bound) subtotal	5.99E-02
10A	2.46E-02
10B	9.09E-03
10C	2.72E-02
10D	1.66E-01
Case 10 frequency (mincut upper bound) subtotal	2.16E-01

Frequency and Subtotal Values (3 sheets)

Case	Frequency
11A	2.46E-02
11B	9.09E-03
11C	5.12E-01
11D	1.25E-01
Case 11 frequency (mincut upper bound) subtotal	5.87E-01
12A	2.46E-02
12B	9.09E-03
12C	2.60E-02
12D	1.37E-03
Case 12 frequency (mincut upper bound) subtotal	5.99E-02

Note: Mincut upper bound calculation follows the formula $[1-(1-A)*(1-B)*(1-C)*(1-D)]$.

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APPENDIX F

**INFORMATION ON INTRINSICALLY SAFE, QUALIFIED
TESTING AND PURGING AS RELATED TO
CLASS 1, DIVISION 1 LOCATIONS**

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APPENDIX F

**INFORMATION ON INTRINSICALLY SAFE, QUALIFIED
TESTING AND PURGING AS RELATED TO
CLASS 1, DIVISION 1 LOCATIONS**

Because of the scrutiny surrounding tank 101-SY, new equipment has been installed on the tank to better monitor its behavior. Before this equipment is put into the tank farm it must undergo several testing requirements. It has become common practice to believe that if the equipment is labeled as "intrinsically safe" then it is safe to be used on tank 101-SY. The discussion below elaborates on the definition of intrinsically safe.

The information presented in this section provides a basis for the assignment of rates at which equipment can produce electrical sparks. The probability of an intrinsically safe piece of equipment producing a spark is lower than that of a piece of equipment not designed for use in flammable environments. Tank 101-SY vapor space gas samples are expected to exceed 3 percent hydrogen. Per the definitions in NFPA 496, 1989 Edition, Chapter 1, the sample stream in tank 101-SY, is a Class 1, Division 1, Group B environment. The criteria for a Class 1, Division 1 location is as follows:

Class 1, Division 1. "A location: (1) in which ignitable concentrations of flammable gases or vapors exist under normal operation conditions; or (2) in which ignitable concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; (3) in which breakdown or faulty operation of equipment or processes might release ignitable concentrations of flammable gases or vapors and might also cause simultaneous failure of electrical equipment."

The equipment that is used in a Class 1, Division 1 location must be intrinsically safe or be approved by qualified testing or purging.

F.1 INTRINSICALLY SAFE DESIGN

The *National Electrical Code - 1990 Handbook*, Article 501-1 (NFPA 1990a), defines intrinsically safe as, "The arc produced at the contacts of listed or labeled intrinsically safe equipment is not ignition capable because the energy available is insufficient to cause ignition."

Intrinsically safe circuits and systems are defined in *National Electrical Code - 1990 Handbook*, Article 504-4 as follows:

An intrinsically safe circuit is "a circuit in which any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed test conditions."

An intrinsically safe apparatus is "an assembly of interconnected intrinsically safe apparatus, associated apparatus, and interconnecting cables in which those parts of the system which may be used in hazardous (classified) locations are intrinsically safe circuits."

F.2 QUALIFIED TESTING

Per the definitions given in Article 500-3 of NFPA 70, *National Electrical Code* (NFPA 1990b), Underwriters Laboratories (UL) Inc. and Factory Mutual Research Corporation (FM) list or approve electrical equipment suitable for use in all groups of Class 1 locations. Further information is available from the UL Hazardous Locations Equipment Director and FM Approval Guide. It should be noted (from the UL Directory) that "only those products bearing the appropriate Listing Mark and the company's name, trade name, trademark or other recognized identification should be considered as covered by UL's listing and follow-up service."

F.3 PURGE SYSTEM

NFPA 496 codes require Type X purging on tank 101-SY. Type X purging is defined as purging that reduces the classification within an enclosure from Division 1 to nonhazardous.

Some specific requirements for Type X purging include

1. A timing device shall be used to prevent energizing electrical equipment within the enclosure until at least four volumes of purge gas (ten volumes for motors) have passed through the enclosure while maintaining an internal pressure of at least 25 Pa (25 N/m²) (0.1 in. water).
2. A cutoff switch shall be incorporated to remove power automatically from all circuits within the enclosure not suitable for Division 1 upon failure.

A list of specific requirements as well as other information on Type X purging is defined in NFPA 496 (NFPA 1989).

F.4 REFERENCES

- NFPA, 1989, *Purged and Pressurized Enclosures for Electrical Equipment*, NFPA 496, 1989 Edition, National Fire Protection Association, Quincy, Massachusetts.
- NFPA, 1990a, *National Electrical Code, 1990 Handbook*, National Fire Protection Association, Quincy, Massachusetts.
- NFPA, 1990b, *National Electrical Code*, NFPA 70, National Fire Protection Association, Quincy, Massachusetts.

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