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7. Abstract

Module 1 of the Waste Receiving and Processing Facility (WRAP 1) is designed to receive, characterize, stabilize, and prepare for long-term storage waste containers (55-gallon drums) which are suspected of containing sufficient amounts of transuranic materials to be classified as transuranic waste. Waste drums which will be received from the storage trenches or be generated as a result of Hanford cleanup activities will be examined in order to determine whether or not the drums meet the appropriate criteria (Waste Isolation Pilot Plant or other) for long-term storage. If the drums do not meet these criteria because of materials which are not allowed (free liquids, for example), the drums will be opened in either the transuranic waste glovebox or the low-level waste glovebox so that the non-compliant items can be removed and treated if necessary. The purpose of this report is to evaluate the probability of an energetic chemical reaction (explosion, fire, or release of large volumes of gas) during the process of glovebox activities which might either damage the glovebox or injure facility personnel.

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PROBABILITY OF AN EXPLOSION IN WRAP-1 GLOVEBOXES

1.0 INTRODUCTION

Module 1 of the Waste Receiving and Processing Facility (WRAP 1) is designed to receive, characterize, stabilize, and prepare for long-term storage waste containers (55-gallon drums) which are suspected of containing sufficient amounts of transuranic materials to be classified as transuranic waste. Waste drums which will be received from the storage trenches or be generated as a result of Hanford cleanup activities will be examined in order to determine whether or not the drums meet the appropriate criteria (Waste Isolation Pilot Plant or other) for long-term storage. If the drums do not meet these criteria because of materials which are not allowed (free liquids, for example), the drums will be opened in either the transuranic waste glovebox or the low-level waste glovebox so that the non-compliant items can be removed and treated if necessary. The purpose of this report is to evaluate the probability of an energetic chemical reaction (explosion, fire, or release of large volumes of gas) during the process of glovebox activities which might either damage the glovebox (and potentially breach the facility boundary) or injure facility personnel. Criteria for peak overpressures causing structural damage or personnel injury are included in Tables 5 and 6.

2.0 GENERAL METHODOLOGY

Evaluation of the probability of an adverse chemical reaction occurring in either of the gloveboxes required several steps. Since part of the purpose of opening the drums in the glovebox is characterization of the drums' contents, a list of chemicals which might be present in the drums was necessary. Several listings were examined, including Klem, Reddinger, and Olson. Klem's list was originally developed to determine which chemicals used in the Hanford 100 and 200 area facilities could have been transferred to single shell waste tanks. The list of facilities in Klem was compared to the list of facilities in Table 1, and the chemicals which were used in facilities which generated suspect transuranic waste after 1970 were listed in Table 2, along with the facilities at which they were used. Reddinger and Olson were used to supplement the information in Klem; both documents contained additional information about chemicals shown in the Hanford waste data bases (R-SWIMS and R-SWITS). The data bases are somewhat limited because the requirements for recording specific hazardous chemical components have changed over the years. Both the Reddinger and Olson reports contained information about packaging of hazardous materials based on interviews with plant personnel, which were used to assign frequencies of occurrence of the various chemicals in the facility waste.

Next, an evaluation of chemical hazards was performed. Four references, Bretherick, NFPA 1991, NFPA 1991b, and the Sigma-Aldrich Material Safety Data Sheets were used to evaluate the potential hazards posed by the chemicals which might be present in the "suspect" transuranic wastes. Many of the chemicals potentially present in solid waste are hazardous by themselves or in combination with other materials expected to be present in solid waste

(organics, metals, moisture, etc). Other chemicals are hazardous when combined with chemicals which could be present in the same drum or other drums from the same facility. After information about the hazards of the various chemicals was examined, reactions which could potentially occur were divided into several categories--flammable gases, flammable liquids, pyrophoric metals, two-component reactions of incompatible chemicals, and explosives. Each category was examined using slightly different methodology; the approaches and conclusions are described in the following sections.

3.0 FLAMMABLE GASES

Examination of the available data showed two hazardous flammable gases, hydrogen and propane, which could be present in waste drums. Hydrogen could be evolved from radiolysis of water or organic materials or from reactions of active metals with water. It is assumed that, if hydrogen were present in the glovebox, the worst case explosion would be a "combustion explosion", rather than a true detonation. The reason for this assumption is that the amount of hydrogen which could initially be transferred into the glovebox would be an entire 55-gallon drum loaded with hydrogen. The glovebox volumes are very large in comparison (3152 cubic feet for the transuranic glovebox and 2185 cubic feet for the low-level waste glovebox) to a drum volume. Furthermore, the eight changes of air per hour would tend to dilute the hydrogen below flammable concentrations very quickly. Finally, the geometry of the glovebox is not appropriate to accelerate the reaction to supersonic rates. Because the near-field effects of the "combustion" explosions (flammable gases and liquids) are mitigated by the venting properties of the large glovebox volumes, it is assumed that the worst physiological effects of the explosion on the operator would be caused by fragments of a failed window. Thus, the probabilities calculated are for events which might cause the failure of the glovebox structure.

If 55-gallons of hydrogen did explode, the resulting pressures on the glovebox wall would be 1.6 psi. (See Appendix A for calculations.) If it is assumed that the glovebox window would fail at 1 psi, the drums containing less than 40 percent hydrogen would not cause failure of the glovebox. This failure assumption is conservative, based on a test of a glovebox which was filled with a mixture of 10% hydrogen (theoretical peak overpressure of 60-110 psi). Exploding the hydrogen caused breakage of a window, but no other failure. (The test report is included in Appendix A.)

The probability per drum processed in WRAP-1 of a hydrogen explosion occurring in the gloveboxes is calculated in Appendix A. It is assumed that approximately one drum in 1000 contains the appropriate materials to evolve enough hydrogen. Since there are approximately 37,000 drums to be retrieved, this assumption implies that about 40 drums exist which could potentially (if all controls failed) be transferred into WRAP-1 with sufficient hydrogen to damage the glovebox. In addition, since drums are vented and sampled prior to being transferred into WRAP-1, the possibility of a sensitive drum being transferred into WRAP-1 is further reduced. (It is assumed that venting the drums would allow hydrogen to diffuse from the drums at a rate which would keep hydrogen from accumulating in the drum void space during interim storage in WRAP-1; it is further assumed that a drum found to contain hydrogen on sampling would not be transferred into WRAP-1 as long as the void space

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contained sufficient hydrogen to have a flammable atmosphere.) Thus, the estimated probability of exploding a pocket of sufficiently large pocket of hydrogen to cause a 1 psi overpressure upon opening a drum is calculated to be $9.4X10^{-5}$ during the processing of retrieved waste; assuming a thirty-year operation, the frequency would be $4.7X10^{-6}$/yr, virtually incredible. Another scenario for producing hydrogen in the glovebox would be the evolution of hydrogen upon opening the drum. The mechanism for initiating this scenario would be the evolution of hydrogen from a reaction with water and an active metal. It is assumed that one drum in 100 could contain an active metal. Failure of the packaging upon opening would have to occur; in addition, water or some other reactant from which hydrogen could be liberated would have to be present with failed packaging. The probability of producing hydrogen in this manner with subsequent explosion is estimated to be 1.2×10^{-6} during the operation of the facility; based on a 30-year operation, a hydrogen explosion initiated by a metal-water reaction would not be considered credible. (Calculations of its likelihood are included in Appendix A.) Note that it is more likely that the result of mixing water with an active metal would be a fire; many of the water-active metal reactions generate sufficient heat to ignite the hydrogen as it evolves. Thus, a fire might occur before sufficient hydrogen evolves to damage the glovebox via a combustion explosion. This fact was not taken into consideration during the development of the fault tree, where it was assumed that, if hydrogen were produced by a metal water reaction, it would not burn before exploding. (See Appendix A.)

Propane could potentially be present in waste from the Plutonium Finishing Plant. Propane cylinders (nominally one pound) were used in plutonium processing. Per Olson, the exhausted cylinders were discarded to transuranic waste without being punctured to remove residual propane. The cylinders were occasionally discarded because of valve failure without being completely empty. In addition, a number of non-empty cylinders were believed to have been discarded when their use was abruptly discontinued.

Based on a usage rate of two to three per week, a total of approximately 1200 propane cylinders could be expected to be in waste drums. Appendix B contains calculations of the amount of propane needed to produce a pressure of 1 psi within the glovebox and calculations of the probability of an explosion which would damage the glovebox. Based on the assumption that retrieved drums known to contain propane cylinders will not be processed in the Transuranic Waste Glovebox, the probability of a propane explosion is calculated to be 6.4×10^{-9} for a single drum containing propane. If it is assumed that 1200 drums containing propane will be retrieved over a 20-yr period (assuming that 2/3 of the waste is from PFP operations and equally likely to contain propane cylinders), the frequency of a propane explosion in the glovebox is calculated to be 1.3×10^{-7}/yr (2.1×10^{-9}/drum * 1200 drums * 1/(20 yr)).

During the early 1970's, an incident which might have been a propane fire/explosion occurred in a PFP burning glovebox. When personnel responded to an air monitor alarm, a propane cylinder with the fusible plug missing was discovered. In addition, the glovebox walls and window were covered with smoke and a window was cracked. This incident led to a process change (source of the last set of assumed non-empty cylinders). Based on an examination of other reports of glovebox fires (including the glovebox test results in Appendix A), the author believes that it is more likely that the window was damaged by thermal stress from a fire rather than by explosion pressure. In

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any case, the consequences of this incident may be similar to what might practically bound the consequences in a WRAP glovebox.

Other flammable gases could potentially be present within the waste drums, but it is assumed that the presence of hydrogen or propane would be considerably more likely than other flammable gases. Thus, it is assumed that these two gases would be primary contributors to the operational risk of the gloveboxes.

4.0 FLAMMABLE LIQUIDS

A number of flammable liquids will potentially be present in waste drums; a list is included as Table 3. Calculations furnished to the author by R. Sexton and reproduced in Appendix C demonstrate that the glovebox airflow rate will be sufficient to dilute any flammable vapors evolved from a spill of liquids in the glovebox; hence the only potential mechanism for a vapor explosion in the glovebox would be flammable vapor which had evolved in a drum. Choosing the most volatile of the vapors examined by Sexton (acetone), the equilibrium concentration in the vapor space of a closed drum would be about 24 volume percent. If it is assumed that the maximum explosive vapor cloud yield would be at about 8 volume percent (about halfway between the upper and lower explosive limits) and further assumed that a drum is full of the equilibrium concentration of acetone, the volume of the vapor cloud would be about 165 gallons. Per Braise and Simpson, it is assumed that the explosion pressure would be approximately 100 psi. Thus, the glovebox pressure would be 1.007 psi. (See calculations, Appendix C.) Based on this result, it would be virtually impossible to breach the glovebox if an entire drum of vapor from a flammable liquid experienced a combustion explosion. Furthermore, the probability of the drum being filled with flammable vapor is lowered by the fact that the packaging of the flammable liquid could be intact and the fact that the drums should be sampled and vented prior to being transferred into the facility. Thus, the probability of a flammable vapor explosion which would breach the WRAP glovebox is considered incredible.

5.0 PYROPHORIC METALS

Among the potential contents of TRU waste drums are a number of active/pyrophoric metals--including aluminum, calcium, magnesium, uranium, plutonium, zirconium etc. The fire hazard from these materials has been mentioned under the topic of hydrogen, but other ways to ignite the materials are possible. One potential mechanism would be a dust explosion, caused by the ignition of a cloud of metal dust particles. Based on calculations for aluminum (reproduced in Appendix D), very small amounts of such material could create an explosive dust cloud. Such an event would be prevented by many features, however, including intact packaging, oxide coating of the materials, ventilation flow, etc. The probability of such an event is calculated to be 10^{-10}/drum in Appendix D. Based on about 40,000 drums processed over a 30-year period, frequency of the event is less than 10^{-6}/year and not considered credible.

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6.0 TWO COMPONENT REACTIONS

For two component reactions, only probabilities were calculated. First, a hazards assessment of two component reactions was performed. It was assumed that waste from separate facilities would not be processed simultaneously, and that the likely initiating event for the reaction would be a mixing of the compounds on the sorting table. Thus, the reactants would have to be in the same drum from the same facility. Numbers of waste drums from the Hanford facilities are taken from Table 1, Appendix E. Possible reactive combinations from the Hanford facilities based on the chemical information available are detailed in Table 2, Appendix E. Consequences of the reactions are detailed in Table 3, Appendix E.

The likelihood of a reaction that would damage the glovebox was then calculated based on assumed occurrence rates of the chemicals, assumed likelihoods of sufficient quantities of chemicals, and a hazard index based on consequences of the reaction.

The assumed occurrence rates were 0.1/drum for "common chemicals" (e.g., nitric acid); 0.01/drum for most other chemicals; and 0.001/drum for "rare chemicals" (e.g., cold). The likelihood of sufficient quantities of materials occurring to cause a significant reaction was assigned as 0.1 for process facilities and 0.01 for laboratory facilities. The hazard index was assigned based on the consequences of an adverse reaction as follows: 1 for an explosion on contact, 0.1 for an explosion occurring when heat or some other factor was necessary to cause a reaction, and 0.01 for a rapid gas evolution or ignition. The results are shown in Table 4, Appendix E. It is assumed that, since most of the drums are from Hanford facilities, the drums from other facilities which could contain similar combinations would not greatly increase the risk of an explosion.

Based on the above assumptions, it was concluded that a reaction which might damage the glovebox would be highly unlikely (annual frequency less than 10^{-4}/yr). The probability of a drum explosion in the Hanford drums calculated by totalling the likelihoods of explosions in Table 4, Appendix E was 2×10^{-4}. If this likelihood is equally divided among the 30 years of assumed operation, the explosion frequency is about 7×10^{-6}/yr. Thus, even if the explosion likelihood is much greater in the non-Hanford drums, the explosion frequency would be less than 10^{-4}/yr.

7.0 EXPLOSIVES

The occurrence of explosives in the drums could not be entirely discounted, based on the possible occurrence of peroxidizable compounds (such as styrene and ether) and indole picrate in some drums. The drum containing indole picrate contains much less than a gram of the compound; based on simple equivalence to TNT, it is not likely that the facility or the glovebox would be damaged. Interviews cited with operations personnel in Olson suggest that ether would not have been put in the drums in significant quantities. As further information is gained from characterization of the drums, the likelihood of occurrence of significant quantities of explosives will be better characterized.

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It can be deduced from Baker's results that in order to cause major damage to the facility or injury to personnel located away from the glovebox, an energy release equivalent to at least 5 pounds of TNT would be required. (Such an explosion would breach the glovebox and injure workers located in the immediate vicinity.) Thus, if the explosive material could release an equivalent energy to TNT per unit mass, at least 5 pounds of the material would be required to cause facility damage or injury to personnel distant from the glovebox. The probability of 5 pounds of sensitive condensed phase explosive being contained in a drum is undoubtedly extremely unlikely to incredible, particularly since, in addition to the low likelihood of large quantities of condensed phase explosive being used in the facilities, such materials are not allowed in waste drums. At the writing of this report, the minimum amount of explosive which would breach the glovebox is unknown, as well as the likelihood of the occurrence of sufficient quantities of such materials; hence, the probability of injury to the facility worker due to the presence of explosives cannot be accurately evaluated.

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8.0 CONCLUSIONS

The conclusions of this report are preliminary and may be subject to revision as the drums are characterized. Based on calculations for the various classes of explosions and the conclusions in Baker, it is concluded that explosions which breach the WRAP facility containment boundary and cause injuries to personnel outside of the facility are not credible.

Based on probabilistic calculations, explosions breaching the glovebox containment and thereby causing worker injury are extremely unlikely. Because of the number of scenarios (See Table 2.), fires and adverse chemical reactions are credible. Because of this fact, the efficacy of the ventilation ducting in venting rapid gas evolution should be analyzed. In addition, firefighting equipment and systems should be provided for all potential fires (metal, hydrocarbons, etc.). In depth training in both the potential hazards of waste handling and appropriate emergency actions must be provided for all operations personnel.

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APPENDIX A

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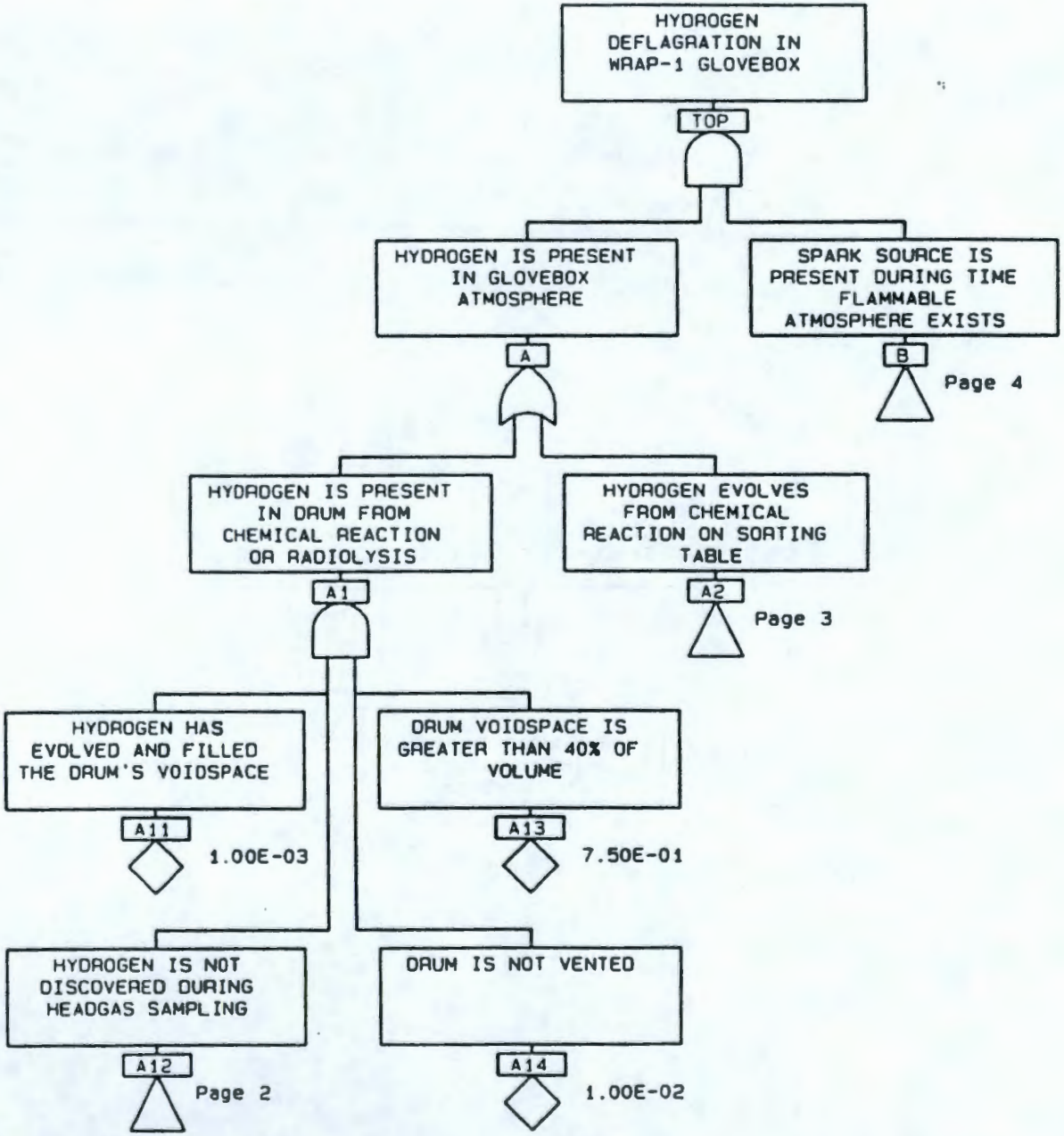

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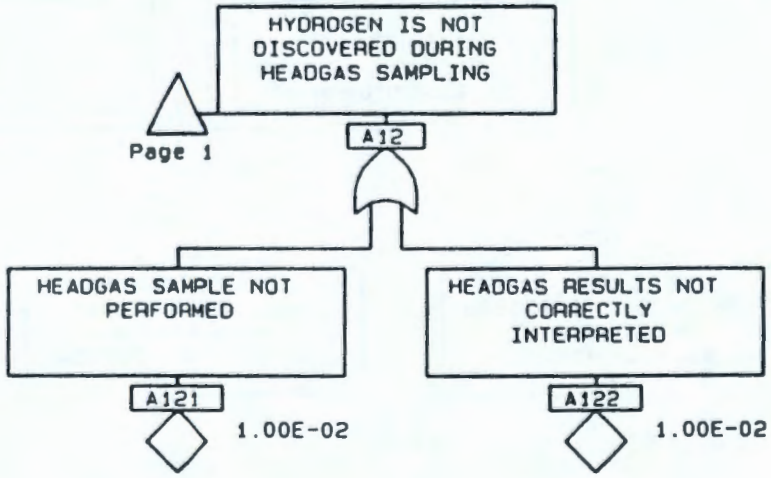
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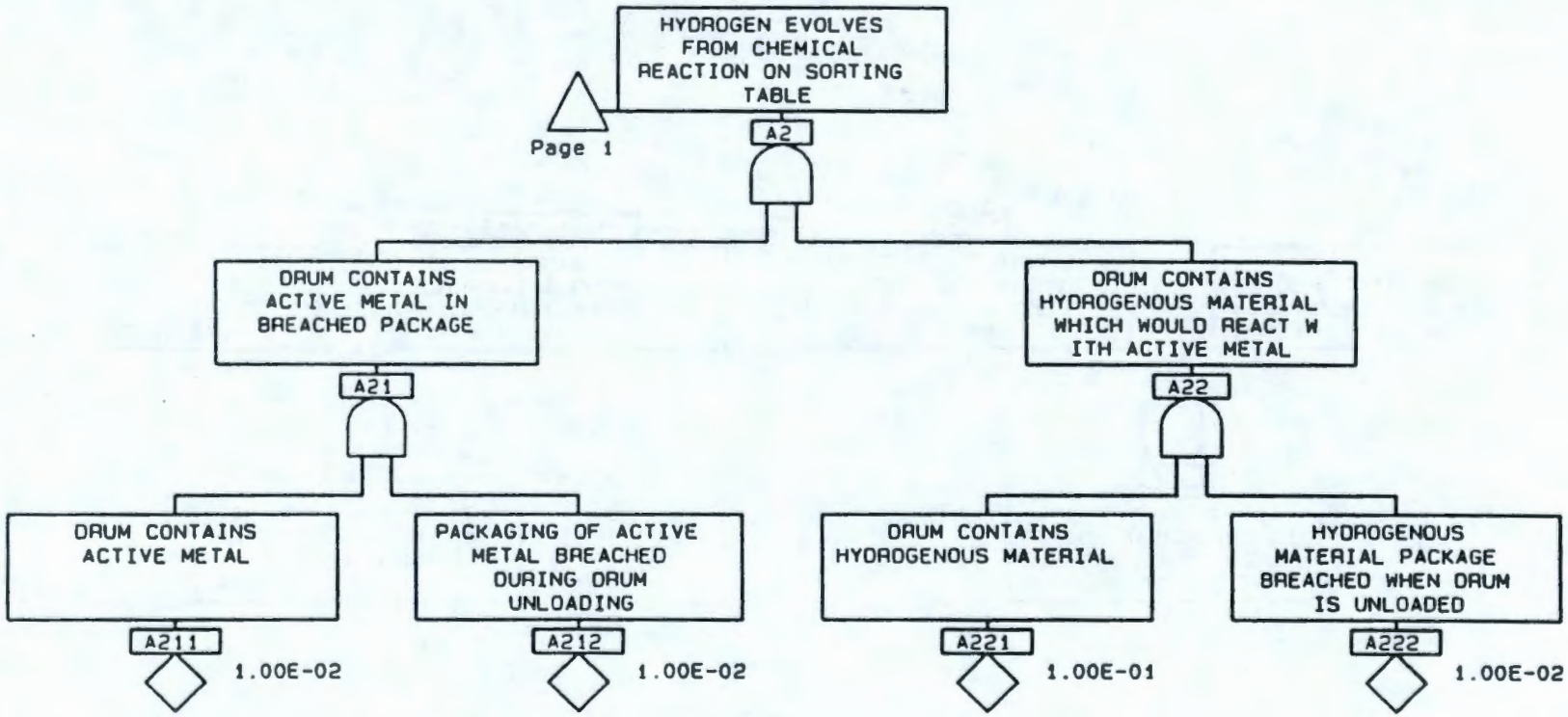

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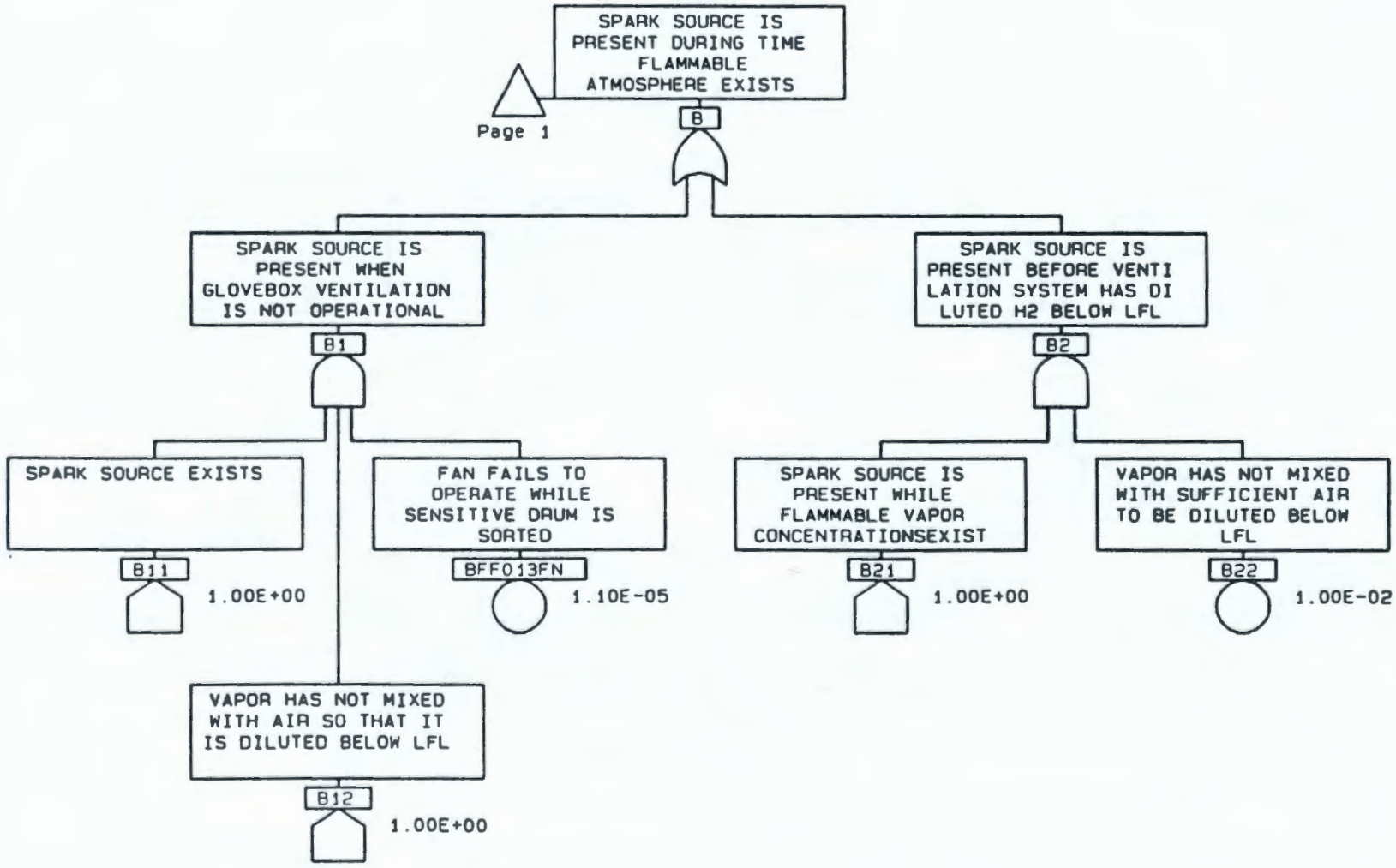
SPARK SOURCE IS PRESENT DURING TIME FLAMMABLE ATMOSPHERE EXISTS
B
Page 1
SPARK SOURCE IS PRESENT WHEN GLOVEBOX VENTILATION IS NOT OPERATIONAL
B1
SPARK SOURCE IS PRESENT BEFORE VENTI LATION SYSTEM HAS DI LUTED H2 BELOW LFL
B2
SPARK SOURCE EXISTS
B11
1.00E+00
FAN FAILS TO OPERATE WHILE SENSITIVE DRUM IS SORTED
BFF013FN
1.10E-05
SPARK SOURCE IS PRESENT WHILE FLAMMABLE VAPOR CONCENTRATIONSEXIST
B21
1.00E+00
VAPOR HAS NOT MIXED WITH SUFFICIENT AIR TO BE DILUTED BELOW LFL
B22
1.00E-02
VAPOR HAS NOT MIXED WITH AIR SO THAT IT IS DILUTED BELOW LFL
B12
1.00E+00

HYEX.TC CAFTA Database Report 7-01-93 9:53 Page 1

	TYPE	RATE	U	DESC	SOURCE
1	FF FN	3.0E-05	H	FAN FAILS TO RUN	WHC-IP-0690

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HYEX.CAF CAFTA Fault Tree Report 7-01-93 9:51 Page 1

Tree list:

TOP	AND	A	B		
A	OR	A1	A2		
A1	AND	A11	A12	A13	A14
A12	OR	A121	A122		
A2	AND	A21	A22		
A21	AND	A211	A212		
A22	AND	A221	A222		
B	OR	B1	B2		
B1	AND	B11	B12	BFF013FN	
B2	AND	B21	B22		

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HYEX.CAF CAFTA Fault Tree Report 7-01-93 9:51 Page 2

Gate outputs:

Gate Name	Outputs
A	TOP
A1	A
A12	A1
A2	A
A21	A2
A22	A2
B	TOP
B1	B
B2	B

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HYEX.CAF CAFTA Fault Tree Report 7-01-93 9:51 Page 3

Basic event outputs:

B.E. Name	Outputs
A11	A1
A121	A12
A122	A12
A13	A1
A14	A1
A211	A21
A212	A21
A221	A22
A222	A22
B11	B1
B12	B1
B21	B2
B22	B2
BFF013FN	B1

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HYEX.BE CAFTA Database Report 7-01-93 9:51 Page 1

	NAME	PROB	DESC
1	A11	1.00E-03	HYDROGEN HAS EVOLVED AND FILLED THE DRUM'S VOIDSPACE
2	A121	1.00E-02	HEADGAS SAMPLE NOT PERFORMED
3	A122	1.00E-02	HEADGAS RESULTS NOT CORRECTLY INTERPRETED
4	A13	7.50E-01	DRUM VOIDSPACE IS GREATER THAN 40% OF VOLUME
5	A14	1.00E-02	DRUM IS NOT VENTED
6	A211	1.00E-02	DRUM CONTAINS ACTIVE METAL
7	A212	1.00E-02	PACKAGING OF ACTIVE METAL BREACHED DURING DRUM UNLOADI
8	A221	1.00E-01	DRUM CONTAINS HYDROGENOUS MATERIAL
9	A222	1.00E-02	HYDROGENOUS MATERIAL PACKAGE BREACHED WHEN DRUM IS UNL
10	B11	1.00E+00	SPARK SOURCE EXISTS
11	B12	1.00E+00	VAPOR HAS NOT MIXED WITH AIR SO THAT IT IS DILUTED BEL
12	B21	1.00E+00	SPARK SOURCE IS PRESENT WHILE FLAMMABLE VAPOR CONCENTR
13	B22	1.00E-02	VAPOR HAS NOT MIXED WITH SUFFICIENT AIR TO BE DILUTED
14	BFF013FN	1.10E-05	FAN FAILS TO OPERATE WHILE SENSITIVE DRUM IS SORTED

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HYEX.CUT CUTSET REPORT 7-01-93 9:54 Page 1
Filter: 'ALL' Truncation Limit: 1.00E-12

MODULE/EVENT NAME	DESCRIPTION	B.E. PROB.	MOD./CS. PROB.
1) TOP			*2.50E-09
1) A11	HYDROGEN HAS EVOLVED AND FILLED THE DRUM	1.00E-03	7.50E-10
A121	HEADGAS SAMPLE NOT PERFORMED	1.00E-02	
A13	DRUM VOIDSPACE IS GREATER THAN 40% OF VO	7.50E-01	
A14	DRUM IS NOT VENTED	1.00E-02	
B21	SPARK SOURCE IS PRESENT WHILE FLAMMABLE	1.00E+00	
B22	VAPOR HAS NOT MIXED WITH SUFFICIENT AIR	1.00E-02	
2) A11	HYDROGEN HAS EVOLVED AND FILLED THE DRUM	1.00E-03	7.50E-10
A122	HEADGAS RESULTS NOT CORRECTLY INTERPRETE	1.00E-02	
A13	DRUM VOIDSPACE IS GREATER THAN 40% OF VO	7.50E-01	
A14	DRUM IS NOT VENTED	1.00E-02	
B21	SPARK SOURCE IS PRESENT WHILE FLAMMABLE	1.00E+00	
B22	VAPOR HAS NOT MIXED WITH SUFFICIENT AIR	1.00E-02	
3) A211	DRUM CONTAINS ACTIVE METAL	1.00E-02	1.00E-09
A212	PACKAGING OF ACTIVE METAL BREACHED DURIN	1.00E-02	
A221	DRUM CONTAINS HYDROGENOUS MATERIAL	1.00E-01	
A222	HYDROGENOUS MATERIAL PACKAGE BREACHED WH	1.00E-02	
B21	SPARK SOURCE IS PRESENT WHILE FLAMMABLE	1.00E+00	
B22	VAPOR HAS NOT MIXED WITH SUFFICIENT AIR	1.00E-02	
4) A211	DRUM CONTAINS ACTIVE METAL	1.00E-02	1.10E-12
A212	PACKAGING OF ACTIVE METAL BREACHED DURIN	1.00E-02	
A221	DRUM CONTAINS HYDROGENOUS MATERIAL	1.00E-01	
A222	HYDROGENOUS MATERIAL PACKAGE BREACHED WH	1.00E-02	
B11	SPARK SOURCE EXISTS	1.00E+00	
B12	VAPOR HAS NOT MIXED WITH AIR SO THAT IT	1.00E+00	
BFF013FN	FAN FAILS TO OPERATE WHILE SENSITIVE DRU	1.10E-05	

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Calculations for Hydrogen buildup in Transuranic Glovebox

The capacity of the transuranic material sorting glovebox is 3152 cubic feet.

$gbcap := 3152 \cdot ft^3$

If an entire 55-gallon drum is loaded with hydrogen gas, the volume must be calculated for the maximum explosive pressure. (Assume that the maximum explosive pressure is at about 16 volume percent hydrogen and that the maximum explosive pressure is about 110 psi--the maximum pressure for flammable gases per the NFPA handbook.)

$volh := 55 \cdot gal$

$$exvolh := \frac{volh}{0.16}$$

$exvolh = 45.953 \cdot ft^3$

$$volfrac := \frac{volh}{gbcap}$$

$volfrac = 0.002$

If a pocket of material explodes at the maximum explosive pressure, the resulting pressure seen by the glovebox wall is as follows:

$$P := \frac{exvolh}{gbcap} \cdot 110 \cdot psi$$

If it is assumed that the strength of the glovebox is about that of a conventional structure, the failure pressure is assumed to be 1 psi.

$P = 1.604 \cdot psi$

Find the amount of hydrogen necessary to breach the glovebox--assuming that the the glovebox would be breached by approximately 1.0 psi.

First, find the explosive volume necessary to subject the glovebox walls to 1.0 psi.

$PF := 1.0 \cdot psi$

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$$STVL := PF \cdot \frac{gbcap}{110 \cdot psi}$$

$$STVL = 28.655 \cdot ft^3$$

$$VH := STVL \cdot .16$$

$$VH = 4.585 \cdot ft^3$$

$$VH = 34.296 \cdot gal$$

$$\frac{VH}{55 \cdot gal} = 0.624$$

Therefore, about 60% of the drum must be full of hydrogen to breach the walls of the transuranic material glovebox.

For the low-level waste glovebox, with a volume of 2185 cubic feet, the amount would be:

$$gbcapll := 2185 \cdot ft^3$$

$$EXVL := PF \cdot \frac{gbcapll}{110 \cdot psi}$$

$$EXVL = 19.864 \cdot ft^3$$

$$VH := EXVL \cdot .16$$

$$VH = 3.178 \cdot ft^3$$

$$VH = 23.774 \cdot gal$$

$$\frac{VH}{55 \cdot gal} = 0.432$$

For the low-level waste glovebox about 43% of a drum must be full of hydrogen to breach the walls.

Now, find the time necessary to dilute the sensitive volume of hydrogen below

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the flammable limit.

For the transuranic glovebox, the calculated airflow over the sorting table has a velocity of 536 ft/hr (0.149 ft/sec); the low-level waste glovebox has an air velocity of 264.7 ft/hr (0.0735 ft/sec).

The objective of this calculation is to determine the time that it would take to disperse a layer of hydrogen from the TRU and LLW sorting gloveboxes. Because of the buoyancy of hydrogen, it is assumed that the hydrogen would almost instantly go to the ceiling of the glovebox. It is further assumed that the hydrogen would form a layer along the ceiling of the glovebox, which would be dispersed by mixing with the ventiliation system airflow. It is assumed that the layer will have an area of 32 square feet (the length of the sorting table multiplied by the glovebox width).

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1. Calculate the Schmidt number.

$$mu := 0.1241 \cdot 10^{-4} \cdot \frac{lb}{sec \cdot ft}$$

$$rho := 0.0718 \cdot \frac{lb}{ft^3}$$

Assume 80 degree F air at less slightly less than one atmosphere (Glovebox operates at a slight vacuum).

$$D := 1.60 \cdot \frac{ft^2}{hr}$$

Diffusion coefficient for hydrogen in air.

$$Sc := \frac{mu}{rho \cdot D}$$

$$Sc = 0.389$$

2. Calculate Reynolds number.

Air velocity is 536 ft/hr (0.149 ft/sec) for tru, 267.7 ft/hr for llw, (0.0735 ft/sec). Length of sorting table is 8 ft.

$$L := 8 \cdot ft$$

$Vtru := 0.149 \cdot \frac{ft}{sec}$ $\qquad$ $Vllw := 0.0735 \cdot \frac{ft}{sec}$

$Retru := L \cdot Vtru \cdot \frac{rho}{mu}$ $\qquad$ $Rellw := L \cdot Vllw \cdot \frac{rho}{mu}$

$Retru = 6.897 \cdot 10^{3}$ $\qquad$ $Rellw = 3.402 \cdot 10^{3}$

3. Calculate Coburn J factor.

$Jdtru := 0.664 \cdot Retru^{0.5}$ $\qquad$ $Jdllw := 0.664 \cdot Rellw^{0.5}$

$Jdtru = 55.142$ $\qquad$ $Jdllw = 38.729$

4. Calculate mass transfer constant (Kc)

$Veltru := 536 \cdot \frac{ft}{hr}$ $\qquad$ $Velllw := 536 \cdot \frac{ft}{hr}$

$Kctru := Jdtru \cdot \frac{Veltru}{Sc^{0.5}}$ $\qquad$ $Kcllw := Jdllw \cdot \frac{Velllw}{Sc^{0.5}}$

$Kctru = 4.739 \cdot 10^{4} \cdot \frac{ft}{hr}$ $\qquad$ $Kcllw = 3.329 \cdot 10^{4} \cdot \frac{ft}{hr}$

5. Calculate mass transfer rate.

$pa := 1 \cdot atm$ Partial pressure of hydrogen in the layer

$pavg := 0 \cdot atm$ Partial pressure of hydrogen in the airstream

$T := 540 \cdot degr$ Assumed 80 degree temperature

$A := 32 \cdot ft^{2}$

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$$R := 0.73008 \cdot ft^3 \cdot \frac{atm}{degr \cdot lbmol}$$

$$Qtru := \frac{Kctru}{R \cdot T} \cdot (pa - pavg) \cdot A \qquad Qllw := \frac{Kcllw}{R \cdot T} \cdot (pa - pavg) \cdot A$$

$$Qtru = 1.069 \cdot \frac{lbmol}{sec} \qquad Qllw = 0.751 \cdot \frac{lbmol}{sec}$$

6. Calculate the time for the hydrogen to disperse.

$$VOLH := 55 \cdot gal$$

$$VOLH = 7.352 \cdot ft^3$$

At standard conditions of temperature and pressure, one pound mole of gas occupies 359 cubic ft.

$$stp := 359 \cdot \frac{ft^3}{lbmol}$$

$$eighty := \left[\frac{540}{528}\right] \cdot stp$$

Volume occupied by a pound mole of gas at 80 deg F.

$$eighty = 367.159 \cdot ft^3$$

$$lbmolh2 := \frac{VOLH}{eighty}$$

$lbmolh2 = 0.02 \cdot lbmol$ Number of pound moles of hydrogen.

$$Timetru := \frac{lbmolh2}{Qtru} \qquad Timellw := \frac{lbmolh2}{Qllw}$$

$$Timetru = 0.019 \cdot sec \qquad Timellw = 0.027 \cdot sec$$

Because of the short times that it might take the hydrogen to disperse compared to the drum processing time (about 1 hour), it is assumed that, if ventilation is working, a flammable mixture would exist in the glovebox for about 1% of the processing time.

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10th Hot Lab Proceedings, ANS, Nov. 1962

FIRE AND EXPLOSION TESTS OF PLUTONIUM GLOVE BOXES

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To test the fire and explosion resistance of new plutonium metallurgy glove-boxes and to obtain information pertinent to fire control, fire and explosion tests were conducted in one of the gloveboxes. It was found that over 10% oxygen is required for non-metal, and that over 5% oxygen is required for freely burning metal fires. However, metal chips will burn with as little as 1% oxygen if additional heat is furnished. Standard dry chemical, Met-L-X and carbon dioxide extinguishers were excellent for non-metal fires. A eutectic salt mixture was excellent for metal fires.

The gloveboxes designed for plutonium research in the new Fuels Technology Center at Argonne National Laboratory have features that make them more adaptable to varying research conditions and at the same time give better fire resistance.(1) They are constructed of a heavy, extruded aluminum framework and have removeable one-inch thick aluminum baseplates and one-half-inch thick aluminum side, back and top panels. Windows are three-eighth-inch laminated safety-glass.

Normally these gloveboxes will be used with an atmosphere of nitrogen containing less than 0.03 percent oxygen. In case, however, the nitrogen atmosphere was lost or a large leak should occur, a fire could develop from the spontaneous ignition of plutonium chips or pyrophoric plutonium alloys.

To test the fire resistance of the new glovebox design and obtain information pertinent to fire control, seventeen fire tests and two explosions were conducted in one of the gloveboxes.

The purposes of the tests can be outlined as follows:

1. To determine the effect on the glovebox of fires and explosions.
2. To find the lowest oxygen concentration that will support combustion.
3. To test the effectiveness of standard fire extinguishers and a fused salt mixture for extinguishing glovebox fires.

The glovebox used for the test had a one-inch thick aluminum baseplate, one-half-inch thick aluminum panel at one end, sloping windows in front and back and a glass panel on top and at one end, with an enclosed volume of 17.7 cubic feet.

Thermoswitch indicators were mounted outside of the top window panel and a chromel-alumel thermocouple was placed in a small hole drilled into the underside of the baseplate.

The fire tests were conducted within a metal dust and fume chamber 10' by 10' by 8' inside dimensions. They were conducted at various oxygen concentrations of 1 to 20 percent in dry nitrogen. Motion pictures were taken through a window in the chamber.

Work performed under the auspices of the U.S. Atomic Energy Commission

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ALCOHOL FIRES

Because ethyl alcohol is used to a considerable extent in some of our gloveboxes, it was used to simulate a non-metal fire in the glovebox. Nine tests were conducted using 50 ml batches of alcohol under varying conditions.

The alcohol was poured into a 7" by 12" by 1-1/2" enamel tray and ignited with a Tesla spark coil. Under some conditions the fires smothered themselves in a few seconds. The remaining fires were allowed to burn for a few minutes then extinguished with a fire extinguisher mounted on the end panel. The nozzle of the extinguisher was sealed through a flexible rubber diaphragm and could be aimed over a wide area of the glovebox. Three types of extinguishers were used; dry chemical (sodium bicarbonate), Met-L-X (sodium chloride) and carbon dioxide. Contrary to what one might expect,(2) the carbon dioxide extinguisher did not pressurize the glovebox more than a few inches of water as the fire was put out with just two or three short bursts of the extinguisher.

The dry chemical also put out the fire with just a few short bursts, and hardly changed the pressure in the glovebox. The Met-L-X extinguisher uses a coarser material and is normally used only on metal fires. To see if it could be used in an emergency if no other type were available, it was tried on the alcohol fire. Surprisingly, it also extinguished the fire with a few short bursts and hardly changed the pressure in the glovebox.

To find the lowest oxygen concentration that would support combustion in case a leak should develop in a glovebox, the glovebox was purged with cylinder nitrogen until the desired oxygen level was reached, then held in a static condition. Oxygen concentrations were measured with a MSA Oxygen Analyzer. Table I summarizes the results of these tests.

Table I. Alcohol Fires

Atmosphere	Glovebox Condition	Results
Nitrogen-10% Oxygen	Closed glovebox; static atmosphere.	Unable to ignite alcohol.
Nitrogen-12.5% Oxygen	Closed glovebox; static atmosphere.	Ignited with difficulty; burned 4 or 5 seconds and went out.
Nitrogen-15% Oxygen	Closed glovebox; exhaust filter open.	Burned readily.
Air	Closed glovebox; exhaust filter closed.	Burned with flames against top window. Gloves swelled to 33" diameter and burst in 30 seconds.
Air	Open glovebox; (gloves removed).	Burned vigorously. Flames confined to interior of glovebox.
Air	Closed glovebox; exhaust filter open.	Fire self-extinguished in 45 seconds, leaving 10 ml alcohol unburned.
Air	Closed glovebox; exhaust filter 20% closed.	Fire self-extinguished in 57 seconds; pressure built up to 14" water column; 18 ml of alcohol unburned.

Table I does not list all the tests conducted but gives representative results for the different conditions tested. Several things can be noted from the table.

1. Over 10 percent oxygen is needed for the combustion of alcohol in the glovebox.
2. When there is no pressure relief, as in the case when the exhaust filter is closed, the pressure build-up will very quickly burst the gloves.

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3. When there is pressure relief, but essentially a static atmosphere in the glovebox, the fire quickly smothers itself without bursting the gloves.

In the tests none of the windows cracked even though flames burned against the top window for short periods. By contrast, a plastic window was ignited by a small amount of burning plutonium in a glovebox fire at another installation.(3) The fire spread to other plastic windows and did considerable damage.

METAL FIRES

To simulate a plutonium metal fire 50 gram batches of magnesium chips were used. Magnesium has a heat of combustion of 5980 cal/g compared to only 1058 cal/g for plutonium;(4) thus in heat produced, 50 grams of magnesium is roughly equivalent to the amount of plutonium normally permitted in one of our gloveboxes at any one time.

A spirally wound nichrome heating element covered by a small ceramic tube was installed in a 4" diameter aluminum pan. The pan was set on a 1/8" aluminum plate placed on the glovebox floor. The chips were poured on top of the heater and heated to the ignition point. Table II summarizes the results of these tests.

Table II. Metal Fires

Atmosphere	Glovebox Condition	Results
Nitrogen-1% Oxygen	Closed glovebox; static atmosphere	Burned very slowly; went out when heater turned off.
Nitrogen-3% Oxygen	Closed glovebox; static atmosphere.	Burned slowly with slight amount of smoke; went out when heater turned off.
Nitrogen-5% Oxygen	Closed glovebox; static atmosphere	Burned slowly with slight flame; went out when heater turned off.
Nitrogen-10% Oxygen	Closed glovebox; static atmosphere	Burned freely with slight flame; box filled with smoke; continued to burn when heater turned off.
Air	Gloves removed; 100 gms of chips directly on baseplate.	Burned freely but not vigorously.
Air	Gloves removed; 100 gms of chips in enamel tray insulated from glovebox floor with 1/2" of sand.	Burned violently with brilliant flame.

The significant things to note in Table II are:

1. The chips will burn in as little as 1 percent oxygen if additional heat is furnished, but they will not burn freely until over 5 percent oxygen is supplied.
2. The difference in burning characteristics between the last two tests clearly indicates that the heavy aluminum baseplate conducts away enough heat to greatly slow down the burning rate.

In the latter three of the above tests, the fires were allowed to burn for nearly ten minutes, then extinguished by pouring over the fire a mixture of finely ground fused salts (35 w/o NaCl, 40 w/o KCl, 25 w/o $BaCl_2$).(5) The fire was extinguished immediately, and

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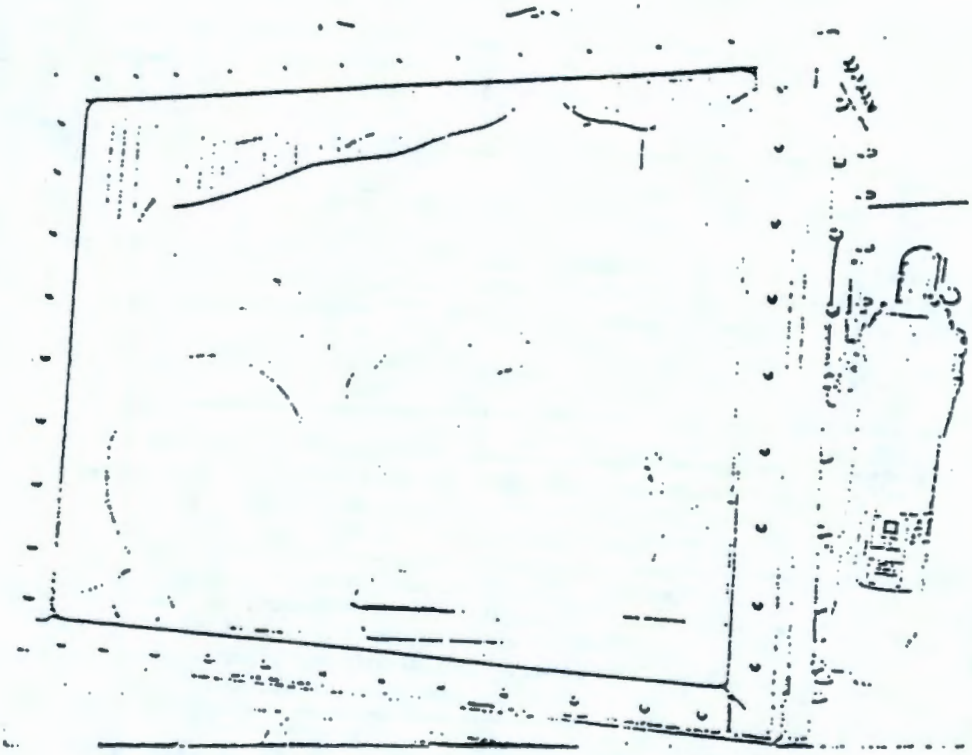

Fig. 1. Front view of glove box after 17 consecutive fire tests

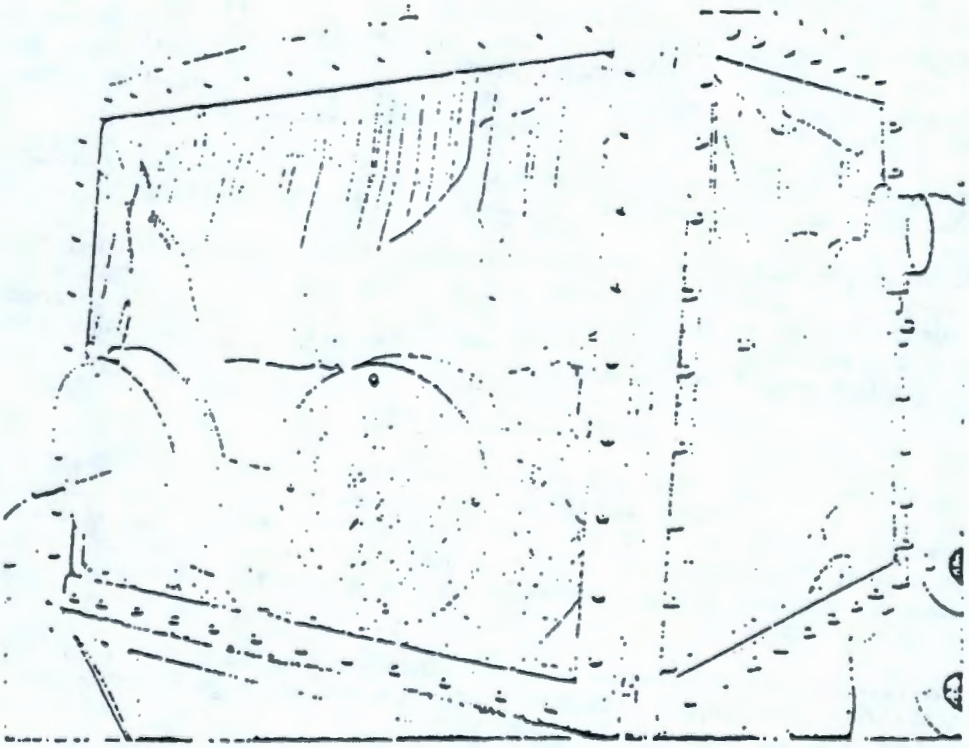

Fig. 2. Rear view of glove box after 17 consecutive fire tests

later examination of the caked material showed that the salt mixture had melted and formed a solid crust around the burning material. Other salt mixtures used in similar tests (2) allowed the burning metal to smoulder for 20 to 30 minutes.

The maximum temperature reached by the baseplate in these tests was 152°F.

ALCOHOL AND METAL FIRES

Up to this point none of the windows had cracked, although blisters had begun to appear in the plastic laminate of the safety glass. Combination alcohol and metal fires were then tried, using larger amounts of material. Table III summarizes these tests.

Table III. Alcohol and Metal Fires

Atmosphere	Glovebox Condition	Results
Air	Gloves removed; 100 gm Mg and 500 ml alcohol directly on baseplate.	Alcohol burned freely and ignited Mg chips; burned for 10 minutes; all windows cracked.
Air	Gloves removed; 300 gm Mg chips and 1000 ml alcohol in enamel tray insulated from floor.	Burned very vigorously; windows further cracked but still intact. Mg continued burning after all alcohol was burned. Fire left to burn itself out.

The significant thing about these two tests is that the windows remained intact, even though badly cracked and blistered.

Three more alcohol fires with the glovebox closed and exhaust filter open were conducted after these two tests, and the windows remained intact for two of them. On the third, the exhaust filter was 80 percent closed, and the pressure buildup blew out one of the cracked windows. Figures 1 and 2 show the appearance of the glovebox after the fire tests. The blistering of the plastic laminate can be seen in the glass end panel of Figure 2. The black streaks are melted binder from the felt used in the window clamps.

After the fire tests the glovebox was disassembled and examined. Aside from the broken windows and a slight set taken by the gaskets, there was no damage to the glovebox.

Although the fire tests were conducted under static conditions, we feel that this closely simulates conditions in our plutonium gloveboxes as the normal flowrate in our nitrogen atmosphere boxes is only 0.2 CFM per 100 cubic foot glovebox. To overcome the possibility of pressurizing the gloveboxes in case of a fire, or for any other reason, we have added a pressure relief vent to all our glovebox lines.

EXPLOSION TESTS

In our previous glovebox work we have had several minor explosions in the gloveboxes, even though they contained high purity atmospheres of helium or nitrogen. Most of these have been due to mixtures of nitric acid and organic materials such as alcohol or acetone. In none of these instances were the gloveboxes ruptured, although the interiors were shambles. To see what we might expect in case of a more violent explosion, two explosion tests were conducted.

The glovebox was reassembled with new windows and moved outdoors to an open field where the tests were photographed with both standard speed and high speed motion picture cameras using color film.

A Tesla coil mounted near the front window so that it would arc to the glovebox frame was used to ignite a 10 percent hydrogen and air atmosphere. The explosion was triggered by a timing circuit used to start the cameras.

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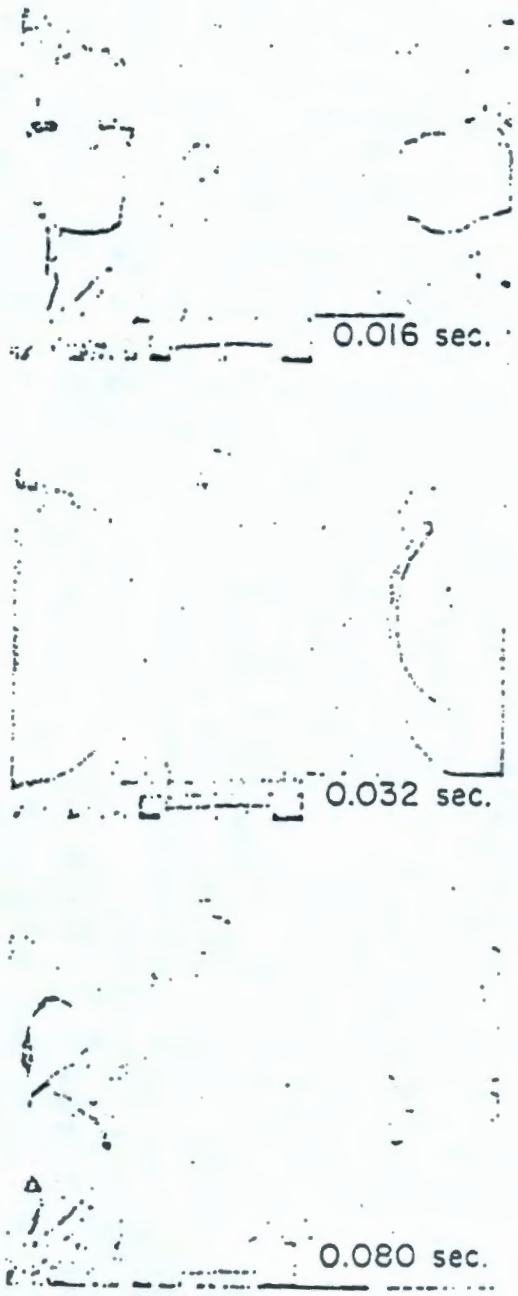

Fig. 3.

Frames from high speed movie film showing glovebox explosion when glove port covers are not used. Time is elapsed time after initiation of explosion

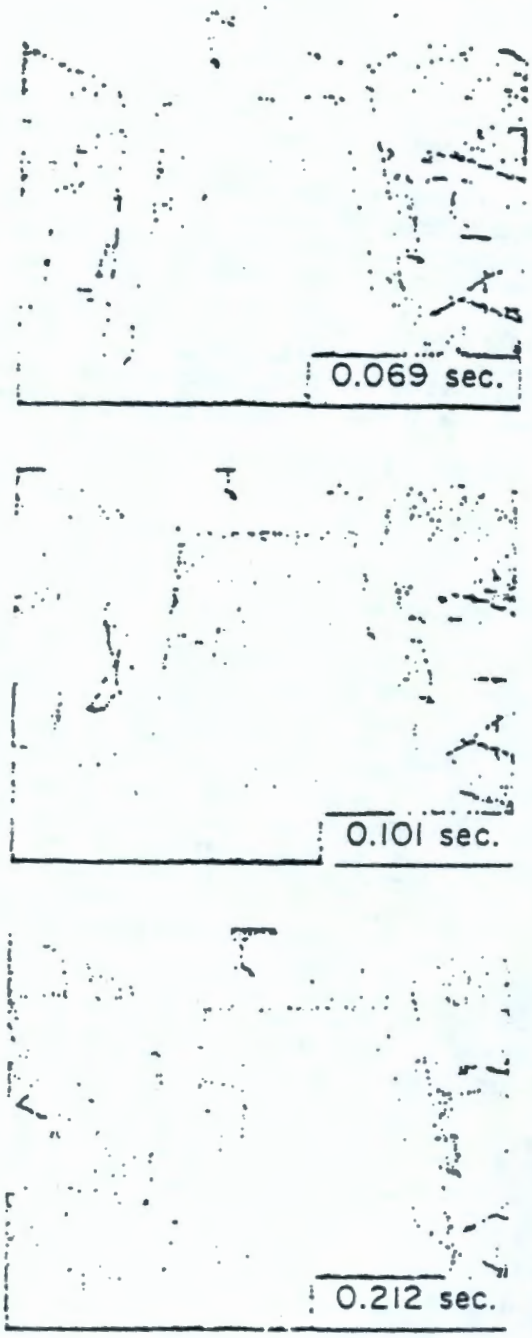

Fig. 4.

Frames from high speed movie film showing glove box explosion when glove port covers are used. Time is elapsed time after initiation of explosion

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In the first test the gloves were not covered. One glove was blown off intact; the other three were completely shattered. Pieces were found 35 feet away. Figure 3 shows three frames taken from the high speed film and reveals that the gloves swelled to about 35 inches in diameter before bursting. None of the windows were cracked.

In the second test the gloves were covered with steel glove port covers. The explosion shattered the front window but did not even crack the others. From Figure 4 it can be seen that the window first bulged out, then lifted away from the frame in a mass of splinters. A two to three-inch border of glass remained in the window frame.

Had the glovebox contained plutonium, contamination would have been widely scattered in both explosions. It was quite obvious, however, that the explosion without the glove ports covered did much less damage to the glovebox and would have been less injurious to anyone near it. The gloves were in effect acting as explosion vents.

Except for the broken window and shattered gloves, no damage was done to the glovebox.

CONCLUSIONS

The tests showed that:

1. Our new gloveboxes are quite rugged. For small metal and alcohol fires, the fires could be safely left to burn out if necessary, providing the gloves are not involved. In case of an explosion, less damage is done if glove port covers are not used.
2. Over 10 percent oxygen is required for an alcohol fire in the glovebox. The metal chips will burn in 1 percent oxygen if some additional heat is supplied.
3. The dry chemical, Met-L-X and CO_2 extinguishers are all excellent for alcohol fires in the glovebox. The fused salt mixture is excellent for metal fires.

The safety glass has good fire resistance for the type of fires that we might expect in our gloveboxes. Although we have not demonstrated it, the safety glass would undoubtedly fall out after being badly cracked in an extremely hot fire, or prolonged fire, because the plastic laminate would soften and melt. However, it would add very little fuel to the fire.

As for explosion resistance, the safety glass is probably worse than a plastic window because of the many glass splinters formed. A solution to this problem might be to install a high impact-resistant plastic window over the outside of the safety glass window and have it held loosely at the edges so that it would come off in one piece and act as a shield.

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3. Serious Accidents Bulletin, Number 130, November 27, 1957, USAEC.
4. ASM Metals Handbook, 8th Edition, 1961, pp. 1213 and 1218.
5. L. H. Cope, The Extinguishing of Uranium and Plutonium Fires, UKAEA, DEGR-29D, November, 1959.

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APPENDIX B

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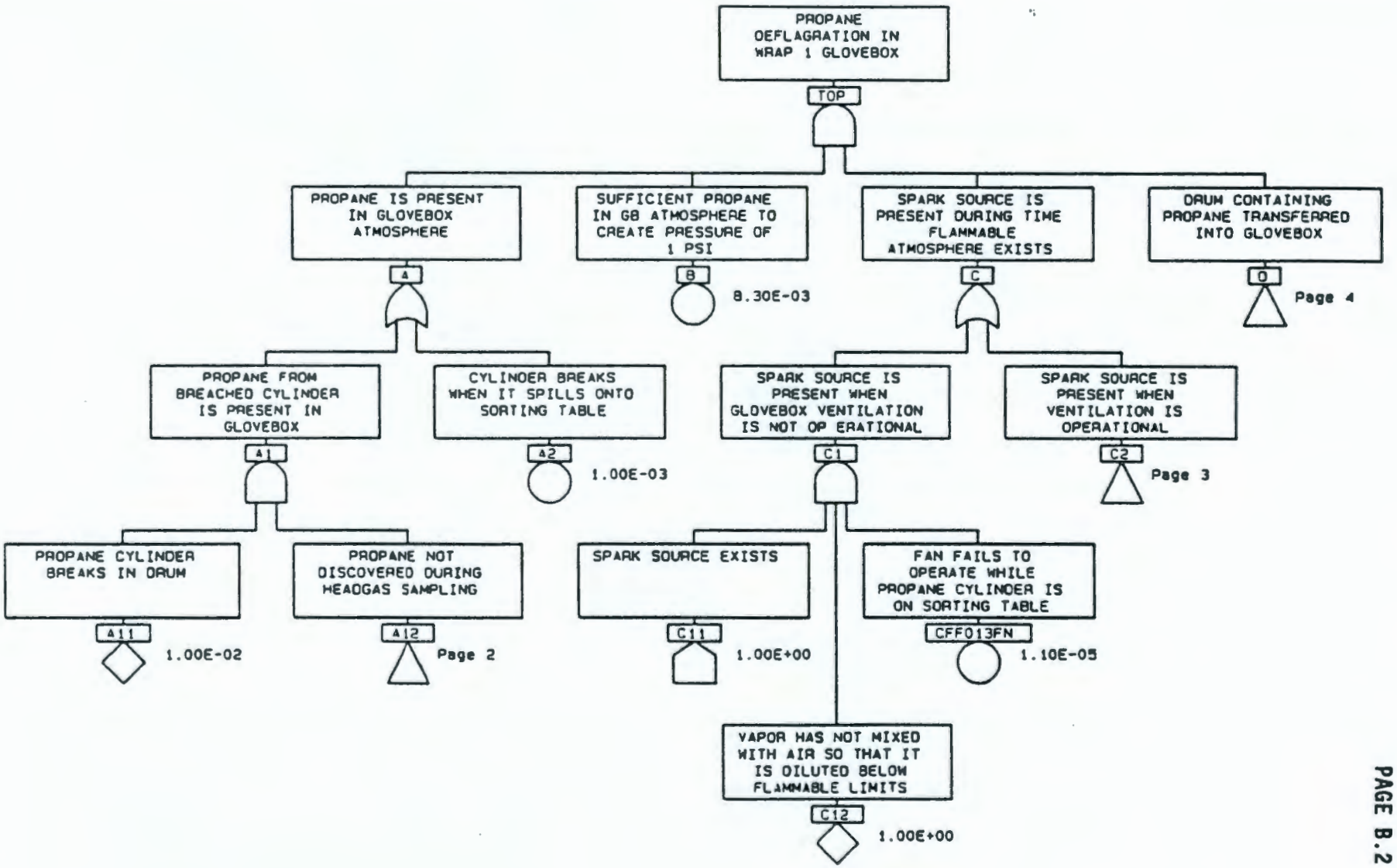
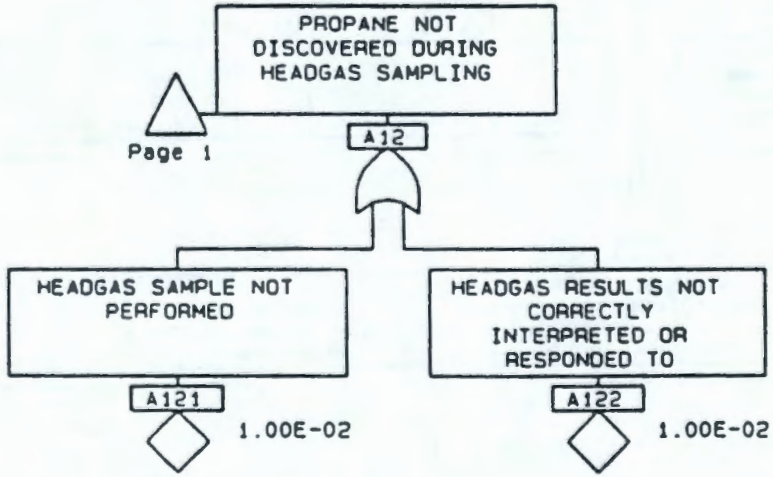
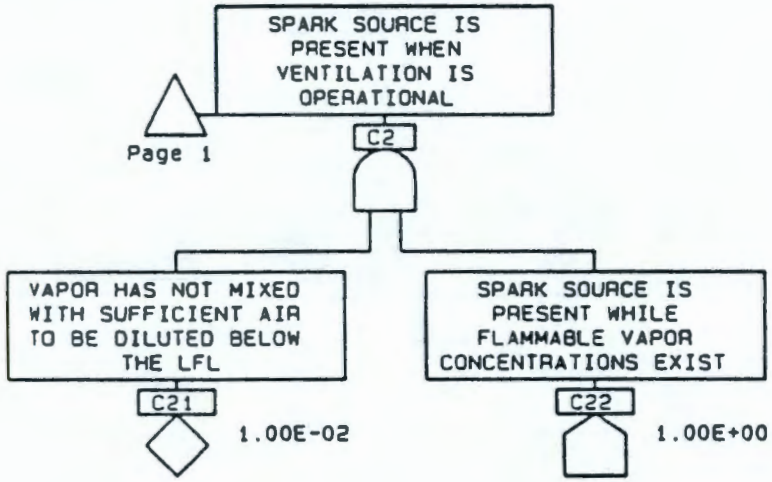


1	2	3	4	5
LIKELIHOOD OF PROPANE EXPLOSION IN WRAP	CYLINDER.CAF	7-06-93	Page 1	


PROPANE NOT DISCOVERED DURING HEADGAS SAMPLING
A12
Page 1
HEADGAS SAMPLE NOT PERFORMED
A121
1.00E-02
HEADGAS RESULTS NOT CORRECTLY INTERPRETED OR RESPONDED TO
A122
1.00E-02



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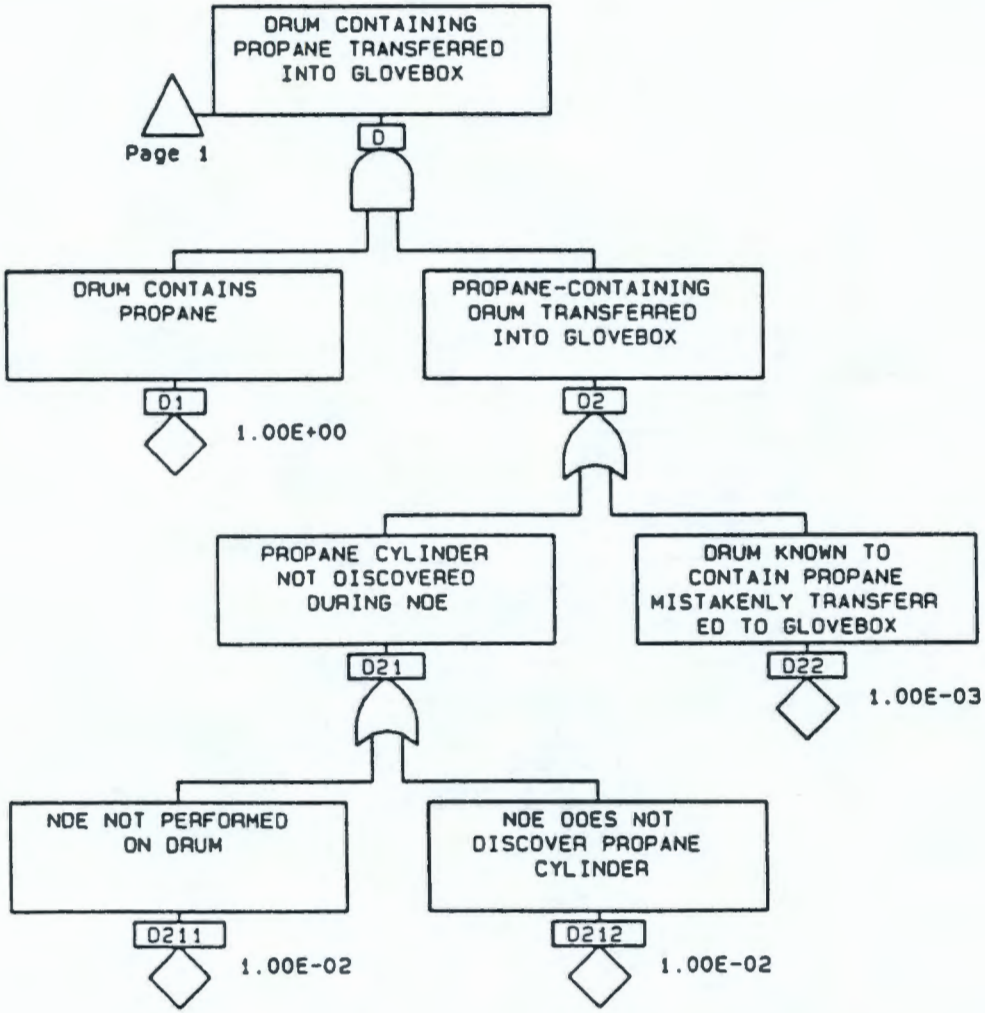

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Tree list:

TOP	AND	A	B	C	D
A	OR	A1	A2		
A1	AND	A11	A12		
A12	OR	A121	A122		
C	OR	C1	C2		
C1	AND	C11	C12	CFF013FN	
C2	AND	C21	C22		
D	AND	D1	D2		
D2	OR	D21	D22		
D21	OR	D211	D212		

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Gate outputs:

Gate Name	Outputs
A	TOP
A1	A
A12	A1
C	TOP
C1	C
C2	C
D	TOP
D2	D
D21	D2

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Basic event outputs:

B.E. Name	Outputs
A11	A1
A121	A12
A122	A12
A2	A
B	TOP
C11	C1
C12	C1
C21	C2
C22	C2
CFF013FN	C1
D1	D
D211	D21
D212	D21
D22	D2

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	NAME	PROB	DESC
1	A11	1.00E-02	PROPANE CYLINDER BREAKS IN DRUM
2	A121	1.00E-02	HEADGAS SAMPLE NOT PERFORMED
3	A122	1.00E-02	HEADGAS RESULTS NOT CORRECTLY INTERPRETED OR RESPONDED
4	A2	1.00E-03	CYLINDER BREAKS WHEN IT SPILLS ONTO SORTING TABLE
5	B	8.30E-03	SUFFICIENT PROPANE IN GB ATMOSPHERE TO CREATE PRESSURE
6	C11	1.00E+00	SPARK SOURCE EXISTS
7	C12	1.00E+00	VAPOR HAS NOT MIXED WITH AIR SO THAT IT IS DILUTED BEL
8	C21	1.00E-02	VAPOR HAS NOT MIXED WITH SUFFICIENT AIR TO BE DILUTED
9	C22	1.00E+00	SPARK SOURCE IS PRESENT WHILE FLAMMABLE VAPOR CONCENTR
10	CFF013FN	1.10E-05	FAN FAILS TO OPERATE WHILE PROPANE CYLINDER IS ON SORT
11	D1	1.00E+00	DRUM CONTAINS PROPANE
12	D211	1.00E-02	NDE NOT PERFORMED ON DRUM
13	D212	1.00E-02	NDE DOES NOT DISCOVER PROPANE CYLINDER
14	D22	1.00E-03	DRUM KNOWN TO CONTAIN PROPANE MISTAKENLY TRANSFERRED T

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TYPE	RATE	U	DESC	SOURCE
I FF FN	3.0E-05	H	FAN FAILS DURING OPERATION	WHC-IP-0690

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MODULE/EVENT NAME	DESCRIPTION	B.E. PROB.	MOD./CS. PROB.
1) TOP			*2.09E-09
1) A2	CYLINDER BREAKS WHEN IT SPILLS ONTO SORT	1.00E-03	8.30E-10
B	SUFFICIENT PROPANE IN GB ATMOSPHERE TO C	8.30E-03	
C21	VAPOR HAS NOT MIXED WITH SUFFICIENT AIR	1.00E-02	
C22	SPARK SOURCE IS PRESENT WHILE FLAMMABLE	1.00E+00	
D1	DRUM CONTAINS PROPANE	1.00E+00	
D212	NDE DOES NOT DISCOVER PROPANE CYLINDER	1.00E-02	
2) A2	CYLINDER BREAKS WHEN IT SPILLS ONTO SORT	1.00E-03	8.30E-10
B	SUFFICIENT PROPANE IN GB ATMOSPHERE TO C	8.30E-03	
C21	VAPOR HAS NOT MIXED WITH SUFFICIENT AIR	1.00E-02	
C22	SPARK SOURCE IS PRESENT WHILE FLAMMABLE	1.00E+00	
D1	DRUM CONTAINS PROPANE	1.00E+00	
D211	NDE NOT PERFORMED ON DRUM	1.00E-02	
3) A2	CYLINDER BREAKS WHEN IT SPILLS ONTO SORT	1.00E-03	8.30E-11
B	SUFFICIENT PROPANE IN GB ATMOSPHERE TO C	8.30E-03	
C21	VAPOR HAS NOT MIXED WITH SUFFICIENT AIR	1.00E-02	
C22	SPARK SOURCE IS PRESENT WHILE FLAMMABLE	1.00E+00	
D1	DRUM CONTAINS PROPANE	1.00E+00	
D22	DRUM KNOWN TO CONTAIN PROPANE MISTAKENLY	1.00E-03	
4) A11	PROPANE CYLINDER BREAKS IN DRUM	1.00E-02	8.30E-11
A121	HEADGAS SAMPLE NOT PERFORMED	1.00E-02	
B	SUFFICIENT PROPANE IN GB ATMOSPHERE TO C	8.30E-03	
C21	VAPOR HAS NOT MIXED WITH SUFFICIENT AIR	1.00E-02	
C22	SPARK SOURCE IS PRESENT WHILE FLAMMABLE	1.00E+00	
D1	DRUM CONTAINS PROPANE	1.00E+00	
D212	NDE DOES NOT DISCOVER PROPANE CYLINDER	1.00E-02	
5) A11	PROPANE CYLINDER BREAKS IN DRUM	1.00E-02	8.30E-11
A122	HEADGAS RESULTS NOT CORRECTLY INTERPRETE	1.00E-02	
B	SUFFICIENT PROPANE IN GB ATMOSPHERE TO C	8.30E-03	
C21	VAPOR HAS NOT MIXED WITH SUFFICIENT AIR	1.00E-02	
C22	SPARK SOURCE IS PRESENT WHILE FLAMMABLE	1.00E+00	
D1	DRUM CONTAINS PROPANE	1.00E+00	
D211	NDE NOT PERFORMED ON DRUM	1.00E-02	
6) A11	PROPANE CYLINDER BREAKS IN DRUM	1.00E-02	8.30E-11
A122	HEADGAS RESULTS NOT CORRECTLY INTERPRETE	1.00E-02	
B	SUFFICIENT PROPANE IN GB ATMOSPHERE TO C	8.30E-03	
C21	VAPOR HAS NOT MIXED WITH SUFFICIENT AIR	1.00E-02	
C22	SPARK SOURCE IS PRESENT WHILE FLAMMABLE	1.00E+00	
D1	DRUM CONTAINS PROPANE	1.00E+00	
D212	NDE DOES NOT DISCOVER PROPANE CYLINDER	1.00E-02	
7) A11	PROPANE CYLINDER BREAKS IN DRUM	1.00E-02	8.30E-11
A121	HEADGAS SAMPLE NOT PERFORMED	1.00E-02	
B	SUFFICIENT PROPANE IN GB ATMOSPHERE TO C	8.30E-03	
C21	VAPOR HAS NOT MIXED WITH SUFFICIENT AIR	1.00E-02	
C22	SPARK SOURCE IS PRESENT WHILE FLAMMABLE	1.00E+00	
D1	DRUM CONTAINS PROPANE	1.00E+00	
D211	NDE NOT PERFORMED ON DRUM	1.00E-02	
8) A11	PROPANE CYLINDER BREAKS IN DRUM	1.00E-02	8.30E-12
A122	HEADGAS RESULTS NOT CORRECTLY INTERPRETE	1.00E-02	
B	SUFFICIENT PROPANE IN GB ATMOSPHERE TO C	8.30E-03	
C21	VAPOR HAS NOT MIXED WITH SUFFICIENT AIR	1.00E-02	
C22	SPARK SOURCE IS PRESENT WHILE FLAMMABLE	1.00E+00	
D1	DRUM CONTAINS PROPANE	1.00E+00	
D22	DRUM KNOWN TO CONTAIN PROPANE MISTAKENLY	1.00E-03	

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MODULE/EVENT NAME	DESCRIPTION	B.E. PROB.	MOD./CS. PROB.
9) A11	PROPANE CYLINDER BREAKS IN DRUM	1.00E-02	8.30E-12
A121	HEADGAS SAMPLE NOT PERFORMED	1.00E-02	
B	SUFFICIENT PROPANE IN GB ATMOSPHERE TO C	8.30E-03	
C21	VAPOR HAS NOT MIXED WITH SUFFICIENT AIR	1.00E-02	
C22	SPARK SOURCE IS PRESENT WHILE FLAMMABLE	1.00E+00	
D1	DRUM CONTAINS PROPANE	1.00E+00	
D22	DRUM KNOWN TO CONTAIN PROPANE MISTAKENLY	1.00E-03	
10) A2	CYLINDER BREAKS WHEN IT SPILLS ONTO SORT	1.00E-03	9.13E-13
B	SUFFICIENT PROPANE IN GB ATMOSPHERE TO C	8.30E-03	
C11	SPARK SOURCE EXISTS	1.00E+00	
C12	VAPOR HAS NOT MIXED WITH AIR SO THAT IT	1.00E+00	
CFF013FN	FAN FAILS TO OPERATE WHILE PROPANE CYLIN	1.10E-05	
D1	DRUM CONTAINS PROPANE	1.00E+00	
D211	NDE NOT PERFORMED ON DRUM	1.00E-02	
11) A2	CYLINDER BREAKS WHEN IT SPILLS ONTO SORT	1.00E-03	9.13E-13
B	SUFFICIENT PROPANE IN GB ATMOSPHERE TO C	8.30E-03	
C11	SPARK SOURCE EXISTS	1.00E+00	
C12	VAPOR HAS NOT MIXED WITH AIR SO THAT IT	1.00E+00	
CFF013FN	FAN FAILS TO OPERATE WHILE PROPANE CYLIN	1.10E-05	
D1	DRUM CONTAINS PROPANE	1.00E+00	
D212	NDE DOES NOT DISCOVER PROPANE CYLINDER	1.00E-02	
12) A2	CYLINDER BREAKS WHEN IT SPILLS ONTO SORT	1.00E-03	9.13E-14
B	SUFFICIENT PROPANE IN GB ATMOSPHERE TO C	8.30E-03	
C11	SPARK SOURCE EXISTS	1.00E+00	
C12	VAPOR HAS NOT MIXED WITH AIR SO THAT IT	1.00E+00	
CFF013FN	FAN FAILS TO OPERATE WHILE PROPANE CYLIN	1.10E-05	
D1	DRUM CONTAINS PROPANE	1.00E+00	
D22	DRUM KNOWN TO CONTAIN PROPANE MISTAKENLY	1.00E-03	
13) A11	PROPANE CYLINDER BREAKS IN DRUM	1.00E-02	9.13E-14
A121	HEADGAS SAMPLE NOT PERFORMED	1.00E-02	
B	SUFFICIENT PROPANE IN GB ATMOSPHERE TO C	8.30E-03	
C11	SPARK SOURCE EXISTS	1.00E+00	
C12	VAPOR HAS NOT MIXED WITH AIR SO THAT IT	1.00E+00	
CFF013FN	FAN FAILS TO OPERATE WHILE PROPANE CYLIN	1.10E-05	
D1	DRUM CONTAINS PROPANE	1.00E+00	
D211	NDE NOT PERFORMED ON DRUM	1.00E-02	
14) A11	PROPANE CYLINDER BREAKS IN DRUM	1.00E-02	9.13E-14
A121	HEADGAS SAMPLE NOT PERFORMED	1.00E-02	
B	SUFFICIENT PROPANE IN GB ATMOSPHERE TO C	8.30E-03	
C11	SPARK SOURCE EXISTS	1.00E+00	
C12	VAPOR HAS NOT MIXED WITH AIR SO THAT IT	1.00E+00	
CFF013FN	FAN FAILS TO OPERATE WHILE PROPANE CYLIN	1.10E-05	
D1	DRUM CONTAINS PROPANE	1.00E+00	
D212	NDE DOES NOT DISCOVER PROPANE CYLINDER	1.00E-02	
15) A11	PROPANE CYLINDER BREAKS IN DRUM	1.00E-02	9.13E-14
A122	HEADGAS RESULTS NOT CORRECTLY INTERPRETE	1.00E-02	
B	SUFFICIENT PROPANE IN GB ATMOSPHERE TO C	8.30E-03	
C11	SPARK SOURCE EXISTS	1.00E+00	
C12	VAPOR HAS NOT MIXED WITH AIR SO THAT IT	1.00E+00	
CFF013FN	FAN FAILS TO OPERATE WHILE PROPANE CYLIN	1.10E-05	
D1	DRUM CONTAINS PROPANE	1.00E+00	
D211	NDE NOT PERFORMED ON DRUM	1.00E-02	
16) A11	PROPANE CYLINDER BREAKS IN DRUM	1.00E-02	9.13E-14

A122 HEADGAS RESULTS NOT CORRECTLY INTERPRETE 1.00E-02

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MODULE/EVENT NAME	DESCRIPTION	B.E. PROB.	MOD./CS. PROB.
B	SUFFICIENT PROPANE IN GB ATMOSPHERE TO C	8.30E-03	
C11	SPARK SOURCE EXISTS	1.00E+00	
C12	VAPOR HAS NOT MIXED WITH AIR SO THAT IT	1.00E+00	
CFF013FN	FAN FAILS TO OPERATE WHILE PROPANE CYLIN	1.10E-05	
D1	DRUM CONTAINS PROPANE	1.00E+00	
D212	NDE DOES NOT DISCOVER PROPANE CYLINDER	1.00E-02	
17) A11	PROPANE CYLINDER BREAKS IN DRUM	1.00E-02	9.13E-15
A121	HEADGAS SAMPLE NOT PERFORMED	1.00E-02	
B	SUFFICIENT PROPANE IN GB ATMOSPHERE TO C	8.30E-03	
C11	SPARK SOURCE EXISTS	1.00E+00	
C12	VAPOR HAS NOT MIXED WITH AIR SO THAT IT	1.00E+00	
CFF013FN	FAN FAILS TO OPERATE WHILE PROPANE CYLIN	1.10E-05	
D1	DRUM CONTAINS PROPANE	1.00E+00	
D22	DRUM KNOWN TO CONTAIN PROPANE MISTAKENLY	1.00E-03	
18) A11	PROPANE CYLINDER BREAKS IN DRUM	1.00E-02	9.13E-15
A122	HEADGAS RESULTS NOT CORRECTLY INTERPRETE	1.00E-02	
B	SUFFICIENT PROPANE IN GB ATMOSPHERE TO C	8.30E-03	
C11	SPARK SOURCE EXISTS	1.00E+00	
C12	VAPOR HAS NOT MIXED WITH AIR SO THAT IT	1.00E+00	
CFF013FN	FAN FAILS TO OPERATE WHILE PROPANE CYLIN	1.10E-05	
D1	DRUM CONTAINS PROPANE	1.00E+00	
D22	DRUM KNOWN TO CONTAIN PROPANE MISTAKENLY	1.00E-03	

Calculations for Propane explosion in TRU glovebox

$$densprop := .18 \cdot \frac{kg}{.1 \cdot m^3}$$ Density of propane

$$densprop = 0.112 \cdot \frac{lb}{ft^3}$$

$$gbcap := 3152 \cdot ft^3$$

If wtprop is 14.1 ounces (the weight of propane contained in a standard "one pound") cylinder:

$$wtprop := \frac{14.1}{16} \cdot lb$$

$$volprop := \frac{wtprop}{densprop}$$

$$volprop = 7.842 \cdot ft^3$$

$$stvolprop := \frac{volprop}{0.05}$$

$$stvolprop = 156.844 \cdot ft^3$$

$$volfrac := \frac{volprop}{gbcap}$$

$$volfrac = 0.002$$

If a pocket of material explodes at the stoichometric pressure, the resulting pressure at the glovebox wall would be:

$$P := \frac{stvolprop}{gbcap} \cdot 818.4 \cdot 1000 \cdot Pa$$

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$P = 5.907 \cdot psi$

Find the amount of propane necessary to breach the glovebox--assuming that the the glovebox would be breached by approximately 1.0 psi.

First, find the stoichometric volume necessary to subject the glovebox walls to 1.0 psi.

$PF := 1.0 \cdot psi$

$$STVL := PF \cdot \frac{gbcap}{818.4 \cdot 1000 \cdot Pa}$$

$STVL = 26.554 \cdot ft^3$

$VP := STVL \cdot .05$

$VP = 1.328 \cdot ft^3$

$WP := VP \cdot densprop$

$WP = 0.149 \cdot lb$
$WP = 2.387 \cdot oz$

The amount of propane necessary to subject the glovebox walls to 1.0 psi is 2.4 oz.

The amount of propane in a "one-pound cylinder is 14.7 oz.

Therefore, the "fraction full of the cylinder" is 2.4/14.7.

$$FF := \frac{WP}{14.1 \cdot oz}$$

$FF = 0.169$

Assume that about 5 (plus and minus two) of the cylinders (disposed of at the end of the burning campaign) contain propane. Further assume that the remaining non-empty cylinders were not emptied because of valve failure. Anecdotal evidence indicates that this failure occurred more than once. It is assumed that this occurred for somewhere between .1% (1) and 1% (12) of the drums. Averaging these two results and adding the cylinders picked for final disposal, approximately 1% of the cylinders can be assumed to contain propane.

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If it is assumed that the conditional probability that a non-empty cylinder contains a given amount of propane is uniformly distributed, the conditional probability that a cylinder would contain greater than 2.4 oz is 1 - 0.169.

$Pdam := 1 - FF$
$Pdam = 0.831$

The overall probability of any cylinder containing greater than 2.4 oz is:

$P := 0.01 \cdot Pdam$
$P = 0.008$

Calculate the likelihood that a spark source would be present when the concentration of material was in the flammable range. For propane, the limits of flammability are between 2.15% and 9.6 vol%. Find the amount of time, taking credit for only ventilation airflow to dilute the maximum amount of propane (1 lb) down below 2.15%.

Find the volume occupied by 14.1 oz propane (100%).

$$v := 14.1 \cdot \frac{oz}{densprop}$$

$$v = 7.842 \cdot ft^3$$

The objective of this calculation is to determine the time that it would take to disperse a layer of propane from the TRU and LLW sorting gloveboxes. Because propane is heavier than air, it is assumed that the propane would form a layer on the sorting table, which would be dispersed by mixing with the ventiliation system airflow. It is assumed that the layer will have an area of 32 square feet (the length of the sorting table multiplied by the glovebox width).

1. Calculate the Schmidt number.

$$mu := 0.1241 \cdot 10^{-4} \cdot \frac{lb}{sec \cdot ft}$$

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$rho := 0.0718 \cdot \frac{lb}{ft^3}$ Assume 80 degree F air at less slightly less than one atmosphere (Glovebox operates at a slight vacuum).

$D := .12 \cdot \frac{cm^2}{sec}$ Diffusion coefficient for propane in air. (Estimated by averaging the coeffecients for methane and butane in nitrogen.)

$D = 0.465 \cdot \frac{ft^2}{hr}$

$Sc := \frac{mu}{rho \cdot D}$

$Sc = 1.338$

2. Calculate Reynolds number.

Air velocity is 536 ft/hr (0.149 ft/sec). Length of sorting table is 8 ft.

$L := 8 \cdot ft$

$V := 0.149 \cdot \frac{ft}{sec}$

$Re := L \cdot V \cdot \frac{rho}{mu}$

$Re = 6.897 \cdot 10^3$

3. Calculate Coburn J factor.

$Jd := 0.664 \cdot Re^{0.5}$

$Jd = 55.142$

4. Calculate mass transfer constant (Kc)

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$$Vel := 536 \cdot \frac{ft}{hr}$$

$$Kc := Jd \cdot \frac{Vel}{Sc^{0.5}}$$

$$Kc = 2.555 \cdot 10^{4} \cdot \frac{ft}{hr}$$

5. Calculate mass transfer rate.

$pa := 1 \cdot atm$ Partial pressure of propane in the layer

$pavg := 0 \cdot atm$ Partial pressure of propane in the airstream

$T := 540 \cdot degr$ Assumed 80 degree temperature

$$A := 32 \cdot ft^{2}$$

$$R := 0.73008 \cdot ft^{3} \cdot \frac{atm}{degr \cdot lbmol}$$

$$Q := \frac{Kc}{R \cdot T} \cdot (pa - pavg) \cdot A$$

$$Q = 0.576 \cdot \frac{lbmol}{sec}$$

6. Calculate the time for the propane to disperse.

$wtpro := 14.1 \cdot oz$

$$denspro := 0.112 \cdot \frac{lb}{ft^{3}} \qquad VOLPRO := \frac{wtpro}{denspro} \qquad VOLPRO = 7.868 \cdot ft^{3}$$

At standard conditions of temperature and pressure, one pound mole of gas occupies 359 cubic ft.

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$$stp := 359 \cdot \frac{ft^3}{lbmol}$$

$$eighty := \left[\frac{540}{528}\right] \cdot stp$$

Volume occupied by a pound mole of gas at 80 deg F.

$$eighty = 367.159 \cdot ft^3$$

$$lbmolpro := \frac{VOLPRO}{eighty}$$

$lbmolpro = 0.021 \cdot lbmol$ Number of pound moles of propane.

$$Time := \frac{lbmolpro}{Q}$$

$$Time = 0.037 \cdot sec$$

Because of the short time necessary to disperse the propane, it is conservatively assumed that it will be flammable 1% of the processing time.

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APPENDIX C

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A flammable vapor/air mixture cannot be produced in the WRAP-1 sorting glove boxes (except in or directly above packages of waste) with the type and quantities of materials being handled. To demonstrate this, two things must be shown, 1. A vapor/air mixture in a closed package will become too dilute to be flammable when punctured and dispersed to the glove box environment. 2. There is not a source of evaporation rapid enough to produce a flammable mixture in the glove box, given the number of CFM flowing through the glove box. The first point is shown based on the vapor pressure and lower limit of flammability of volatiles of concern. The following tables lists volatiles for which the equilibrium concentration is above the lower limit of flammability. The last column shows the ratio of these two concentrations.

Volatile	Vapor Pressure (mm Hg)	Lower Limit of Flammability (% by volume)	Equilibrium Concentration/ Flammability Concentration
Hexane	127	1.18	14.2
Acetone	182	2.55	9.4
2-Butanone	82	1.35	8.0
Heptane	36	1.1	4.3
2-Propanol 1-Methoxy Acetate	47	1.77	3.5
Toluene	22	1.27	2.3
Isopropyl Alcohol	33	2.02	2.1
Methanol	95	6.72	1.9
Ethyl Alcohol	43	3.28	1.7

This data means that if a sealed waste package contains hexane, and it is punctured and dispersed in a volume that is at least 14.2 times the volume of the air/vapor space in the package, the resulting mixture will be too dilute to be flammable. Since the smaller of the two glove boxes has a volume of 2185 cubic feet, an entire 55-gallon drum (7.4 cubic feet) of vapor dispersed into the glove box could not produce a flammable mixture.

The rate of evaporation is also a function of the vapor pressure. Evaporation rates in gmole/hr are calculated as follows:

$$dN/dt = K_g A P$$

where K_g is a mass transfer coefficient in gmole/hr/m^2/atm and A is the surface area of the exposed liquid, and P is the vapor pressure of the volatile. K_g is calculated as a function of air speed over the evaporating liquid. Based on an assumed 5 ft/min, the mass transfer coefficient is 25.27. If the area exposed is assumed to be a 1 ft. diameter circle (A = .073 m^2) of the liquid volatile (a conservative assumption), the evaporation rates would be as indicated in the following table. Given the evaporation rate, the

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flowrate needed in the glove box to maintain a concentration below flammable limits can be calculated as follows:

Required flowrate (CFM) = DN/dt (gmole/hr) * (.79 ft^3/gmole * 1hr/60 min) / Flammability Limit (% by volume). The results of this calculation are also shown in the following table. Note that these flowrates are not additive, and the design should support the worst case (Hexane) of 261 CFM. The flowrate through the smaller of the two gloveboxes is 300 CFM. It is concluded, therefore, that a flammable vapor mixture will not occur in the glove box.

Volatile	Vapor Pressure (mm Hg)	Evaporation Rate (gmole/hr)	Lower Limit of Flammability (% by volume)	Required Glove Box Flowrate (CFM)
Hexane	127	234	1.18	261
Acetone	182	336	2.55	173
2-Butanone	82	151	1.35	147
Heptane	36	66	1.1	79
2-Propanol 1-Methoxy Acetate	47	87	1.77	65
Toluene	22	41	1.27	43
Isopropyl Alcohol	33	61	2.02	40
Methanol	95	175	6.72	34
Ethyl Alcohol	43	79	3.28	32

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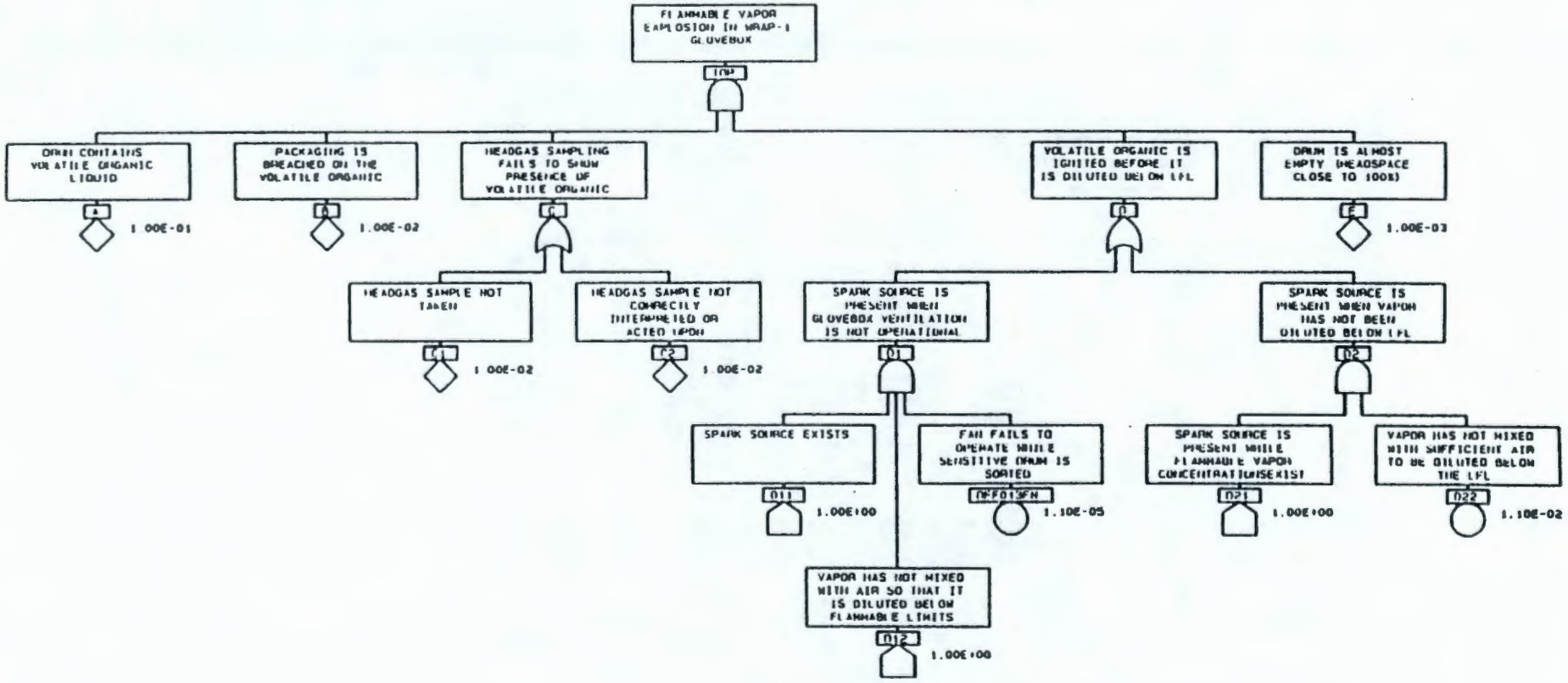

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ORGANIC VAPOR EXPLOSION IN GLOVEBOX				ORGVAP.CAF	4-06-93	Page

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MODULE/EVENT NAME	DESCRIPTION	B.E. PROB.	MOD./CS. PROB.
1) TOP			*2.20E-10
1) A	DRUM CONTAINS VOLATILE ORGANIC LIQUID	1.00E-01	1.10E-10
B	PACKAGING IS BREACHED ON THE VOLATILE OR	1.00E-02	
C1	HEADGAS SAMPLE NOT TAKEN	1.00E-02	
D21	SPARK SOURCE IS PRESENT WHILE FLAMMABLE	1.00E+00	
D22	VAPOR HAS NOT MIXED WITH SUFFICIENT AIR	1.10E-02	
E	DRUM IS ALMOST EMPTY (HEADSPACE CLOSE TO	1.00E-03	
2) A	DRUM CONTAINS VOLATILE ORGANIC LIQUID	1.00E-01	1.10E-10
B	PACKAGING IS BREACHED ON THE VOLATILE OR	1.00E-02	
C2	HEADGAS SAMPLE NOT CORRECTLY INTERPRETED	1.00E-02	
D21	SPARK SOURCE IS PRESENT WHILE FLAMMABLE	1.00E+00	
D22	VAPOR HAS NOT MIXED WITH SUFFICIENT AIR	1.10E-02	
E	DRUM IS ALMOST EMPTY (HEADSPACE CLOSE TO	1.00E-03	
3) A	DRUM CONTAINS VOLATILE ORGANIC LIQUID	1.00E-01	1.10E-13
B	PACKAGING IS BREACHED ON THE VOLATILE OR	1.00E-02	
C1	HEADGAS SAMPLE NOT TAKEN	1.00E-02	
D11	SPARK SOURCE EXISTS	1.00E+00	
D12	VAPOR HAS NOT MIXED WITH AIR SO THAT IT	1.00E+00	
DFF013FN	FAN FAILS TO OPERATE WHILE SENSITIVE DRU	1.10E-05	
E	DRUM IS ALMOST EMPTY (HEADSPACE CLOSE TO	1.00E-03	
4) A	DRUM CONTAINS VOLATILE ORGANIC LIQUID	1.00E-01	1.10E-13
B	PACKAGING IS BREACHED ON THE VOLATILE OR	1.00E-02	
C2	HEADGAS SAMPLE NOT CORRECTLY INTERPRETED	1.00E-02	
D11	SPARK SOURCE EXISTS	1.00E+00	
D12	VAPOR HAS NOT MIXED WITH AIR SO THAT IT	1.00E+00	
DFF013FN	FAN FAILS TO OPERATE WHILE SENSITIVE DRU	1.10E-05	
E	DRUM IS ALMOST EMPTY (HEADSPACE CLOSE TO	1.00E-03	

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HYEX.BE CAFTA Database Report 4-06-93 9:33 Page 1

	NAME	PROB	DESC
1	A11	1.00E-03	HYDROGEN HAS EVOLVED AND FILLED THE DRUM'S VOIDSPACE
2	A121	1.00E-02	HEADGAS SAMPLE NOT PERFORMED
3	A122	1.00E-02	HEADGAS RESULTS NOT CORRECTLY INTERPRETED
4	A13	7.50E-01	DRUM VOIDSPACE IS GREATER THAN 40% OF VOLUME
5	A14	1.00E-01	HYDROGEN HAS NOT ESCAPED FROM DRUM VIA VENT
6	A211	1.00E-02	DRUM CONTAINS ACTIVE METAL
7	A212	1.00E-02	PACKAGING OF ACTIVE METAL BREACHED DURING DRUM UNLOADI
8	A221	1.00E-01	DRUM CONTAINS HYDROGENOUS MATERIAL
9	A222	1.00E-02	HYDROGENOUS MATERIAL PACKAGE BREACHED WHEN DRUM IS UNL
10	B11	1.00E+00	SPARK SOURCE EXISTS
11	B12	1.00E+00	VAPOR HAS NOT MIXED WITH AIR SO THAT IT IS DILUTED BEL
12	B21	1.00E+00	SPARK SOURCE IS PRESENT WHILE FLAMMABLE VAPOR CONCENTR
13	B22	1.10E-02	VAPOR HAS NOT MIXED WITH SUFFICIENT AIR TO BE DILUTED
14	BFF013FN	1.10E-05	FAN FAILS TO OPERATE WHILE SENSITIVE DRUM IS SORTED

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)RGVAP.TC CAFTA Database Report 4-06-93 9:38 Page 1

	TYPE	RATE	U	DESC	SOURCE
1	FF FN	3.0E-05	H	FAN FAILS TO OPERATE	WHC-IP-

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APPENDIX D

DUST EXPLOSION CALCULATIONS

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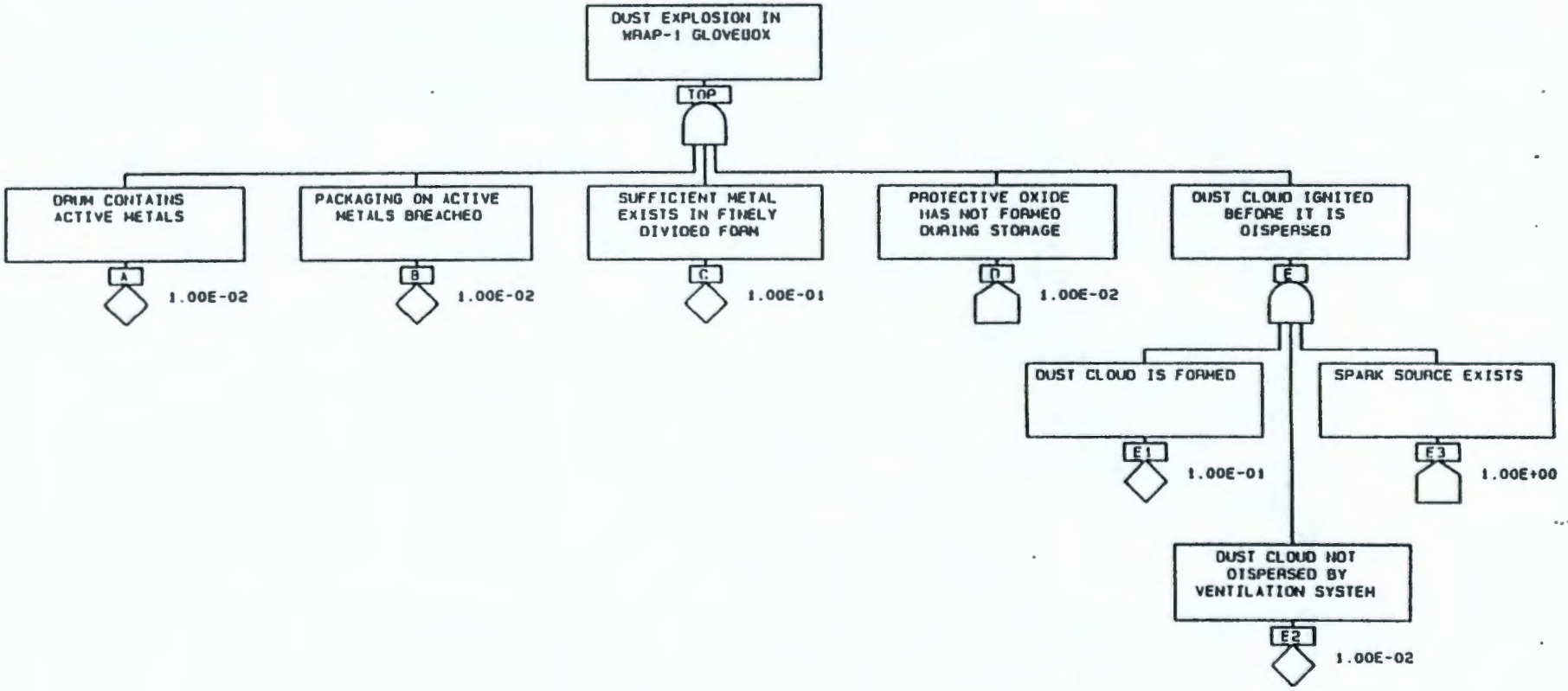

METAL DUST EXPLOSION IN WRAP-1 GLOVEBOX	DUSTEX.CAF	4-06-93	Page

DUSTEX.CUT CUTSET REPORT 4-06-93 8:40 Page 1
Filter: 'ALL' Truncation Limit: 1.00E-10

MODULE/EVENT NAME	DESCRIPTION	B.E. PROB.	MOD./CS. PROB.
1) TOP			*1.00E-10
1) A	DRUM CONTAINS ACTIVE METALS	1.00E-02	1.00E-10
B	PACKAGING ON ACTIVE METALS BREACHED	1.00E-02	
C	SUFFICIENT METAL EXISTS IN FINELY DIVIDE	1.00E-01	
D	PROTECTIVE OXIDE HAS NOT FORMED DURING S	1.00E-02	
E1	DUST CLOUD IS FORMED	1.00E-01	
E2	DUST CLOUD NOT DISPERSED BY VENTILATION	1.00E-02	
E3	SPARK SOURCE EXISTS	1.00E+00	

9413148.0021

DUSTEX.BE CAFTA Database Report 4-06-93 9:30 Page 1

	NAME	PROB	DESC
1	A	1.00E-02	DRUM CONTAINS ACTIVE METALS
2	B	1.00E-02	PACKAGING ON ACTIVE METALS BREACHED
3	C	1.00E-01	SUFFICIENT METAL EXISTS IN FINELY DIVIDED FORM
4	D	1.00E-02	PROTECTIVE OXIDE HAS NOT FORMED DURING STORAGE
5	E1	1.00E-01	DUST CLOUD IS FORMED
6	E2	1.00E-02	DUST CLOUD NOT DISPERSED BY VENTILATION SYSTEM
7	E3	1.00E+00	SPARK SOURCE EXISTS

9413148.0122

Calculations for Dust Explosion for Glovebox

The maximum pressure for an explosive metal dust potentially found in WRAP-I gloveboxes is 100 psi for aluminum dust. Find the maximum number of cubic feet of dust required to bring the glovebox to 1 psi.

$$VGB := 2134 \cdot ft^3$$
$$PGB := 1 \cdot psi$$
$$PEXP := 100 \cdot psi$$
$$VEXP := \frac{PGB}{PEXP} \cdot VGB$$
$$VEXP = 21.34 \cdot ft^3$$

The minimum amount of aluminum dust required to initiate such an explosion is:

$$EXPCONC := 0.045 \cdot \frac{oz}{ft^3}$$

$$AL := EXPCONC \cdot VEXP$$
$$AL = 0.06 \cdot lb$$

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APPENDIX E

TWO COMPONENT REACTION CALCULATIONS

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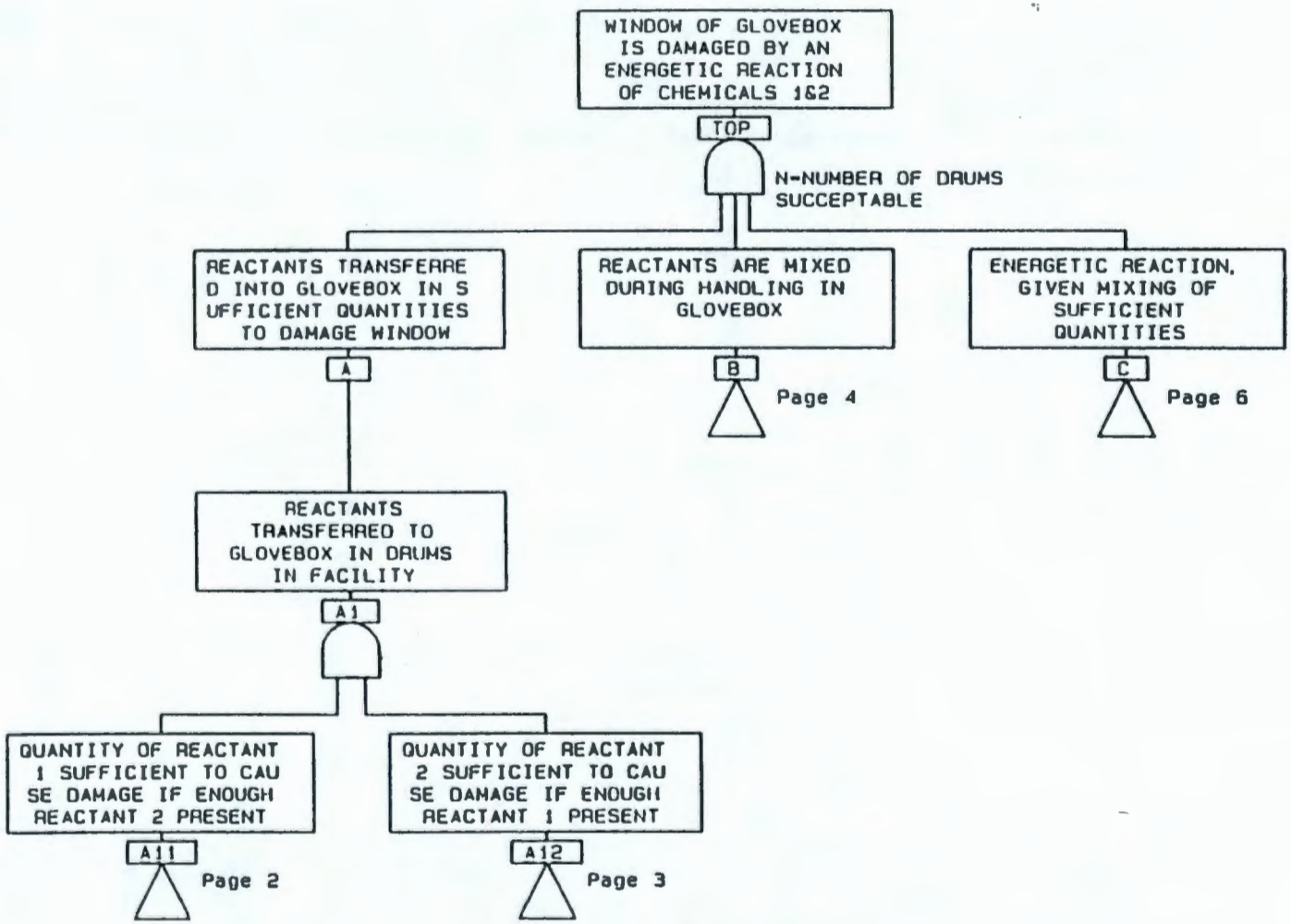

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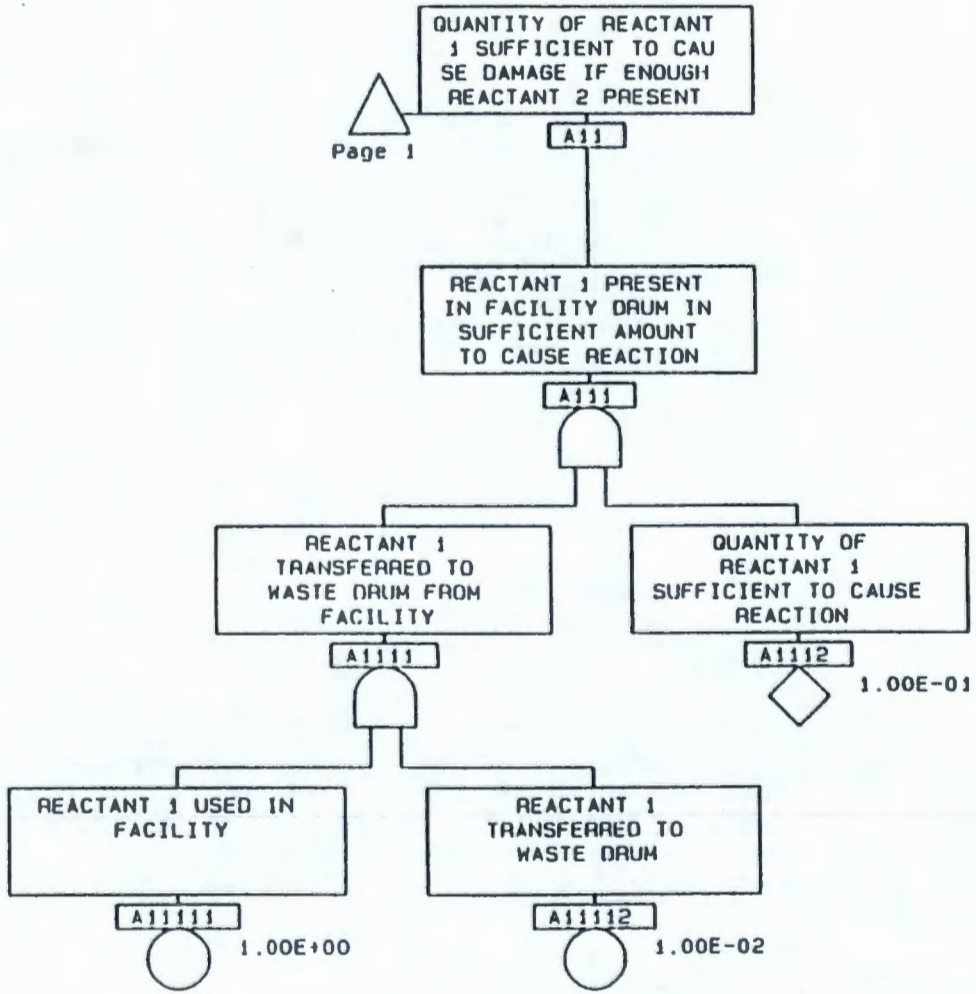
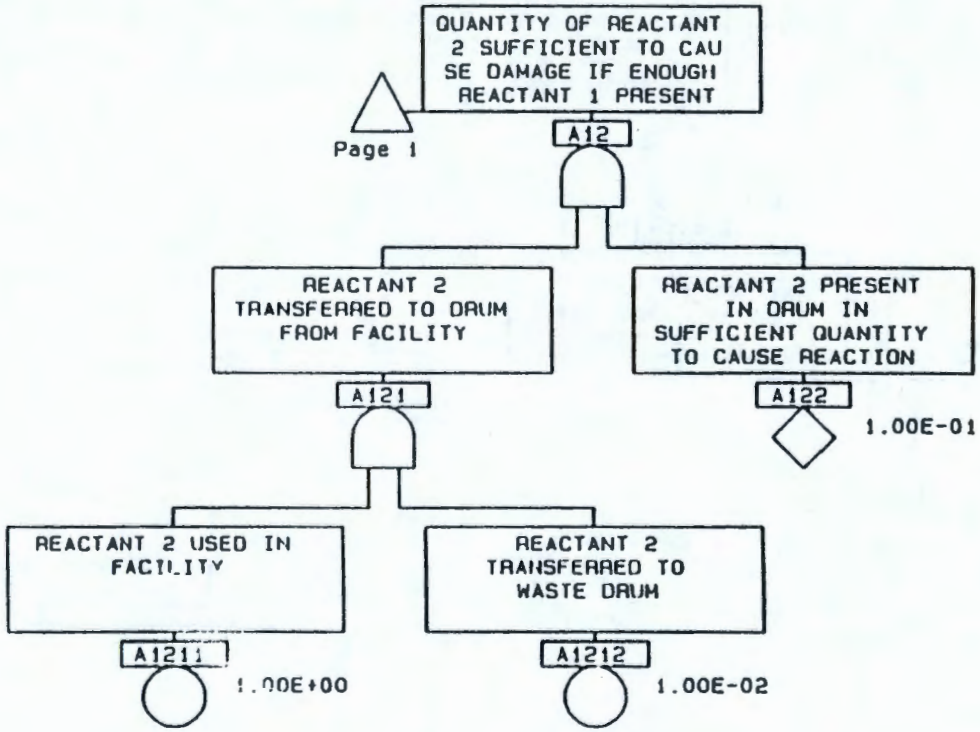
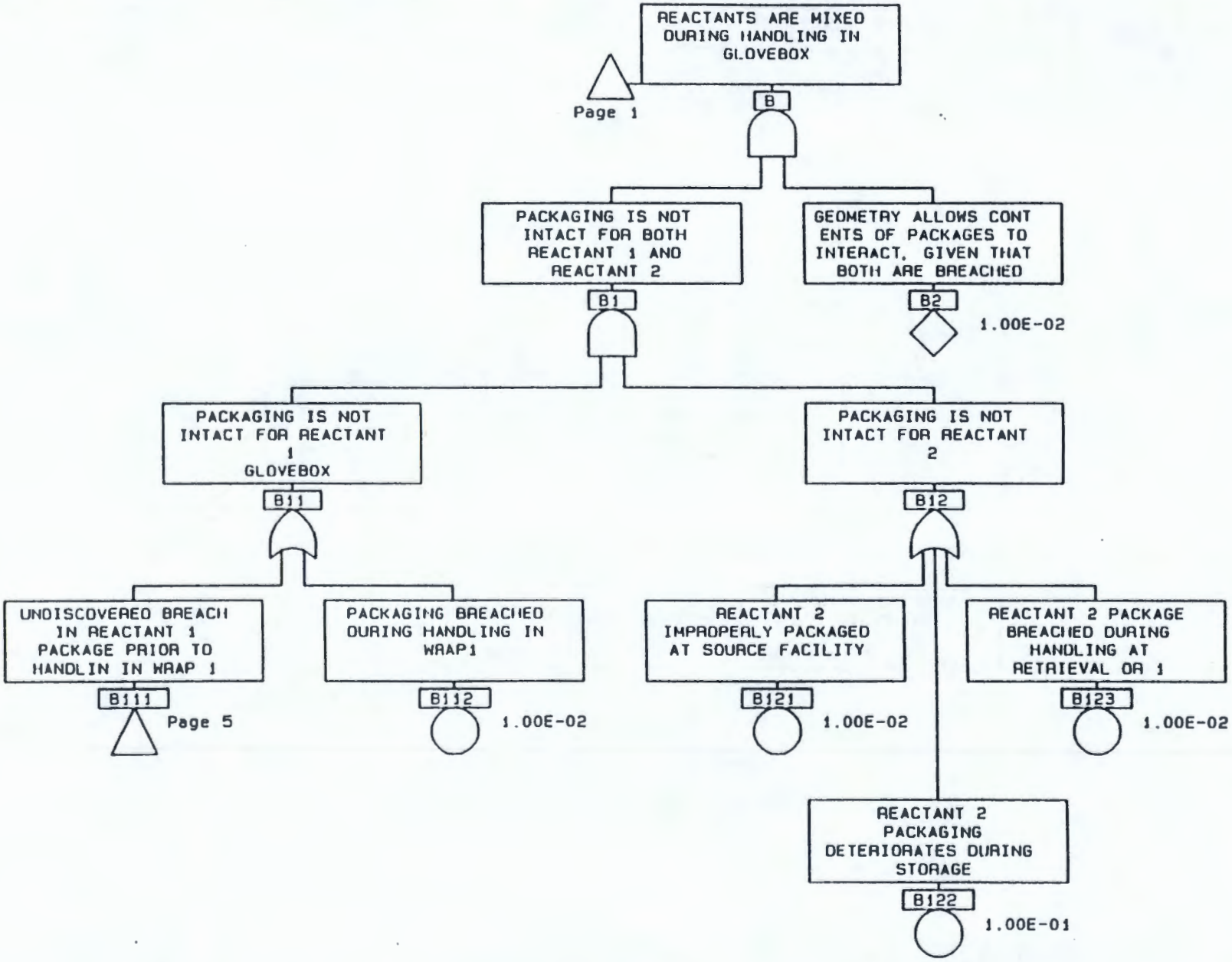
EXPLOSION IN WRAP 1 GLOVEBOX	GBEX2.CAF	4-06-93	Page 1



EXPLOSION IN WRAP 1 GLOVEBOX	GBEX2.CAF	4-06-93	Page 2



EXPLOSION IN WRAP 1 GLOVEBOX	GBEX2.CAF	4-06-93	Page 3



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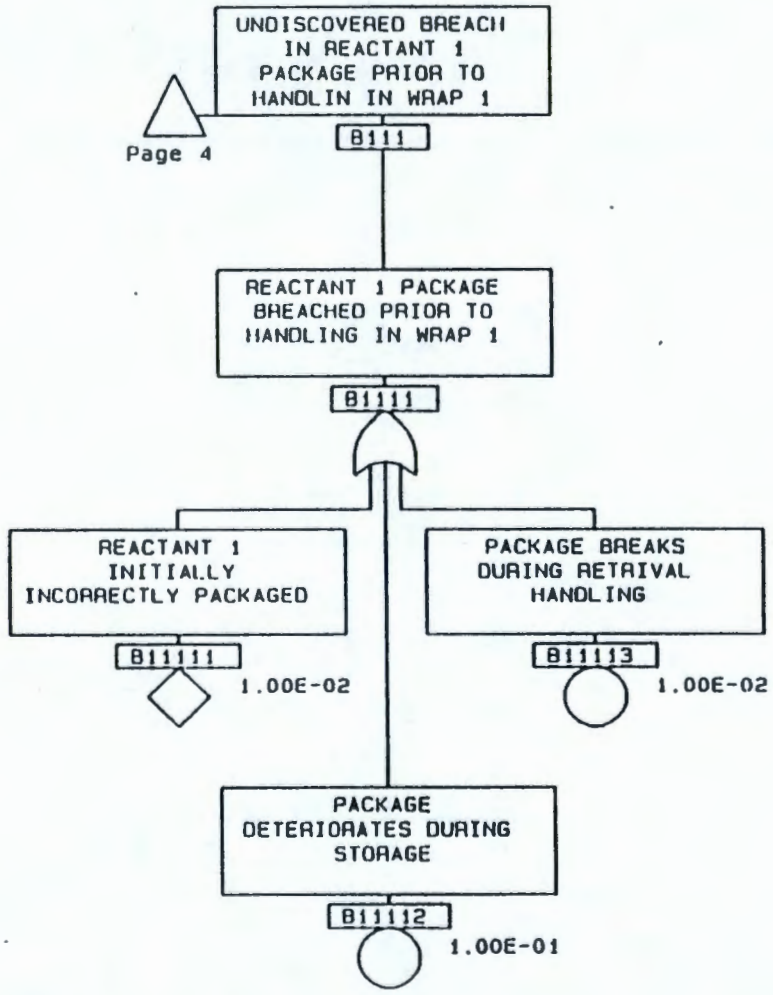
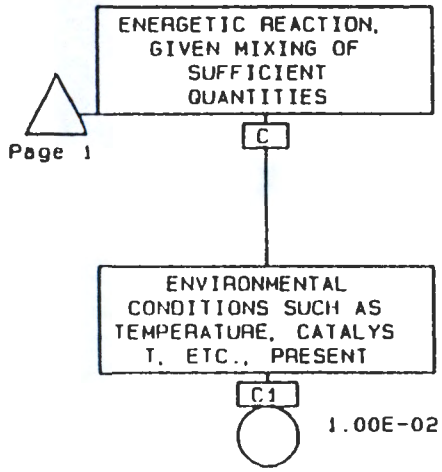
EXPLOSION IN WRAP 1 GLOVEBOX	GBEX2.CAF	4-06-93	Page 4



EXPLOSION IN WRAP 1 GLOVEBOX	GBEX2.CAF	4-06-93	Page 5



EXPLOSION IN WRAP 1 GLOVEBOX	GBEX2.CAF	4-06-93	Page 6

Table 1
Sources of Drums in Retrievable Storage by Year

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	TOTAL
1. Babcock and Wilcox, Appolla, PA												773	223	151						1147
2. UC Lawrence Berkeley Labs													1							1
3. Bartlesville Energy Technology Center												3								3
4. Energy Systems Group, Canoga Park, CA											40			1	172			23		236
5. Rocky Flats, CO			21	45	143		217			140	105	35	12	90	159					973
6. EXXON Nuclear, Richland, WA											74	128	1							203
7. General Electric, Vallecitos, CA												76	74							150
8. General Electric, San Jose, CA						16														16
9. Argonne National Labs, Argonne, IL					1	4										42	68	6		119
10. 200 West Area, J. A. Jones	47	47	202		17															313
11. Kerr McGee, Crescent, OK														461	152	190	266	152		1221
12. Lawrence Livermore Labs.			2	1																3
13. Ceer University, Mayaguez, PR																		1		1
14. Battelle Columbus Labs, Columbus, OH							41		42											83
15. 108F & 144F Bldg. PNL, Richland, WA	64	57																		121
16. 1705F Bldg. PNL, Richland, WA	4																			4
17. 1706K Bldg. PNL, Richland, WA											3									3
18. 209E Bldg. PNL, Richland, WA	6	13	11	3	9	8	3	4			9	15			16	19	9		20	144
19. 231Z Bldg. PNL, Richland, WA	23	66	112	166	105	101	95	220	60	129	27	20	19	13						1360
20. 303C Bldg. PNL, Richland, WA								62												62
21. 308 Bldg. PNL, Richland, WA	10															4		6		20
22. 318 Bldg. PNL, Richland, WA																1		2		3
23. 324 Bldg. PNL, Richland, WA															15			1		16
24. 325 Bldg. PNL, Richland, WA	35	326	548	79	52	121	53	33	40	250	17					3		16		1573
25. 325A Bldg. PNL, Richland, WA							10			5										15
26. 340 Bldg. PNL, Richland, WA											32	46	16	20	3					117
27. 3720 Bldg. PNL, Richland, WA																		1		1
28. IAEA, Seibersdorf, Austria																	1			1
29. Westinghouse Adv. Rctr. Div., Cheswick, PA											48	183	304	374						909
30. 105KE Bldg., WHC							34	4												38
31. 105N Bldg., WHC		2																		2
32. 200W Tank Farms, WHC					29					22	6									57
33. 202A Bldg., WHC	382	712	406	94	60	31			10	60			227	10	81	86	84	91	49	2397
34. 202AL Bldg., WHC	416	571	437	25	13	4	3	4	5	6										1484
35. 216Z9 Crib Area, WHC									10	561	141									702
36. 221TS Bldg., WHC	12	5	15		2															34
37. 222S Bldg., WHC	34	46	15	48	41	35	34	43	10							3				309
38. 233S Bldg., WHC										21	36									57
39. 2345Z Bldg., WHC	1102	1344	1306	1264	942	1222	1026	1199	900	1569	1658	830	672	949	1656	1782	673	425	214	20831
40. 2724W Bldg., WHC		1																		1
41. 308 Bldg., WHC	25																12	44		81
42. 324 & 325 Bldg., WHC	67	236	230	217	264	218	162	140	307	437	91			35	70	74	16			2562
43. 327C Bldg., WHC																		13		13
44. 340 Bldg., WHC											76	93	46	19				19		255
TOTAL	2227	3446	3313	1942	1760	1840	1677	1717	1392	3196	2365	2210	1595	2129	2522	2204	1027	800	283	37641

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
ACETIC ACID		AMMONIUM NITRATE	CHROMIC ACID	NITRIC ACID	HYDROGEN PEROXIDE	PERCHLORIC ACID	POTASSIUM PERMANGAMATE	POTASSIUM HYDROXIDE	SODIUM HYDROXIDE
	PFP LAB			X	X		X		X
	325 WHC		X	X			X		X
ACETONE		CHROMIC ACID	HYDROGEN PEROXIDE	NITRIC ACID/ SULFURIC ACID					
	222S			X					
	PFP LAB		X	X					
	325 WHC	X		X					
	PUREX LAB		X	X					
	T-PLANT		X	X					
	TANK FARMS								
	325 AL		X	X					
	325 PNL			X					
	327	X	X	X					
ALIZARIN YELLOW		OXIDIZING MATERIALS							
	PFP LAB	X							
ALUMINUM		RUST	CARBON TETRA-CHLORIDE	AMMONIUM NITRATE	SODIUM HYDROXIDE	AMMONIUM SULFATE	CERIC SULFATE	NICKEL SULFATE	
	T-PLANT	X		X	X	X			
	325 WHC	X			X				
	PUREX	X		X	X				
	PFP	X	X		X				
	327	X	X		X				
ALUMINUM NITRATE NONAHYDRATE		ALUMINUM/ WATER	NITRIC ACID	SULFURIC ACID	HYDRAZINE				
	222-S		X	X	X				
	PFP LAB		X	X	X				
	PUREX	X	X	X	X				
	T-PLANT	X	X	X	X				

9413148.0132

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
	PFP	X	X	X	X				
	324 CE		X						
	325 PNL		X	X	X				
	325 AL		X	X	X				
ALUMINUM SULFATE	SEE ABOVE								
AMMONIA (ANHYDROUS)		CHROMIC ACID	CALCIUM	SILVER NITRATE	NITRIC ACID				
	325 WHC	X		X	X				
	325 AL			X	X				
AMMONIUM BISULFATE		STRONG ACIDS	OXIDIZING AGENTS						
	N-REACTOR		X						
AMMONIUM CHLORIDE		AMMONIUM NITRATE							
	PFP LAB								
AMMONIUM FLUORIDE		ACIDS	GLASS						
	PUREX	X	X						
AMMONIUM HYDROXIDE		HYDROCHLORIC ACID	HYDROFLUORIC ACID	SULFURIC ACID	SILVER NITRATE	SILVER OXIDE			
	222 S	X	X	X					
	PFP LAB	X	X	X		X			
	325 AL	X	X	X	X				
	325 PNL	X	X	X					
AMMONIUM NITRATE		SODIUM	ORGANIC MATERIALS	POTASSIUM PERMANGAMATE	IRON	LEAD	MAGNESIUM	NICKEL	SUGAR
	T-PLANT		X	X	X	X			
	PUREX		X	X	X	X			X
	325 AL		X	X	X	X			
AMMONIUM OXALATE		STRONG OXIDIZING AGENTS	STRONG ACIDS						
	222 S	X	X						
	PFP LAB	X	X						
	325 AL	X	X						

9413148.0133

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
	325 WHC	X	X						
AMMONIUM FLUO-SILICATE		STRONG OXIDIZING AGENTS	STRONG ACIDS						
	T-PLANT	X	X						
AMMONIUM SULFATE		SODIUM OR POTASSIUM/ AMMONIUM NITRATE	SODIUM HYPOCHLOR ITE						
	T-PLANT								
	PFP LAB								
AMMONIUM SULFITE		STRONG OXIDIZING AGENTS	STRONG ACIDS						
	T-PLANT	X	X						
BARIUM NITRATE		ALUMINUM POWDER/ SULFUR	STANNOUS CHLORIDE	ORGANIC MATERIALS	CYANATES	THIOCYANAT ES	ISO-THIOCYANATES	HYPO-PHOSHITES	ORGANIC MATERIALS
	324 CE			X					X
	325 WHC			X					
BENZENE		NITRIC ACID							
	327								
BERYLLIU M		TRICHLOR-ETHYLENE	CARBON TETRA-CHLORIDE	ACIDS	CAUSTICS	OXIDIZERS			
	PUREX			X	X	X			
	PFP		X	X	X	X			
	325 WHC			X	X	X			
	327		X	X	X	X			
BORIC ACID		POTASSIUM							
	T-PLANT								
	PFP LAB								
	325 WHC								
BORON CARBIDE		OXIDIZING AGENTS							
	327	X							
BROMOCRE SOL PURPLE		OXIDIZING AGENTS							
	PFP	X							
	325 AL	X							
BROMO-NAPHTHAL ENE		OXIDIZING AGENTS							
	222S	X							

9413148.0134

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
BUTANOL		ALUMINUM	ACID ANHYDRIDES	REDUCING AGENTS	COPPER				
	327	X	X	X					
CADMINUM NITRATE		REDUCING AGENTS	COPPER	ORGANIC MATERIALS					
	PUREX	X		X					
CALCIUM		SODIUM HYDROXIDE	POTASSIUM HYDROXIDE	SODIUM CARBONATE	POTASSIUM CARBONATE	MERCURY	WATER	SODIUM	
	PFP	X		X	X				
CALCIUM CARBONATE		STRONG OXIDERS	ACIDS	MAGNESIUM	ALUMINUM				
	TANK FARMS	X	X						
	325 AL	X	X						
CALCIUM CHLORIDE		AMMONIUM NITRATE	ZINC	WATER (RAPID BOILING)					
	325 AL	X		X					
	325 WHC			X					
CALCIUM NITRATE		ORGANICS	ALUMINUM AND AMMONIUM NITRATE						
	TANK FARMS	X							
	325 WHC	X							
CARBON TETRA-CHLORIDE		ALUMINUM (SEE ABOVE)	BERYLLIUM (SEE ABOVE)						
	PUREX LAB								
	325 PNL								
	PFP								
	PFP LAB								
	325 AL								
	327								
CERIC AMMONIUM NITRATE		REDUCING AGENTS	POWDERED METALS						
	PFP LAB	X	X						
CERIC FLUORIDE		NO INFORMATION							
	PUREX LAB								

9413148.0135

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
CERIC NITRATE		NO INFORMATIO N							
	T-PLANT								
	325 WHC								
CERIC SULFATE		OXIDIZING AGENTS							
	222 S	X							
	325 AL	X							
	PUREX LAB	X							
CEROUS NITRATE		NO INFORMATIO N							
	325 WHC								
CESIUM		REDUCING AGENTS	ALCOHOLS	ORGANICS	WATER	ALUMINUM			
	325 WHC	X	X	X	X	X			
CESIUM NITRATE		NO INFORMATIO N							
	325 PNL								
	327								
CHROMIC ACID		ORGANICS	HEAT	METALS	HYDROGEN SULFIDE				
	325 WHC	X	X	X					
	327	X	X	X					
CITRIC ACID		OXIDIZING AGENTS	REDUCING AGENTS	BASES					
	N-REACTOR	X	X	X					
	TANK FARMS	X	X	X					
	325 WHC	X	X	X					
COPPER NITRATE		REDUCING AGENTS	ORGANICS	HEAT	MOISTURE				
	324 CE		X	X	X				
	325 PNL	X	X	X	X				
DIATOMA-CEOUS EARTH		HYDROCHLOR IC ACID	MAGNESIUM						
	TANK FARMS								
	325 WHC	X							

9413148.0136

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
DI2 ETHYL HEXYL PHOSPHOR IC ACID		AMMONIA	AMMONIA/ SILVER NITRATE						
	222S								
DIBUTYL BUTYL PHOSPHON ATE		STRONG OXIDIZING AGENTS	STRONG BASES						
	PFP								
DIBUTYL PHOSPHAT E		STRONG OXIDIZING AGENTS							
	PUREX								
	PFP LAB								
DODECANE		OXIDIZING AGENTS							
	Z-PLANT	X							
ETHANOL		AMMONIA	AMMONIA/ SILVER NITRATE	NITRIC ACID/ SILVER	HYDROGEN PEROXIDE	NITRIC ACID	PERCHLORIC ACID	PLATINUM	POTASSIUM
	325 AL				X	X	X		
	325 WHC	X	X		X	X			
	325 PNL				X	X		X	
	327			X	X	X	X	X	
FERRIC AMMONIUM SULFATE		STRONG ACIDS							
	PFP LAB	X							
	325 WHC	X							
FERRIC NITRATE		STRONG OXIDIZING AGENTS							
	PUREX	X							
	PFP LAB	X							
	324 CE	X							
	325 WHC	X							
FERRIC SULFATE		SODIUM NITRATE/ ARSENIC TRIOXIDE							
	PUREX LAB								
	325 WHC								
FERROUS AMMONIUM SULFATE		STRONG ACIDS	STRONG OXIDIZING AGENTS						

9413148.0037

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
	PFP LAB	X	X						
	325 AL	X	X						
FERROUS SULFATE		OXIDIZING AGENTS	CARBONATES	SILVER SALTS	POTASSIUM IODIDE	LEAD ACETATE			
	222 S	X							
	T-PLANT	X							
FORMADEHYDE		STRONG ACIDS	STRONG BASES	OXIDIZING AGENTS	ISOCYANATES	ANHYDRIDES			
	PUREX	X	X	X		X			
GALLIUM		STRONG ACIDS	STRONG OXIDIZING AGENTS	HALOGENS	STRONG BASES				
	PFP	X	X		X				
GALLIUM OXIDE		STRONG OXIDIZING AGENTS							
	PFP	X							
GLYCEROL		HYDROGEN PEROXIDE	NITRIC ACID	POTASSIUM PERMANGAMATE	OTHER STRONG OXIDIZING AGENTS	STRONG BASES			
	327	X	X	X	X	X			
GOLD		HYDROGEN PEROXIDE	HALOGENS	AMMONIA					
	327	X							
HYDRAZINE		AMMONIUM NITRATE	HYDROGEN PEROXIDE	NITRIC ACID	POTASSIUM DI-CHROMATE	SODIUM NITRATE	RUSTY IRON	WOOD	DIRT
	PUREX	X		X		X	X	X	X
	222 S			X			X	X	X
	PFP		X	X		X	X	X	X
	N-REACTOR			X			X	X	X
	PFP LAB		X	X	X	X	X	X	X
	325 AL	X	X	X			X	X	X
	325 WHC		X	X	X	X	X	X	X
	325 PNL		X	X		X	X	X	X
HYDRAZINE		CHROMATE SALTS	RAGS	POTASSIUM PERMANGAMATE	SILVER COMPOUNDS	CADMIUM NITRATE	MERCURIC NITRATE	STAINLESS STEEL	
	PUREX		X	X	X				
	222 S		X	X					
	PFP		X	X					
	N-REACTOR		X	X					

9413148.0138

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
	PFP LAB		X	X	X				
	325 AL		X	X	X				
	325 WHC	X	X	X	X				
	325 PNL		X	X	X				
HYDROBRO MIC ACID		AMMONIA	METALS	OXIDANTS	BASES				
	PUREX LAB	X	X	X	X				
	PFP LAB	X	X	X	X				
HYDRO-CHLORIC ACID		ALUMINUM	SILICON DIOXIDE	POTASSIUM PERMANGAMATE	SULFURIC ACID	PHOSPHORUS PENTOXIDE			
	PUREX LAB			X	X	X			
	222 S			X	X				
	PFP								
	PFP LAB			X	X				
	325 AL			X	X				
	325 WHC	X	X	X	X				
	325 PNL			X	X				
HYDRO-FLUORIC ACID		POTASSIUM PERMANGAMA TE							
	T PLANT	X							
	PFP	X							
	325 AL	X							
	325 PNL	X							
	327	X							
HYDROGEN PEROXIDE		RUST	SILVER OXIDE	OXIDANTS	NITRIC ACID		METAL HYDROXIDES		
	PUREX LAB	X		X	X				
	T PLANT	X		X	X				
	PFP	X		X	X				
	PFP LAB	X	X	X	X				
	325 AL	X		X	X				
	327	X		X	X				
HYDROIOD IC ACID		PERCHLORIC ACID	NITRIC ACID	MAGNESIUM					
	PFP LAB		X						
	325 AL	X	X						

9413148.0139

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
HYDROXYL -AMINE HYDRO-CHLORIDE		SODIUM HYDROXIDE							
	PUREX LAB	X							
	222 S	X							
	PFP	X							
	PFP LAB	X							
	325 AL	X							
HYDROXYL - AMINE NITRATE	SEE REACTION S WITH OXIDANTS								
HYDROXY-QUINOLIN E		NO INFORMATIO N							
	222 S								
IODINE		AMMONIA	ALUMINUM	ACTIVE METALS					
	PFP			X					
	325 AL			X					
	325 WHC	X	X	X					
ISOAMYL ACETATE		OXIDIZING AGENTS	STRONG ACIDS						
	327	X	X						
ISOPROPY L ALCOHOL		OXIDIZING AGENTS	ACIDS	IODINE	ALUMINUM				
	PUREX LAB	X	X						
	325 AL	X	X	X					
	325 WHC	X	X	X	X				
KEROSENE		STRONG OXIDIZING AGENTS	BASES	ACIDS	AMINES				
	325 AL	X	X	X					
	327	X	X	X					
	T-PLANT	X	X	X					
LANTHANU M FLUORIDE		OXIDIZING AGENTS	ACIDS						
	PUREX LAB	X	X						
LANTHANU M CHLORIDE		NO INFORMATIO N							

9413148.0140

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
	PUREX LAB								
LANTHANUM HYDROXIDE		NO INFORMATION							
	PUREX LAB								
LANTHANUM NITRATE		REDUCING AGENTS	OXIDIZING AGENTS						
	PUREX LAB	X	X						
	T-PLANT	X	X						
	325 PNL	X	X						
	325 WHC	X	X						
LEAD NITRATE		POTASSIUM ACETATE	CARBON						
	222 S		X						
	325 WHC		X						
LITHIUM		NITRIC ACID	SODIUM CARBONATE	SODIUM CHLORIDE	SULFUR DIOXIDE				
	327	X							
MAGNESIUM NITRATE		ALUMINUM POWDER/WATER	TIN CHLORIDE	CYANIDES	THIO-CYANATES	ISO-THIO-CYANATES			
	325 WHC	X							
MAGNESIUM OXIDE		OXIDIZING AGENTS							
	PFP	X							
	325 AL	X							
MERCURY		IODINE	STRONG OXIDANTS	AMMONIA	NITRATES	SULFURIC ACID			
	325 AL	X	X	X	X	X			
	325 PNL		X		X	X			
MERCURIC NITRATE		HYDRAZINE	STRONG BASES	REDUCING AGENTS					
	PUREX	X	X	X					
	PFP	X	X	X					
	325 AL	X	X	X					
	325 WHC	X	X	X					
	325 PNL	X	X	X					
	327		X	X					
MERCURIC THIOCYANATE		STRONG OXIDIZING AGENTS							

9413148.0141

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
	222 S	X							
METHANOL		CARBON TETRA-CHLORIDE	ALUMINUM	HYDROGEN PEROXIDE	OXIDIZING AGENTS	REDUCING AGENTS			
	PFP LAB	X		X	X	X			
	325 AL	X		X	X	X			
	325 WHC		X		X	X			
	325 PNL				X	X			
	327	X	X	X	X	X			
METHYL ETHYL KETONE		OXIDIZING AGENTS	STRONG REDUCING AGENTS	HYDROGEN PEROXIDE/ NITRIC ACID					
	222 S	X	X	X					
	327	X	X	X					
METHYL ISOBUTYL KETONE		OXIDIZING AGENTS	REDUCING AGENTS	STRONG BASES					
	222 S	X	X	X					
METHYL LACTIC ACID	NO INFORMAT ION								
MOLYBDEN UM		STRONG OXIDIZING AGENTS	NITRIC ACID	SULFURIC ACIDS					
	PFP	X	X						
	324 CE	X	X						
	325 WHC	X	X	X					
	327	X	X	X					
MORPHOLI NE		ACIDS	OXIDIZING AGENTS						
	N-REACTOR	X	X						
NAPTHYL-AMINE		ACIDS	OXIDIZING AGENTS						
	PFP LAB	X	X						
NICKEL		ACIDS	OXIDIZING AGENTS						
	327	X	X						
NICKEL NITRATE		ORGANIC MATERIAL							
	324 CE	X							
NICKEL SULFATE		STRONG OXIDIZING AGENTS							
	TANK FARMS	X							

9413148.0042

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
NITRILO-TRIACETIC ACID		OXIDIZING AGENTS	STRONG BASES						
	325 PNL	X	X						
NITRIC ACID	SEE OTHER REACTIONS								
NITROUS ACID		ORGANIC MATERIAL							
	325 WHC	X							
NORMAL PARAFFIN HYDRO-CARBONS		STRONG OXIDIZING AGENTS	BASES	AMINES					
	PUREX	X	X						
	222 S	X	X	X					
	325 WHC	X	X						
	325 PNL	X	X						
O-PHENATHRO-LINE		STRONG OXIDIZERS	STRONG ACIDS						
	222 S	X	X						
OXALIC ACID		SILVER	UREA	BASES	ACID CHLORIDES	ALKALAI METALS			
	PUREX			X					
	T-PLANT			X					
	PFP			X	X				
	N REACTOR			X					
	TANK FARMS			X					
	324 CE			X					
	325 AL			X	X				
	327	X		X					
PENTA-SODIUM DI-ETHYLENE TRIAMINE PENTA-ACETATE (DPTA)		OXIDIZING AGENTS	BASES	COPPER	COPPER ALLOYS	NICKEL			
	TANK FARMS	X	X						
	325 PNL	X	X						
PER-CHLORIC ACID		ALCOHOLS	CARBO-NACEOUS MATERIAL	CELLULOSE	CLAY	LEAD OXIDE/ GLYCERINE	SULFUR	MAGNESIUM	ALUMINUM POWDER

9413148.0143

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
	PUREX		X	X					
	325 AL								
PHOS-PHORIC ACID		STRONG BASES	FINELY POWDERED METALS						
	PUREX	X	X						
	T-PLANT	X	X						
	N REACTOR	X							
	PFP	X	X						
	324 CE	X	X						
	325 AL	X	X						
	325 WHC	X	X						
PHOS-PHORUS PENT-OXIDE		HYDRO-FLUORIC ACID	OXIDES	CALCIUM	WATER	REDUCING MATERIALS			
	PUREX				X	X			
	325 WHC				X	X			
PLATINUM		STRONG OXIDIZING AGENTS							
	325 PNL	X							
	327	X							
POTAS-SIUM ACETATE		OXIDIZING AGENTS							
	PFP LAB	X							
POTAS-SIUM BI-CARBO-NATE		STRONG OXIDIZING AGENTS	STRONG ACIDS						
	325 WHC	X	X						
POTAS-SIUM CARBO-NATE		OXIDIZING AGENTS	ACIDS						
	PFP	X	X						
	325 WHC	X	X						
POTAS-SIUM DI-CHROMATE		HYDRAZINE	IRON						
	PFP LAB	X							
	324 CE								
	325 WHC	X	X						

9413148.0044

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
POTAS-SIUM FLUORIDE		STRONG ACIDS							
	PUREX	X							
	222 S	X							
	T-PLANT	X							
POTAS-SIUM HYDROX-IDE		ALUMINUM	ORGANIC MATERIALS	ACID CHLORIDES	ACID ANHY-DRIDES	MAGNESIUM	COPPER		
	PUREX		X	X	X				
	T-PLANT	X	X		X				
	325 AL		X	X	X				
	327	X	X		X				
POTAS-SIUM IODATE		ALUMINUM							
	PFP LAB								
	325 AL								
POTAS-SIUM OXALATE		OXIDIZING AGENTS							
	PUREX LAB	X							
	222 S	X							
POTAS-SIUM OXIDE		NO INFO.							
	327								
POTAS-SIUM PERMAN-GAMATE		ACETIC ACID	GLYCERINE	AMMONIUM NITRATE	GLYCEROL	WOOD			
	PUREX			X		X			
	PUREX LAB					X			
	222 S					X			
	T-PLANT			X		X			
	PFP					X			
	N REACTOR					X			
	PFP LAB	X				X			
	TANK FARMS					X			
	324 CE					X			
	325 AL			X		X			

9413148.0045

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
	325 WHC	X				X			
	325 PNL				X	X			
	327					X			
S-DIPHENYL CARBA-ZIDE		STRONG OXIDIZING AGENTS							
	222 S	X							
SILICON		STRONG ACIDS							
	PUREX	X							
	T-PLANT	X							
SILVER		STRONG ACIDS	STRONG BASES						
	327	X	X						
SILVER NITRATE		AMMONIA	ETHANOL	ORGANICS	CHARCOAL				
	PUREX			X					
	PUREX LAB			X					
	324 CE								
	325 AL	X	X	X					
	325 WHC	X	X	X					
SILVER OXIDE		HYDROGEN SULFIDE	OXIDIZERS						
	PFP		X						
SODIUM BISMU-THATE		ACIDS							
	T-PLANT	X							
SODIUM BI-SULFATE		STRONG BASES	STRONG OXIDIZING AGENTS						
	PUREX LAB	X	X						
	T-PLANT	X	X						
	PFP	X	X						
	PFP LAB	X	X						
	TANK FARMS	X	X						
	325 WHC	X	X						
SODIUM BROMATE		STRONG REDUCING AGENTS	FINELY POWDERED METALS	ALCOHOLS	STRONG ACIDS	ORGANIC MATTER			
	PUREX	X	X		X	X			

9413148.0146

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
SODIUM CARBO-NATE		STRONG ACIDS	ALUMINUM						
	PUREX	X	X						
	PUREX LAB	X							
	T-PLANT	X	X						
	PFP	X	X						
	TANK FARMS	X							
	324 CE	X							
	325 AL	X							
	325 WHC	X	X						
SODIUM DI-CHROMATE		STRONG REDUCING AGENTS	ALCOHOLS						
	222 S	X							
	T-PLANT	X							
	325 WHC	X	X						
	325 PNL	X	X						
SODIUM FERRO-CYANIDE		NONE SPECIFIC							
	TANK FARMS								
SODIUM FLUORIDE		STRONG ACIDS							
	PUREX	X							
	PUREX LAB	X							
	222 S	X							
	T-PLANT	X							
	PFP	X							
	N REACTOR	X							
	PFP LAB	X							
	TANK FARMS	X							
	324 CE	X							
	325 PNL	X							
	325 AL	X							
	325 WHC	X							
	327	X							
	340	X							

9413148.0147

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
SODIUM HYPO-CHLORITE		STRONG ACIDS	AMINES	AMMONIA					
	325 WHC	X							
SODIUM IODIDE		STRONG ACIDS							
	325 WHC	X							
SODIUM NITRATE		STRONG REDUCING AGENTS	FINELY POWDERED METALS	STRONG ACIDS	ALUMINUM/ OXIDANT	SODIUM (FORMS EXPLOSIVE)	HEATING SODIUM PHOSPHINATE	METAL CYANIDES HEATING EXP	
	PUREX	X	X	X	X				
	PUREX LAB	X	X	X					
	T-PLANT			X	X				
	PFP	X	X	X	X				
	PFP LAB	X		X					
	TANK FARMS	X		X					
	324 CE	X		X					
	325 WHC	X		X	X				
	325 PNL	X	X	X	X				
SODIUM NITRITE		STRONG REDUCING AGENTS	FINELY POWDERED METALS	STRONG ACIDS					
	PUREX	X	X	X					
	222 S	X	X	X					
	T-PLANT	X	X	X					
	N REACTOR			X					
	PFP LAB	X	X	X					
	TANK FARMS	X	X	X					
	324 CE		X	X					
	325 WHC	X	X						
	325 PNL	X	X						
SODIUM OXALATE		STRONG OXIDIZING AGENTS							
	PFP LAB	X							
	325 WHC	X							
SODIUM PHOS-PHATE		STRONG ACIDS							
	324 CE	X							

9413148.0148

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
	325 WHC	X							
	325 PNL	X							
	327	X							
SODIUM SILICATE		NO INFO.							
	325 WHC								
SODIUM SULFATE		STRONG ACIDS	ALUMINUM	MAGNESIUM					
	325 WHC	X	X						
	325 PNL	X							
SODIUM SULFIDE		ACIDS	OXIDIZING AGENTS	ALUMINUM	COPPER	ZINC			
	TANK FARMS	X	X						
SODIUM TARTRATE		STRONG OXIDIZING AGENTS							
	PFP LAB	X							
SODIUM THIO-SULFATE		STRONG ACIDS	STRONG OXIDIZING AGENTS						
	PUREX	X	X						
	T-PLANT	X	X						
STRON-TIUM NITRATE		STRONG REDUCING AGENTS	STRONG ACIDS	ALUMINUM POWDER/WATER	TIN CHLORIDE	PHOS-PHINATES	ORGANIC MATERIALS	CYANIDES	THIO-CYANATES
	324 CE		X				X		
	325 AL	X	X				X		
	325 WHC	X	X	X			X		
	325 PNL	X	X				X		
SUGAR		STRONG OXIDIZING AGENTS							
	PUREX	X							
	325 WHC	X							
SULFAMIC ACID		STRONG OXIDIZING AGENTS	STRONG BASES						
	PUREX	X	X						
	PFP	X	X						
	PFP LAB	X	X						
	324 CE	X	X						
SULFONIC ACID (CHLORO)		ACIDS	BASES	ALCOHOLS	METALS	AMINES	POWDERED METALS	WATER	
	PFP LAB	X	X	X	X	X			

9413148.0149

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
SULFURIC ACID		BASES	HALIDES	METALS	WATER				
	PUREX	X	X	X	X				
	PUREX LAB	X	X	X	X				
	222 S	X	X	X	X				
	T-PLANT	X	X	X	X				
	PFP LAB	X	X	X	X				
	325 AL	X	X	X	X				
	325 WHC								
	325 PNL								
	327								
TARTARIC ACID		NO INFO.							
	PUREX								
	TANK FARMS								
TANTALUM		OXYGEN	HALOGENS	STRONG BASES	HYDROGEN FLUORIDE				
	327	X		X	X				
TETRA-SODIUM ETHYLENE DIAMINE TETRA ACETATE (EDTA)		STONG OXIDIZING AGENTS	STRONG BASES	COPPER	NICKEL				
	325 AL	X	X						
	325 WHC	X	X						
	325 PNL	X	X						
TETRA-BROMO-ETHANE		STRONG BASES	STRONG OXIDIZING AGENTS	MAGNESIUM					
	222 S	X	X						
TETRAPHE NYL BORON		NO INFORMATIO N							
	222 S								
THENOYL-TRIFLUOR O-ACETONE		STRONG OXIDIZING AGENTS							
	PUREX	X							
	PFP LAB	X							
	325 AL	X							
	222 S	X							

9413148.0150

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
THY-MOL-PTHALEIN		STRONG OXIDIZING AGENTS							
	PFP LAB	X							
TITANIUM CHLORIDE		STRONG OXIDIZING AGENTS							
	222 S	X							
TOLUENE		OXIDIZING AGENTS							
	PFP LAB	X							
	327	X							
TRIBUTYL PHOS-PHATE		STRONG OXIDIZING AGENTS	STRONG BASES						
	PFP LAB	X	X						
	325 AL	X	X						
	325 WHC	X	X						
	325 PNL	X	X						
	222 S	X	X						
	PUREX	X	X						
	PFP	X	X						
TRI-CHLORO-ETHANE		STRONG OXIDIZING AGENTS	ALUMINUM	MAGNESIUM	ZINC	STRONG BASES	POTASSIUM	SODIUM	
	T-PLANT	X							
	325 AL	X							
	327	X							
	PUREX	X							
TRI-N-DODE-CYLAMINE		STRONG OXIDIZING AGENTS							
	T-PLANT	X							
	325 AL	X							
	327	X							
	PUREX	X							
TRI-ISO-OCTYLA-MINE		STRONG OXIDIZING AGENTS							
	PFP LAB	X							
	222 S	X							
TRI-N-OCTYLA-MINE		ACIDS	ACID CHLORIDES	ACID ANHYDRIDES	OXIDIZING AGENTS				
	325 AL	X	X	X	X				

9413148.0151

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
	222 S	X	X	X	X				
TRIS (HYDROXY -METHYL) AMINO METHANE		BASES	OXIDIZING AGENTS						
	PFP LAB	X	X						
TRI-SODIUM HYDROXY-ETHYL ETHYLENE - DAMINE TRIA-CETATE (HEDTA)		STRONG OXIDIZING AGENTS							
	325 PNL	X							
UREA		OXIDIZING AGENTS							
	325 WHC	X							
VANADIUM		STRONG ACIDS	STRONG OXIDIZING AGENTS						
	325 WHC	X	X						
VANADIUM PENTOX-IDE		CALCIUM/ SULFUR/ WATER							
	325 AL								
XYLENE		OXIDIZERS							
	222 S	X							
	PFP LAB	X							
	325 AL	X							
	327	X							
YTTRIUM NITRATE		OXIDIZERS							
	325 PNL	X							
ZINC AMALGAM									
	222 S								
ZINC NITRATE		STRONG REDUCING AGENTS	ALUMINUM/ WATER	TIN CHLORIDE	CYANIDES	THIO-CYANATES	ISOTHIO-CYANATES		
	325 WHC	X	X						
	325 PNL	X							
ZIRCO-NIUM		HYDROGEN FLUORIDE	PHOS-PHORIC ACID						
	PUREX								

9413148.0152

TABLE 2
INCOMPATIBLE COMBINATIONS BY FACILITY

COMPOUND	FACILITY	INCOMPATA-BILITIES							
	325 WHC		X						
	327	X							
ZIRCONYL NITRATE		STRONG REDUCING AGENTS	STRONG ACIDS	ALUMINUM POWDER/WATER	TIN CHLORIDE	PHOSPHI-NATES	CYANIDES	THIOCYA-NATES	ISOTHI-CYANATES
	T-PLANT		X						
	325 AL	X	X						
ZIRCONYL PHOS-PHATE		NO INFO.							
	PUREX								

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TABLE 3
CONSEQUENCES OF POTENTIAL CHEMICAL MIXTURES

No.	Compound	Compound	Consequences of Reaction
1	ACETIC ACID	NITRIC ACID	HEAT; OFFGAS
2	ACETIC ACID	HYDROGEN PEROXIDE	EXPLODES WHEN HEATED
3	ACETIC ACID	POTASSIUM PERMANGAMATE	EXPLODES WHEN HEATED
4	ACETIC ACID	SODIUM HYDROXIDE	HEAT, OFFGAS
5	ACETIC ACID	CHROMIC ACID	HEAT, OFFGAS
6	ACETONE	CHROMIC ACID	HEAT, OFFGAS
7	ACETONE	HYDROGEN PEROXIDE	EXPLODES WHEN HEATED
8	ACETONE	NITRIC ACID/SULFURIC ACID	EXPLODES
9	ALIZARIN YELLOW	OXIDIZING MATERIALS	HEAT, POTENTIAL FIRE
10	ALUMINUM	RUST	FORMS EXPLOSIVE MATERIAL (THERMITE REACTION)
11	ALUMINUM	CARBON TETRACHLORIDE	EXPLODES
12	ALUMINUM	AMMONIUM NITRATE	EXPLOSIVE MATERIAL
13	ALUMINUM	SODIUM HYDROXIDE	FORMS HYDROGEN
14	ALUMINUM	AMMONIUM SULFATE	OFFGAS
15	ALUMINUM NITRATE NONAHYDRATE	ALUMINUM/ WATER	REACTS OVER TIME TO FORM EXPLOSIVE
16	ALUMINUM NITRATE NONAHYDRATE	NITRIC ACID	OFFGAS
17	AMMONIA	CHROMIC ACID	HEAT, INCANDESCENCE

TABLE 3
CONSEQUENCES OF POTENTIAL CHEMICAL MIXTURES

18	AMMONIA	SILVER NITRATE	FORMS SENSITIVE COMPOUNDS
19	AMMONIA	NITRIC ACID	IGNITES
20	AMMONIUM BISULFATE	OXIDIZING AGENTS	EXOTHERMIC REACTION
21	AMMONIUM FLUORIDE	ACIDS	EXOTHERMIC REACTION
22	AMMONIUM FLUORIDE	GLASS	EXOTHERMIC REACTION
23	AMMONIUM HYDROXIDE	HYDROCHLORIC ACID	EXOTHERMIC REACTION
24	AMMONIUM HYDROXIDE	HYDROFLUORIC ACID	EXOTHERMIC REACTION
25	AMMONIUM HYDROXIDE	SULFURIC ACID	EXOTHERMIC REACTION
26	AMMONIUM HYDROXIDE	SILVER NITRATE	EXOTHERMIC REACTION
27	AMMONIUM HYDROXIDE	SILVER OXIDE	EXOTHERMIC REACTION
28	AMMONIUM NITRATE	ORGANIC MATERIALS	EXPLODES UNDER CONDITIONS OF HEATING AND CONFINEMENT
29	AMMONIUM NITRATE	POTASSIUM PERMANGAMATE	CAN EXPLODE
30	AMMONIUM NITRATE	IRON	EXOTHERMIC REACTION
31	AMMONIUM NITRATE	LEAD	EXOTHERMIC REACTION
32	AMMONIUM NITRATE	SUGAR	EXOTHERMIC REACTION
33	AMMONIUM OXALATE	STRONG OXIDIZING AGENTS	EXOTHERMIC REACTION
34	AMMONIUM OXALATE	STRONG ACIDS	EXOTHERMIC REACTION
35	AMMONIUM FLUOSILICATE	STRONG OXIDIZING AGENTS	EXOTHERMIC REACTION
36	AMMONIUM FLUOSILICATE	STRONG ACIDS	EXOTHERMIC REACTION

9413148.0155

TABLE 3
CONSEQUENCES OF POTENTIAL CHEMICAL MIXTURES

37	AMMONIUM SULFITE	STRONG OXIDIZING AGENTS	HEAT, OFFGAS
38	AMMONIUM SULFITE	STRONG ACIDS	HEAT, OFFGAS
39	BARIUM NITRATE	ORGANIC MATERIALS	POTENTIAL FIRE, EXPLOSION
40	BENZENE	NITRIC ACID	EXPLODES
41	BERYLLIUM	CARBON TETRACHLORIDE	FLASHES AND SPARKS
42	BERYLLIUM	ACIDS	HEAT, OFFGAS
43	BERYLLIUM	CAUSTICS	HEAT, OFFGAS
44	BERYLLIUM	OXIDIZERS	HEAT, OFFGAS
45	BORON CARBIDE	OXIDIZING AGENTS	HEAT, OFFGAS
46	BROMOCRESOL PURPLE	OXIDIZING AGENTS	HEAT, OFFGAS
47	BROMONAPHTHALENE	OXIDIZING AGENTS	HEAT, OFFGAS
48	BUTANOL	ALUMINUM	VIGOROUS REACTION
49	BUTANOL	ACID ANHYDRIDES	FIRE
50	BUTANOL	REDUCING AGENTS	HEAT, OFFGAS
51	CADMIUM NITRATE	REDUCING AGENTS	HEAT, OFFGAS
52	CADMIUM NITRATE	ORGANIC MATERIALS	FIRE, POTENTIAL EXPLOSION
53	CALCIUM	SODIUM HYDROXIDE	HEAT, OFFGAS
54	CALCIUM	SODIUM CARBONATE	OFFGAS
55	CALCIUM	POTASSIUM CARBONATE	HYDROGEN GAS PRODUCED
56	CALCIUM	WATER	EXPLOSION
57	CALCIUM	ACIDS	OFFGAS
58	CALCAIUM CARBONATE	STRONG OXIDIZERS	OFFGAS

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TABLE 3
CONSEQUENCES OF POTENTIAL CHEMICAL MIXTURES

59	CALCIUM CARBONATE	ACIDS	VIGOROUS REACTION
60	CALCIUM CHLORIDE	AMMONIUM NITRATE	HEAT, OFFGAS
61	CALCIUM CHLORIDE	WATER	CAN EXPLODE WHEN HEATED
62	CARBON TETRACHLORIDE	LITHIUM	HEAT, OFFGAS
63	CERIC AMMONIUM NITRATE	REDUCING AGENTS	HEAT, OFFGAS
64	CERIC AMMONIUM NITRATE	POWDERED METALS	HEAT, OFFGAS
65	CERIC SULFATE	OXIDIZING AGENTS	HEAT, OFFGAS
66	CESIUM	REDUCING AGENTS	HEAT
67	CESIUM	ALCOHOLS	FIRE
68	CESIUM	ORGANICS	FIRE
69	CESIUM	WATER	FIRE
70	CESIUM	ALUMINUM	LIBERATES HYDROGEN, IGNITES
71	CESIUM	AIR	FIRE
72	CHROMIC ACID	ORGANICS	FIRE
73	CHROMIC ACID	METALS	EXPLOSION
74	CHROMIC ACID	ETHYL ALCOHOL	IGNITED
75	CITRIC ACID	OXIDIZING AGENTS	FIRE
76	CITRIC ACID	REDUCING AGENTS	HEAT
77	CITRIC ACID	BASES	HEAT
78	COPPER NITRATE	REDUCING AGENTS	OFFGAS
79	COPPER NITRATE	ORGANICS	FIRE, POTENTIAL EXPLOSION UNDER RIGHT CONDITIONS
80	COPPER NITRATE	MOISTURE	HEAT
81	DIATOMACEOUS EARTH	HYDROCHLORIC ACID	HEAT

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TABLE 3
CONSEQUENCES OF POTENTIAL CHEMICAL MIXTURES

82	DIBUTYL BUTYL PHOSPHONATE	STRONG OXIDIZING AGENTS	FIRE
83	DIBUTYL BUTYL PHOSPHONATE	STRONG BASES	HEAT, OFFGAS
84	DIBUTYL PHOSPHATE	STRONG OXIDIZING AGENTS	FIRE
85	DODECANE	OXIDIZING AGENTS	FIRE
86	ETHANOL	AMMONIA	EXPLODES
87	ETHANOL	AMMONIA/ SILVER NITRATE	FORMS EXPLOSIVE MIXTURE
88	ETHANOL	NITRIC ACID/SILVER	EXPLODES
89	ETHANOL	HYDROGEN PEROXIDE	EXPLODES
90	ETHANOL	NITRIC ACID	DECOMPOSES VIOLENTLY
91	ETHANOL	PERCHLORIC ACID	EXPLODES
92	ETHANOL	PLATINUM	HEAT
93	FERRIC AMMONIUM SULFATE	STRONG ACIDS	OFFGAS, HEAT
94	FERRIC NITRATE	STRONG OXIDIZING AGENTS	OFFGAS
95	FERROUS AMMONIUM SULFATE	STRONG ACIDS	OFFGAS, HEAT
96	FERROUS SULFATE	OXIDIZING AGENTS	OFFGAS, HEAT
97	FORMALDEHYDE	STRONG ACIDS	OFFGAS, HEAT
98	FORMALDEHYDE	STRONG BASES	OFFGAS, HEAT
99	FORMALDEHYDE	OXIDIZING AGENTS	EXPLODES
100	FORMALDEHYDE	ACID ANHYDRIDES	OFFGAS, HEAT
101	GALLIUM	STRONG ACIDS	HEAT
102	GALLIUM	STRONG OXIDIZING AGENTS	HEAT

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TABLE 3
CONSEQUENCES OF POTENTIAL CHEMICAL MIXTURES

103	GLYCEROL	HYDROGEN PEROXIDE	EXPLODES
104	GLYCEROL	NITRIC ACID	FIRE
105	GLYCEROL	POTASSIUM PERMANGAMATE	EXPLODES
106	GLYCEROL	OTHER STRONG OXIDIZING AGENTS	EXPLODES
107	GLYCEROL	STRONG BASES	OFFGAS
108	GLYCEROL	CHROMIC ACID	REACTS VIOLENTLY
109	GALLIUM OXIDE	STRONG OXIDIZING AGENTS	HEAT
110	GOLD	HYDROGEN PEROXIDE	EXPLODES
111	HYDRAZINE	AMMONIUM NITRATE	EXPLODES
112	HYDRAZINE	HYDROGEN PEROXIDE	IGNITES
113	HYDRAZINE	NITRIC ACID	IGNITES
114	HYDRAZINE	SODIUM NITRATE	IGNITES
115	HYDRAZINE	RUSTY IRON, WOOD, RAGS, OR DIRT	IGNITES
116	HYDRAZINE	CHROMATE SALTS	EXPLODES
117	HYDRAZINE	POTASSIUM PERMANGAMATE	IGNITES
118	HYDRAZINE	SILVER COMPOUNDS	EXPLODES
119	HYDROBROMIC ACID	AMMONIA	FIRE
120	HYDROBROMIC ACID	METALS	FIRE
121	HYDROBROMIC ACID	OXIDANTS	HEAT
122	HYDROBROMIC ACID	BASES	HEAT
123	HYDROCHLORIC ACID	ALUMINUM	REACTS VIOLENTLY
124	HYDROCHLORIC ACID	SILICON DIOXIDE	HEAT

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TABLE 3
CONSEQUENCES OF POTENTIAL CHEMICAL MIXTURES

125	HYDROCHLORIC ACID	POTASSIUM PERMANGAMATE	EXPLODES
126	HYDROCHLORIC ACID	SULFURIC ACID	HEAT, OFFGAS
127	HYDOCHLORIC ACID	PHOSPHORUS PENTOXIDE	VIGOROUS REACTION
128	HYDROFLUORIC ACID	POTASSIUM PERMANGAMATE	EXPLODES
129	HYDROFLUORIC ACID	SODIUM HYDROXIDE	HEAT, OFFGAS
130	HYDROGEN PEROXIDE	RUST OR IRON	FIRE
131	HYDROGEN PEROXIDE	SILVER OXIDE	REACTS VIOLENTLY
132	HYDROGEN PEROXIDE	OXIDANTS	EXPLODES
133	HYDROGEN PEROXIDE	NITRIC ACID	UNSTABLE
134	HYDROIODIC ACID	PERCHLORIC ACID	IGNITES
135	HYDROIODIC ACID	NITRIC ACID	IGNITES
136	HYDROXYLAMINE HYDROCHLORIDE	SODIUM HYDROXIDE	DECOMPSES WHEN HEATED
137	IODINE	AMMONIA	EXPLODES
138	IODINE	ALUMINUM	FIRE
139	IODINE	ACTIVE METALS	IGNITES
140	ISOAMYL ACETATE	OXIDIZING AGENTS	IGNITES
141	ISOAMYL ACETATE	STRONG ACIDS	IGNITES
142	ISOPROPYL ALCOHOL	OXIDIZING AGENTS	IGNITES
143	ISOPROPYL ALCOHOL	ACIDS	IGNITES
144	ISOPROPYL ALCOHOL	IODINE	HEAT
145	KEROSENE	STRONG OXIDIZING AGENTS	FIRE
146	KEROSENE	BASES	FIRE
147	KEROSENE	ACIDS	HEAT, OFFGAS

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TABLE 3
CONSEQUENCES OF POTENTIAL CHEMICAL MIXTURES

148	LANTHANUM FLUORIDE	OXIDIZING AGENTS	FIRE
149	LANTHANUM FLUORIDE	ACIDS	OFFGAS
150	LANTHANUM NITRATE	REDUCING AGENTS	OFFGAS
151	LANTHANUM NITRATE	OXIDIZING AGENTS	HEAT
152	LEAD NITRATE	CARBON	OFFGAS, HEAT
153	LITHIUM	NITRIC ACID	SPARKS WHEN HEATED
154	MAGNESIUM NITRATE	ALUMINUM POWDER/WATER	FIRE
155	MANGESIUM OXIDE	OXIDIZING AGENTS	EXPLODES
156	MERCURY	IODINE	OFFGAS
157	MERCURY	STRONG OXIDANTS	INCOMPATIBLE
158	MERCURY	AMMONIA	HEAT
159	MERCURY	NITRIC ACID	EXPLODES
160	MERCURIC NITRATE	HYDRAZINE	UNSTABLE MATERIAL
161	MERCURIC NITRATE	STRONG BASES	HEAT, OFFGAS
162	MERCURIC NITRATE	REDUCING AGENTS	HEAT, OFFGAS
163	MERCURIC NITRATE	ETHYL ALCOHOL	FORMS EXPLOSIVE MIXTURE
164	MERCURIC THIOCYANATE	STRONG OXIDIZING AGENTS	OFFGAS
165	METHANOL	CARBON TETRACHLORIDE	REACTS VIOLENTLY
166	METHANOL	HYDROGEN PEROXIDE	EXPLODES
167	METHANOL	OXIDIZING AGENTS	FIRE
168	METHANOL	REDUCING AGENTS	HEAT
169	METHYL ETHYL KETONE	OXIDIZING AGENTS	FIRE

TABLE 3
CONSEQUENCES OF POTENTIAL CHEMICAL MIXTURES

170	METHYL ETHYL KETONE	STRONG REDUCING AGENTS	HEAT
171	METHYL ETHYL KETONE	HYDROGEN PEROXIDE/ NITRIC ACID	EXPLODES WHEN HEATED
172	METHYL ISOBUTYL KETONE	OXIDIZING AGENTS	FIRE
173	METHYL ISOBUTYL KETONE	REDUCING AGENTS	HEAT, OFFGAS
174	METHYL ISOBUTYL KETONE	STRONG BASES	HEAT, OFFGAS
175	MOLYBDENUM	STRONG OXIDIZING AGENTS	VIOLENT REACTION
176	MOLYBDENUM	NITRIC ACID	HEAT, OFFGAS
177	MOLYBDENUM	SULFURIC ACID	HEAT, OFFGAS
178	MORPHOLINE	ACIDS	OFFGAS
179	MORPHOLINE	OXIDIZING AGENTS	FIRE
180	NAPTHYLAMINE	ACIDS	FIRE
181	NAPTHYLAMINE	OXIDIZING AGENTS	FIRE
182	NICKEL	ACIDS	VIOLENT REACTION
183	NICKEL	OXIDIZING AGENTS	VIOLENT REACTION
184	NICKEL NITRATE	ORGANIC MATERIAL	EXPLOSION
185	NICKEL SULFATE	STRONG OXIDIZING AGENTS	OFFGAS
186	NIRILOTRIACETIC ACID	OXIDIZING AGENTS	OFFGAS
187	NITROUS ACID	ORGANIC MATERIAL	EXPLODES
188	NORMAL PARAFFIN HYDROCARBONS	STRONG OXIDIZING AGENTS	FIRE
189	NORMAL PARAFFIN HYDROCARBONS	BASES	HEATING
190	NORMAL PARAFFIN HYDROCARBONS	AMINES	EXPLODES
191	O-PHENATHROLINE	STRONG OXIDIZERS	HEAT

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TABLE 3
CONSEQUENCES OF POTENTIAL CHEMICAL MIXTURES

192	O-PHENATHROLINE	STRONG ACIDS	HEAT
193	OXALIC ACID	BASES	HEAT, OFFGAS
194	OXALIC ACID	ACID CHLORIDES	HEAT, OFFGAS
195	OXALIC ACID	SILVER	EXPLODES ON HEATING
196	PENTASODIUM DIETHYLENE TRIAMINE PENTA ACETATE (DPTA)	OXIDIZING AGENTS	FIRE
197	PERCHLORIC ACID	CARBONACEOUS MATERIAL	EXPLODES
198	PERCHLORIC ACID	CELLULOSE	EXPLODES
199	PHOSPHORIC ACID	STRONG BASES	REACTS VIOLENTLY
200	PHOSPHORIC ACID	FINELY POWDERED METALS	FIRE
201	PHOSPHORUS PENTOXIDE	WATER	VIGOROUS REACTION
202	PHOSPHORUS PENTOXIDE	REDUCING MATERIALS	VIGOROUS REACTION
203	PLATINUM	STRONG OXIDIZING AGENTS	HEAT
204	POTASSIUM ACETATE	OXIDIZING AGENTS	HEAT
205	POTASSIUM BICARBONATE	STRONG OXIDIZING AGENTS	OFFGAS
206	POTASSIUM BICARBONATE	STRONG ACIDS	OFFGAS
207	POTASSIUM CARBONATE	OXIDIZING AGENTS	OFFGAS
208	POTASSIUM CARBONATE	ACIDS	OFFGAS
209	POTASSIUM DICHROMATE	HYDRAZINE	EXPLODES
210	POTASSIUM DICHROMATE	IRON	EXPLODES
211	POTASSIUM FLUORIDE	STRONG ACIDS	OFFGAS
212	POTASSIUM HYDROXIDE	ALUMINUM	VIGOROUS REACTION
213	POTASSIUM HYDROXIDE	ORGANIC MATERIALS	VIGOROUS REACTION

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TABLE 3
CONSEQUENCES OF POTENTIAL CHEMICAL MIXTURES

214	POTASSIUM HYDROXIDE	ACID CHLORIDES	OFFGAS
215	POTASSIUM HYDROXIDE	ACID ANHYDRIDES	VIGOROUS REACTION
216	POTASSIUM OXALATE	OXIDIZING AGENTS	HEAT
217	POTASSIUM PERMANGAMATE	WOOD	FIRE
218	S-DIPHENYL CARBAZIDE	STRONG OXIDIZING AGENTS	FIRE
219	SILICON	STRONG ACIDS	HEAT
220	SILVER	STRONG ACIDS	HEAT
221	SILVER	STRONG BASES	HEAT
222	POTASSIUM PERMANGAMATE	SILVER	EXPLODES
223	SILVER NITRATE	AMMONIA	FIRE
224	SILVER NITRATE	ETHANOL	FIRE
225	SILVER NITRATE	ORGANICS	HEAT
226	SILVER OXIDE	OXIDIZERS	OFFGAS
227	SODIUM BISMUTHATE	ACIDS	OFFGAS
228	SODIUM BISULFATE	STRONG BASES	OFFGAS
229	SODIUM BISULFATE	STRONG OXIDIZING AGENTS	OFFGAS
230	SODIUM BROMATE	STRONG REDUCING AGENTS	OFFGAS
231	SODIUM BROMATE	FINELY POWDERED METALS	SENSITIVE MATERIAL
232	SODIUM BROMATE	STRONG ACIDS	OFFGAS
233	SODIUM BROMATE	ORGANIC MATTER	EXPLODES WHEN HEATED
234	SODIUM CARBONATE	STRONG ACIDS	OFFGAS

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TABLE 3
CONSEQUENCES OF POTENTIAL CHEMICAL MIXTURES

235	SODIUM CARBONATE	ALUMINUM	EXPLODES WHEN HEATED
236	SODIUM DICHROMATE	STRONG REDUCING AGENTS	EXPLODES
237	SODIUM DICHROMATE	ALCOHOLS	FIRE
238	SODIUM FLUORIDE	STRONG ACIDS	OFFGAS
239	SODIUM IODIDE	STRONG ACIDS	OFFGAS
240	SODIUM HYPOCHLORITE	STRONG ACIDS	VIGOROUS REACTION
241	SODIUM NITRATE	STRONG REDUCING AGENTS	HEAT
242	SODIUM NITRATE	FINELY POWDERED METALS	DECOMPOSES WHEN HEATED
243	SODIUM NITRATE	STRONG ACIDS	EXPLODES WHEN HEATED
244	SODIUM NITRATE	ALUMINUM/ OXIDANT	HEAT, POTENTIAL EXPLOSION
245	SODIUM NITRITE	STRONG REDUCING AGENTS	EXPLOSION
246	SODIUM NITRITE	FINELY POWDERED METALS	DECOMPOSES WHEN HEATED
247	SODIUM OXALATE	STRONG OXIDIZING AGENTS	HEAT
248	SODIUM PHOSPHATE	STRONG ACIDS	HEAT, OFFGAS
249	SODIUM SULFATE	STRONG ACIDS	EXPLODES WHEN HEATED
250	SODIUM SULFATE	ALUMINUM	HEAT, OFFGAS
251	SODIUM SULFIDE	ACIDS	HEAT, OFFGAS
252	SODIUM SULFATE	OXIDIZING AGENTS	HEAT, OFFGAS
253	SODIUM TARTRATE	STRONG OXIDIZING AGENTS	HEAT, OFFGAS

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TABLE 3
CONSEQUENCES OF POTENTIAL CHEMICAL MIXTURES

254	SODIUM THIOSULFATE	STRONG OXIDIZING AGENTS	OFFGAS
255	SODIUM THIOSULFATE	STRONG ACIDS	OFFGAS
256	STRONTIUM NITRATE	STRONG REDUCING AGENTS	MAY EXPLODE
257	STRONTIUM NITRATE	STRONG ACIDS	EXPLODES WHEN HEATED
258	STRONTIUM NITRATE	ALUMINUM POWDER/WATER	EXPLODES WHEN HEATED
259	SUGAR	STRONG OXIDIZING AGENTS	EXPLODES WHEN HEATED
260	SULFAMIC ACID	STRONG OXIDIZING AGENTS	OFFGAS
261	SULFAMIC ACID	STRONG BASES	OFFGAS
262	SULFONIC ACID	ACIDS	OFFGAS
263	SULFONIC ACID	BASES	OFFGAS
264	SULFONIC ACID	ALCOHOLS	FIRE
265	SULFONIC ACID	METALS	GENERATES HYDROGEN
266	SULFONIC ACID	AMINES	OFFGAS
267	SULFONIC ACID	WATER	VIOLENT REACTION
268	SULFURIC ACID	BASES	HEAT, OFFGAS
269	SULFURIC ACID	HALIDES	VIOLENT REACTION
270	SUFURIC ACID	METALS	HAZARDOUS WHEN HEATED
271	SULFURIC ACID	WATER	HEAT
272	TANTALUM	STRONG BASES	HEAT, OFFGAS
273	TANTALUM	HYDROGEN FLUORIDE	OFFGAS
274	TETRASODIUM ETHYLENE DIAMINE TETRAACETATE (EDTA)	STRONG OXIDIZING AGENTS	OFFGAS

TABLE 3
CONSEQUENCES OF POTENTIAL CHEMICAL MIXTURES

275	TETRASODIUM ETHYLENE DIAMINE TETRAACETATE (EDTA)	STRONG BASES	OFFGAS
276	TETRABROMO- ETHANE	STRONG BASES	OFFGAS
277	TETRABROMETHANE	STRONG OXIDIZING AGENTS	OFFGAS
278	THENOYL TRIFLUROACETONE	STRONG OXIDIZING AGENTS	OFFGAS
279	THYMOLPTHALEIN	STRONG OXIDIZING AGENTS	OFFGAS
280	TITANIUM CHLORIDE	STRONG OXIDIZING AGENTS	OFFGAS
281	TOLUENE	OXIDIZING AGENTS	EXPLODES WHEN HEATED
282	TRIBUTYL PHOSPHATE	STRONG OXIDIZING AGENTS	EXPLODES WHEN HEATED
283	TRIBUTYL PHOSPHATE	STRONG BASES	DECOMPOSES
284	TRICHLOROETHANE	STRONG OXIDIZING AGENTS	OFFGAS
285	TRI-N-DODECYLAMINE	STRONG OXIDIZING AGENTS	OFFGAS
286	TRI-ISO-OCTYLAMINE	STRONG OXIDIZING AGENTS	OFFGAS
287	TRI-N OCTYLAMENE	ACIDS	OFFGAS
288	TRI-N-OCTYLAMENE	ACID CHLORIDES	OFFGAS
289	TRI-N-OCTYLAMENE	ACID ANHYDRIDES	OFFGAS
291	TRI-N-OCTYLAMENE	OXIDIZING AGENTS	OFFGAS
292	TRIS (HYDR-OXYLMETHYL) AMINO METHANE	BASES	OFFGAS

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TABLE 3
CONSEQUENCES OF POTENTIAL CHEMICAL MIXTURES

293	TRIS (HYDR-OXYLMETHYL) AMINO METHANE BASES	OXIDIZING AGENTS	OFFGAS
294	TRISODIUM HYDROXYETHYL-ETHYLENE DIAMINE TRIACETATE (HEDTA)	STRONG OXIDIZING AGENTS	FIRE
295	UREA	OXIDIZING AGENTS	EXPLODES WHEN HEATED
296	VANADIUM	STRONG ACIDS	HEAT
297	VANADIUM	STRONG OXIDIZING AGENTS	HEAT
298	XYLENE	OXIDIZERS	FIRE, OFFGAS
299	YTTRIUM NITRATE	OXIDIZERS	HEAT, POTENTIAL EXPLOSION
300	ZINC NITRATE	STRONG REDUCING AGENTS	HEAT
301	ZINC NITRATE	ALUMINUM/ WATER	EXPLODES
302	ZIRCONIUM	HYDROGEN FLUORIDE	
303	ZIRCONIUM	PHOSPHORIC ACID	
304	ZIRCONYL NITRATE	STRONG ACIDS	
305	ZIRCONYL NITRATE	ALUMINUM POWDER/WATER	

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
1	ACETIC ACID	0.01	NITRIC ACID	0.1	0.01	0.01	PFP LAB	5000	7.8E-10
						0.01	325 WHC	2562	4.0E-10
2	ACETIC ACID	0.01	HYDROGEN PEROXIDE	0.01	0.1	0.01	PFP LAB	5000	7.8E-10
3	ACETIC ACID	0.01	POTASSIUM PERMANGAMATE	0.01	0.1	0.01	PFP LAB	5000	7.8E-10
						0.01	325 WHC	2562	4.0E-10
4	ACETIC ACID	0.01	SODIUM HYDROXIDE	0.1	0.01	0.01	PFP LAB	5000	7.8E-10
						0.01	325 WHC	2562	4.0E-10
5	ACETIC ACID	0.01	CHROMIC ACID	0.01	0.1	0.01	325 WHC	2562	4.0E-10
6	ACETONE	0.01	CHROMIC ACID	0.01	0.01	0.01	325 WHC	3262	4.0E-11
						0.01	327	13	2.0E-13
7	ACETONE	0.01	HYDROGEN PEROXIDE	0.01	1	0.01	PFP LAB	5000	7.8E-09
						0.01	PUREX LAB	2397	3.7E-09
						0.1	T-PLANT	34	5.3E-09
						0.01	325 AL	15	2.3E-11
						0.01	327	13	2.0E-11
8	ACETONE	0.01	NITRIC ACID/SULFURIC ACID	0.01	1	0.01	222 S	309	4.8E-10
						0.01	PFP LAB	5000	7.8E-09
						0.01	325 WHC	2562	4.0E-09
						0.01	325 AL	15	2.3E-11
						0.01	325 PNL	1573	2.5E-09
						0.01	327	13	2.0E-11
9	ALIZARIN YELLOW	0.001	OXIDIZING MATERIALS	0.1	.01	0.01	PFP LAB	5000	7.8E-11
10	ALUMINUM	0.01	RUST	0.1	1	0.1	T-PLANT	34	5.3E-08
						0.1	325 WHC	2562	4.0E-11
						0.1	PUREX	2397	3.7E-06
						0.1	PFP	20831	3.2E-05
						0.01	327	13	2.0E-10
11	ALUMINUM	0.01	CARBON TETRACHLORIDE	0.01	1	0.1	PFP	20831	3.2E-06
						0.01	327	13	2.0E-11

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
12	ALUMINUM	0.01	AMMONIUM NITRATE	0.01	1	0.1	T-PLANT	34	5.3E-09
						0.1	PUREX	2397	3.7E-07
13	ALUMINUM	0.01	SODIUM HYDROXIDE	0.1	.01	0.1	T-PLANT	34	5.3E-10
						0.01	325 WHC	2562	4.0E-10
						0.1	PUREX	2397	3.7E-08
						0.1	PFP	20831	3.2E-07
						0.01	327	13	2.0E-10
14	ALUMINUM	0.01	AMMONIUM SULFATE	0.01	.01	0.1	T-PLANT	34	5.3E-11
15	ALUMINUM NITRATE NONAHYDRATE	0.01	ALUMINUM/ WATER	0.001	.1	0.1	PUREX	2397	3.7E-08
						0.1	T-PLANT	34	5.3E-10
						0.1	PFP	20831	3.2E-07
16	ALUMINUM NITRATE NONAHYDRATE	0.01	NITRIC ACID	0.1	.01	0.01	222 S	309	4.8E-11
						0.01	PFP LAB	5000	7.8E-10
						0.1	PUREX	2397	3.7E-08
						0.1	T-PLANT	34	5.3E-10
						0.1	PFP	20831	3.2E-07
						0.01	324 CE	16	2.5E-10
						0.01	325 PNL	1573	2.5E-10
						0.01	325 AL	15	2.3E-12
17	AMMONIA	0.01	CHROMIC ACID	0.01	.01	0.01	325 WHC	2562	4.0E-11
18	AMMONIA		SILVER NITRATE	0.01	.1	0.01	325 WHC	2562	4.0E-10
						0.01	325 AL	15	2.3E-12
19	AMMONIA	0.01	NITRIC ACID	0.1	.01	0.01	325 WHC	2562	4.0E-10
						0.01	325 AL	15	2.3E-12
20	AMMONIUM BISULFATE	0.01	OXIDIZING AGENTS	0.1	.01	0.1	N-REACTOR	38	5.9E-10
21	AMMONIUM FLUORIDE	0.01	ACIDS	0.1	.01	0.1	PUREX	2397	3.7E-08
22	AMMONIUM FLUORIDE	0.01	GLASS	0.1	.001	0.1	PUREX	2397	3.7E-09
23	AMMONIUM HYDROXIDE	0.01	HYDROCHLORIC ACID	0.1	.01	0.01	222 S	309	4.8E-11
						0.01	PFP LAB	5000	7.8E-10

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
						0.01	325 AL	15	2.3E-12
						0.01	325 PNL	1573	2.5E-10
24	AMMONIUM HYDROXIDE	0.01	HYDROFLUORIC ACID	0.01	.01	0.01	222 S	309	4.8E-10
						0.01	PFP LAB	5000	7.8E-09
						0.01	325 AL	15	2.3E-11
						0.01	325 PNL	1573	2.5E-09
25	AMMONIUM HYDROXIDE	0.01	SULFURIC ACID	0.1	.01	0.01	222 S	309	4.8E-11
						0.01	325 AL	15	2.3E-12
						0.01	325 PNL	1573	2.5E-10
						0.01	PFP LAB	5000	7.8E-10
26	AMMONIUM HYDROXIDE	0.01	SILVER NITRATE	0.01	.1	0.01	325 AL	15	2.3E-12
27	AMMONIUM HYDROXIDE	0.01	SILVER OXIDE	0.01	.1	0.01	PFP LAB	5000	7.8E-10
28	AMMONIUM NITRATE	0.01	ORGANIC MATERIALS	0.1	.1	0.1	T-PLANT	34	5.3E-11
						0.1	PUREX	2397	3.7E-07
						0.01	325 AL	25	2.3E-11
29	AMMONIUM NITRATE	0.01	POTASSIUM PERMANGAMATE	0.01	.1	0.1	T-PLANT	34	5.3E-10
						0.1	PUREX	2397	3.7E-08
						0.01	325 AL	15	2.3E-12
30	AMMONIUM NITRATE	0.01	IRON	0.1	.1	0.1	T-PLANT	34	5.3E-09
						0.1	PUREX	2397	3.7E-07
						0.01	325 AL	15	2.3E-11
31	AMMONIUM NITRATE	0.01	LEAD	0.1	.1	0.1	T-PLANT	34	5.3E-09
						0.01	325 AL	15	2.3E-11
						0.1	PUREX	2397	3.7E-07
32	AMMONIUM NITRATE	0.01	SUGAR	0.01	.1	0.1	PUREX	2397	3.7E-08
33	AMMONIUM OXALATE	0.01	STRONG OXIDIZING AGENTS	0.1	.01	0.01	222 S	309	4.8E-11
						0.01	PFP LAB	5000	7.8E-10
						0.01	325 AL	15	2.3E-12
						0.01	325 WHC	2562	4.0E-10
34	AMMONIUM OXALATE	0.01	STRONG ACIDS	0.1	.01	0.01	222 S	309	4.8E-11

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
						0.01	PFP LAB	5000	7.8E-10
						0.01	325 AL	15	2.3E-12
						0.01	325 WHC	2562	4.0E-10
35	AMMONIUM FLUOSILICATE	0.01	STRONG OXIDIZING AGENTS	0.1	.01	0.1	T-PLANT	34	5.3E-10
36	AMMONIUM FLUOSILICATE	0.01	STRONG ACIDS	0.1	.01	0.1	T-PLANT	34	5.3E-10
37	AMMONIUM SULFITE	0.01	STRONG OXIDIZING AGENTS	0.1	.01	0.1	T-PLANT	34	5.3E-10
38	AMMONIUM SULFITE	0.01	STRONG ACIDS	0.1	.01	0.1	T-PLANT	34	5.3E-10
39	BARIUM NITRATE	0.01	ORGANIC MATERIALS	0.1	.01	0.01	324 CE	16	2.5E-12
						0.01	325 WHC	2562	4.0E-10
40	BENZENE	0.10	NITRIC ACID	0.01	1	0.01	327	13	2.0E-10
41	BERYLLIUM	0.01	CARBON TETRACHLORIDE	0.01	.01	0.1	PFP	20831	3.2E-08
42	BERYLLIUM	0.01	ACIDS	0.1	.01	0.1	PUREX	2397	3.7E-08
						0.1	PFP	20831	3.2E-07
						0.01	325 WHC	2562	4.0E-10
						0.01	327	13	2.0E-10
43	BERYLLIUM	0.01	CAUSTICS	0.1	.01	0.1	PUREX	2397	3.7E-08
						0.1	PFP	20831	3.2E-07
						0.01	325 WHC	2562	4.0E-10
						0.01	327	13	2.0E-12
44	BERYLLIUM	0.01	OXIDIZERS	0.1	.01	0.1	PUREX	2397	3.7E-08
						0.1	PFP	20831	3.2E-07
						0.01	325 WHC	2562	4.0E-09
						0.01	327	13	2.0E-12
45	BORON CARBIDE	0.01	OXIDIZING AGENTS	0.1	.01	0.01	327	13	2.0E-12
46	BROMOCRESOL PURPLE	0.001	OXIDIZING AGENTS	0.1	.01	0.1	PFP	20831	3.2E-08
						0.01	325 AL	15	2.3E-13
47	BROMONAPHTHALENE	0.01	OXIDIZING AGENTS	0.1	.01	0.01	222 S	309	4.8E-11
48	BUTANOL	0.10	ALUMINUM	0.01	.1	0.01	327	13	2.0E-12
49	BUTANOL	0.10	ACID ANHYDRIDES	0.1	.01	0.01	327	13	2.0E-08

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
50	BUTANOL	0.10	REDUCING AGENTS	0.1	.01	0.01	327	13	2.0E-11
51	CADMIUM NITRATE	0.01	REDUCING AGENTS	0.1	.01	0.1	PUREX	2397	3.7E-08
52	CADMIUM NITRATE	0.01	ORGANIC MATERIALS	0.1	.01	0.1	PUREX	2397	3.7E-08
53	CALCIUM	0.01	SODIUM HYDROXIDE	0.1	.01	0.1	PFP	20831	3.2E-07
54	CALCIUM	0.01	SODIUM CARBONATE	0.01	.01	0.1	PFP	20831	3.2E-08
55	CALCIUM	0.01	POTASSIUM CARBONATE	0.01	.01	0.1	PFP	20831	3.2E-08
56	CALCIUM	0.01	WATER	0.1	.1	0.1	PFP	20831	3.2E-06
57	CALCIUM	0.01	ACIDS	0.1	1	0.1	PFP	20831	3.2E-05
58	CALCIUM CARBONATE	0.01	STRONG OXIDIZERS	0.1	.01	0.1	TANK FARMS	57	8.9E-10
						0.01	325 WHC	2562	4.0E-10
59	CALCIUM CARBONATE	0.01	ACIDS	0.1	.01	0.1	TANK FARMS	57	8.9E-10
						0.01	325 WHC	2562	4.0E-10
60	CALCIUM CHLORIDE	0.01	AMMONIUM NITRATE	0.01	0.1	0.01	325 AL	15	2.3E-12
61	CALCIUM CHLORIDE	0.01	WATER	0.1	0.1	0.01	325 AL	15	2.3E-12
						0.01	325 WHC	2562	4.0E-09
62	CARBON TETRACHLORIDE	0.01	LITHIUM	0.001	0.1	0.01	327	13	2.0E-12
63	CERIC AMMONIUM NITRATE	0.01	REDUCING AGENTS	0.1	0.01	0.01	PFP LAB	5000	7.8E-10
64	CERIC AMMONIUM NITRATE	0.01	POWDERED METALS	0.01	0.01	0.01	PFP LAB	5000	7.8E-11
65	CERIC SULFATE	0.01	OXIDIZING AGENTS	0.1	0.01	0.01	222 S	309	4.8E-11
						0.01	325 AL	15	2.3E-12
						0.01	PUREX LAB	1484	2.3E-10
66	CESIUM	0.01	REDUCING AGENTS	0.1	0.01	0.01	325 WHC	2562	4.0E-10
67	CESIUM	0.01	ALCOHOLS	0.01	0.01	0.01	325 WHC	2562	4.0E-11
68	CESIUM	0.01	ORGANICS	0.1	0.01	0.01	325 WHC	2562	4.0E-10
69	CESIUM	0.01	WATER	0.1	.1	0.01	325 WHC	2562	4.0E-09
70	CESIUM	0.01	ALUMINUM	0.01	0.01	0.01	325 WHC	2562	4.0E-11
71	CESIUM	0.01	AIR	1.	0.1	0.01	325 WHC	2562	4.0E-07
72	CHROMIC ACID	0.01	ORGANICS	0.1		0.01	325 WHC	2562	4.0E-08
						0.01	327	13	2.0E-10

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
73	CHROMIC ACID	0.01	METALS	0.1	0.01	0.01	325 WHC	2562	4.0E-10
						0.01	327	13	2.0E-12
74	CHROMIC ACID	0.01	ETHYL ALCOHOL	0.01	0.01	0.01	325 WHC	2562	4.0E-11
						0.01	327	13	2.0E-13
75	CITRIC ACID	0.01	OXIDIZING AGENTS	0.01	0.01	0.1	N-REACTOR	38	5.9E-11
						0.1	TANK FARMS	57	8.9E-11
						0.01	325 WHC	2562	4.0E-10
76	CITRIC ACID	0.01	REDUCING AGENTS	0.01	0.01	0.1	N-REACTOR	38	5.9E-11
						0.1	TANK FARMS	57	8.9E-11
						0.01	325 WHC	2562	4.0E-09
77	CITRIC ACID	0.01	BASES	0.1	0.01	0.1	N-REACTOR	38	5.9E-10
						0.1	TANK FARMS	57	8.9E-10
						0.01	325 WHC	2562	4.0E-10
78	COPPER NITRATE	0.01	REDUCING AGENTS	0.1	0.01	0.01	325 PNL	1573	2.5E-08
79	COPPER NITRATE	0.01	ORGANICS	0.1	0.01	0.01	324 CE	16	2.5E-12
						0.01	325 PNL	1573	2.5E-08
80	COPPER NITRATE	0.01	MOISTURE	0.1	0.01	0.01	324 CE	16	2.5E-12
						0.01	325 PNL	1573	2.5E-08
81	DIATOMACEOUS EARTH	0.10	HYDROCHLORIC ACID	0.1	0.01	0.01	325 WHC	2562	4.0E-09
82	DIBUTYL BUTYL PHOSPHONATE	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.1	PFP	20831	3.2E-07
83	DIBUTYL BUTYL PHOSPHONATE	0.01	STRONG BASES	0.1	0.01	0.1	PFP	20831	3.2E-07
84	DIBUTYL PHOSPHATE	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.1	PUREX	2397	3.7E-07
						0.01	PFP LAB	5000	7.8E-10
85	DODECANE	0.10	OXIDIZING AGENTS	0.1	0.01	0.1	PFP	20831	3.2E-06
86	ETHANOL	0.01	AMMONIA	0.01	1	0.01	325 WHC	2562	4.0E-09
87	ETHANOL	0.01	AMMONIA/ SILVER NITRATE	0.001	1	0.01	325 WHC	2562	4.0E-09
88	ETHANOL	0.01	NITRIC ACID/SILVER	0.001	1	0.01	327	13	2.0E-11
89	ETHANOL	0.01	HYDROGEN PEROXIDE	0.01	1	0.01	325 AL	15	2.3E-11

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
						0.01	325 WHC	2562	4.0E-09
						0.01	325 PNL	1573	2.5E-09
						0.01	327	13	2.0E-11
90	ETHANOL	0.01	NITRIC ACID	0.1	0.1	0.01	325 AL	15	2.3E-11
						0.01	325 WHC	2562	4.0E-09
						0.01	325 PNL	1573	2.5E-09
						0.01	327	13	2.0E-11
91	ETHANOL	0.01	PERCHLORIC ACID	0.01	1	0.01	325 AL	15	2.3E-11
						0.01	327	13	2.0E-11
92	ETHANOL	0.01	PLATINUM	0.001	0.01	0.01	325 PNL	1573	2.5E-09
						0.01	327	13	2.0E=13
93	FERRIC AMMONIUM SULFATE	0.01	STRONG ACIDS	0.1	0.01	0.01	PFP LAB	5000	7.8E-10
						0.01	325 WHC	2562	4.0E-10
94	FERRIC NITRATE	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.1	PUREX	2397	3.7E-09
						0.01	PFP LAB	5000	7.8E-10
						0.01	324 CE	16	2.5E-12
						0.01	325 WHC	2562	4.0E-10
95	FERROUS AMMONIUM SULFATE	0.01	STRONG ACIDS	0.1	0.01	0.01	PFP LAB	5000	7.83-10
						0.01	325 AL	15	2.3E-12
96	FERROUS SULFATE	0.01	OXIDIZING AGENTS	0.1	0.01	0.01	222 S	309	4.8E-09
						0.1	T-PLANT	34	5.3E-10
97	FORMALDEHYDE	0.01	STRONG ACIDS	0.1	0.01	0.1	PUREX	2397	3.7E-08
98	FORMALDEHYDE	0.01	STRONG BASES	0.1	0.01	0.1	PUREX	2397	3.7E-08
99	FORMALDEHYDE	0.01	OXIDIZING AGENTS	0.1	1	0.1	PUREX	2397	3.7E-06
100	FORMALDEHYDE	0.01	ACID ANHYDRIDES	0.1	.01	0.1	PUREX	2397	3.7E-08
101	GALLIUM	0.01	STRONG ACIDS	0.1	0.01	0.1	PFP	20831	3.2E-07
102	GALLIUM	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.1	PFP	20831	3.2E-07
103	GLYCEROL	0.01	HYDROGEN PEROXIDE	0.01	1	0.01	327	13	2.03-11
104	GLYCEROL	0.01	NITRIC ACID	0.1	.10	0.01	327	13	2.0E-11

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
105	GLYCEROL	0.01	POTASSIUM PERMANGAMATE	0.01	1	0.01	327	13	2.0E-11
106	GLYCEROL	0.01	OTHER STRONG OXIDIZING AGENTS	0.1	1	0.01	327	13	2.0E-10
107	GLYCEROL	0.01	STRONG BASES	0.1	0.01	0.01	327	13	2.0E-12
108	GLYCEROL	0.01	CHROMIC ACID	0.01	0.1	0.01	327	13	2.0E-12
109	GALLIUM OXIDE	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.1	PFP	20831	3.2E-07
110	GOLD	0.001	HYDROGEN PEROXIDE	0.01	1	0.01	327	13	2.0E-12
111	HYDRAZINE	0.01	AMMONIUM NITRATE	0.01	1	0.1	PUREX	2397	3.7E-07
						0.01	325 AL	15	2.3E-11
112	HYDRAZINE	0.01	HYDROGEN PEROXIDE	0.01	0.01	0.1	PUREX	2397	3.7E-09
						0.1	PFP	20831	3.2E-08
						0.01	PFP LAB	5000	7.8E-11
						0.01	325 AL	15	2.3E-13
						0.01	325 WHC	2562	4.0E-11
						0.01	325 PNL	1573	2.5E-11
113	HYDRAZINE	0.01	NITRIC ACID	0.1	0.01	0.1	PUREX	2397	3.7E-08
						0.01	222 S	309	4.8E-11
						0.1	PFP	20831	3.2E-07
						0.01	PFP LAB	5000	7.8E-10
						0.01	325 AL	15	2.3E-12
						0.01	325 WHC	2562	4.0E-10
						0.01	325 PNL	1573	2.5E-10
114	HYDRAZINE	0.01	SODIUM NITRATE	0.1	0.01	0.01	325 AL	15	2.3E-12
						0.1	PFP	20831	3.2E-07
						0.1	PUREX	2397	3.7E-08
						0.01	325 WHC	2562	4.0E-10
115	HYDRAZINE	0.01	RUSTY IRON, WOOD, RAGS, OR DIRT	0.5	0.01	0.1	PUREX	2397	1.9E-08
						0.01	222 S	309	2.4E-11
						0.1	PFP	20831	1.6E-07
						0.1	N-REACTOR	38	2.6E-12

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
						0.01	PFP LAB	5000	3.9E-08
						0.01	325 AL	15	1.1E-12
						0.01	325 WHC	2562	2.0E-10
						0.01	325 PNL	1573	1.2E-10
116	HYDRAZINE	0.01	CHROMATE SALTS	0.01	1	0.01	325 WHC	2562	4.0E-09
117	HYDRAZINE	0.01	POTASSIUM PERMANGAMATE	0.01	.01	0.1	PUREX	2397	3.7E-09
						0.01	222 S	309	4.8E-12
						0.1	PFP	20831	3.2E-08
						0.1	N-REACTOR	38	5.9E-11
						0.01	PFP LAB	5000	7.8E-11
						0.01	325 AL	15	2.3E-13
						0.01	325 WHC	2562	4.0E-11
						0.01	325 PNL	1573	2.5E-11
118	HYDRAZINE	0.01	SILVER COMPOUNDS	0.01	1	0.1	PUREX	2397	3.7E-07
						0.01	PFP LAB	5000	7.8E-09
						0.01	325 AL	15	2.3E-11
						0.01	325 WHC	2562	4.0E-09
						0.01	325 PNL	1573	2.5E-09
119	HYDROBROMIC ACID	0.01	AMMONIA	0.01	0.01	0.01	PUREX LAB	1484	2.3E-11
						0.01	PFP LAB	5000	7.8E-11
120	HYDROBROMIC ACID	0.01	METALS	0.1	0.01	0.01	PUREX LAB	1484	2.3E-10
						0.01	PFP LAB	5000	7.8E-10
121	HYDROBROMIC ACID	0.01	OXIDANTS	0.1	0.01	0.01	PUREX LAB	1484	2.3E-10
						0.01	PFP LAB	5000	7.8E-10
122	HYDROBROMIC ACID	0.01	BASES	0.1	0.01	0.01	PUREX LAB	1484	2.3E-10
						0.01	PFP LAB	5000	7.8E-10
123	HYDROCHLORIC ACID	0.10	ALUMINUM	0.01	0.1	0.01	325 WHC	2562	4.0E-09
124	HYDROCHLORIC ACID	0.10	SILICON DIOXIDE	0.01	.01	0.01	325 WHC	2562	4.0E-11
125	HYDROCHLORIC ACID	0.10	POTASSIUM PERMANGAMATE	0.01	1	0.01	PUREX LAB	1484	2.3E-09
						0.01	222 S	309	4.8E-10

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
						0.01	PFP LAB	5000	7.8E-09
						0.01	325 AL	15	2.3E-11
						0.01	325 WHC	2562	4.0E-09
						0.01	325 PNL	1573	2.5E-09
126	HYDROCHLORIC ACID	0.10	SULFURIC ACID	0.1	0.01	0.01	PUREX LAB	1484	2.3E-10
						0.01	222 S	309	4.8E-11
						0.01	PFP LAB	5000	7.8E-10
						0.01	325 AL	15	2.3E-12
						0.01	325 PNL	1573	2.5E-10
						0.01	325 WHC	2562	4.0E-10
127	HYDOCHLORIC ACID	0.10	PHOSPHORUS PENTOXIDE	0.01	0.1	0.01	PUREX LAB	1484	2.3E-09
128	HYDROFLUORIC ACID	0.01	POTASSIUM PERMANGAMATE	0.01	1	0.1	T PLANT	34	5.3E-09
						0.1	PFP	20831	3.2E-06
						0.01	325 AL	15	2.3E-11
						0.01	325 PNL	1573	2.5E-09
						0.01	327	13	2.0E-11
129	HYDROFLUORIC ACID	0.01	SODIUM HYDROXIDE	0.1	.01	0.1	T PLANT	34	5.3E-10
						0.1	PFP	20831	3.2E-07
						0.01	325 AL	15	2.3E-12
						0.01	325 PNL	1573	2.5E-10
						0.01	327	13	2.0E-12
130	HYDROGEN PEROXIDE	0.01	RUST OR IRON	0.1	0.01	0.01	PUREX LAB	1484	2.3E-10
						0.1	T-PLANT	34	5.3E-10
						0.1	PFP	20831	3.2E-07
						0.01	PFP LAB	5000	7.8E-10
						0.01	325 AL	15	2.3E-12
						0.01	327	13	2.0E-12
131	HYDROGEN PEROXIDE	0.01	SILVER OXIDE	0.01	0.1	0.01	PFP LAB	5000	7.8E-10
132	HYDROGEN PEROXIDE	0.01	OXIDANTS	0.1	1	0.01	PUREX LAB	1484	2.3E-08
						0.1	T-PLANT	34	5.3E-08
						0.1	PFP	20831	3.2E-05

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
						0.01	PFP LAB	5000	7.8E-08
						0.01	325 AL	15	2.3E-10
						0.01	327	13	2.0E-10
133	HYDROGEN PEROXIDE	0.01	NITRIC ACID	0.1	0.1	0.01	PUREX LAB	1484	2.3E-09
						0.1	T-PLANT	34	5.3E-09
						0.1	PFP	20831	3.2E-06
						0.01	PFP LAB	5000	7.8E-09
						0.01	325 AL	15	2.E3-11
						0.01	327	13	2.0E-11
134	HYDROIODIC ACID	0.01	PERCHLORIC ACID	0.01	0.01	0.01	325 AL	15	2.3E-11
135	HYDROIODIC ACID	0.01	NITRIC ACID	0.1	0.01	0.01	PFP LAB	5000	7.8E-10
						0.01	325 AL	15	2.3E-12
136	HYDROXYLAMINE HYDROCHLORIDE	0.01	SODIUM HYDROXIDE	0.1	0.01	10.01	PUREX LAB	1484	2.3E-10
						0.01	222 S	309	4.8E-09
						0.1	PFP	20831	3.2E-07
						0.01	PFP LAB	5000	7.8E-10
						0.01	325 AL	15	2.3E-12
137	IODINE	0.01	AMMONIA	0.01	1	0.01	325 WHC	2562	4.0E-09
138	IODINE	0.01	ALUMINUM	0.01	0.01	0.01	325 WHC	2562	4.0E-11
139	IODINE	0.01	ACTIVE METALS	0.01	0.01	0.1	PFP	20831	3.2E-08
						0.01	325 AL	15	2.3E-13
						0.01	325 WHC	2562	4.0E-11
140	ISOAMYL ACETATE	0.01	OXIDIZING AGENTS	0.1	0.01	0.01	327	13	2.0E-12
141	ISOAMYL ACETATE	0.01	STRONG ACIDS	0.1	0.01	0.01	327	13	2.0E-12
142	ISOPROPYL ALCOHOL	0.01	OXIDIZING AGENTS	0.1	0.01	0.01	PUREX LAB	1484	2.3E-10
						0.01	325 AL	15	2.3E-12
						0.01	325 WHC	2562	4.0E-10
143	ISOPROPYL ALCOHOL	0.01	ACIDS	0.1	0.01	0.01	PUREX LAB	1484	2.3E-10
						0.01	325 AL	15	2.3E-12
						0.01	325 WHC	2562	4.0E-10
144	ISOPROPYL ALCOHOL	0.01	IODINE	0.01	0.01	0.01	325 AL	15	2.3E-13

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
						0.01	325 WHC	2562	4.0E-11
145	KEROSENE	0.10	STRONG OXIDIZING AGENTS	0.1	0.01	0.01	325 AL	15	2.3E-11
						0.01	327	13	2.0E-11
						0.1	T-PLANT	34	5.3E-09
146	KEROSENE	0.10	BASES	0.1	0.01	0.01	325 AL	15	2.3E-11
						0.01	327	13	2.0E-11
147	KEROSENE	0.10	ACIDS	0.1	0.01	0.1	T-PLANT	34	5.3E-09
						0.01	325 AL	15	2.3E-11
						0.01	325 WHC	2562	4.0E-09
148	LANTHANUM FLUORIDE	0.01	OXIDIZING AGENTS	0.1	0.01	0.01	PUREX LAB	1484	2.3E-10
149	LANTHANUM FLUORIDE	0.01	ACIDS	0.1	0.01	0.01	PUREX LAB	1484	2.3E-10
						0.01	PUREX LAB	1484	2.3E-10
150	LANTHANUM NITRATE	0.01	REDUCING AGENTS	0.1	0.01	0.1	T-PLANT	34	5.3E-10
						0.01	325 PNL	1573	2.5E-10
						0.01	325 WHC	2562	4.0E-10
						0.01	PUREX LAB	1484	2.3E-10
151	LANTHANUM NITRATE	0.01	OXIDIZING AGENTS	0.1	0.01	0.1	T-PLANT	34	5.3E-10
						0.01	325 PNL	1573	2.5E-10
						0.01	325 WHC	2562	4.0E-10
152	LEAD NITRATE	0.01	CARBON	0.1	0.01	0.01	222 S	309	4.8E-11
						0.01	325 WHC	2562	4.0E-10
153	LITHIUM	0.01	NITRIC ACID	0.1	0.01	0.01	327	13	2.0E-12
154	MAGNESIUM NITRATE	0.01	ALUMINUM POWDER/WATER	0.001	,1	0.01	325 WHC	2562	4.0E-10
155	MANGESIUM OXIDE	0.01	OXIDIZING AGENTS	0.1	0.01	0.1	PFP	20831	3.2E-07
						0.01	325 AL	15	2.3E-12
156	MERCURY	0.01	IODINE	0.01	0.1	0.01	325 AL	15	2.3E-12
157	MERCURY	0.01	STRONG OXIDANTS	0.1	0.01	0.01	325 AL	15	2.3E-12
						0.01	325 PNL	1573	2.5E-10
158	MERCURY	0.01	AMMONIA	0.01	1	0.01	325 AL	15	2.3E-11
159	MERCURY	0.01	NITRIC ACID	0.1	1	0.01	325 WHC	2562	4.0E-08

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
160	MERCURIC NITRATE	0.01	HYDRAZINE	0.01	0.1	0.1	PUREX	2397	3.7E-08
						0.1	PFP	20831	3.2E-07
						0.01	325 AL	15	2.3E-12
						0.01	325 WHC	2562	4.0E-10
						0.01	325 PNL	1573	2.5E-10
161	MERCURIC NITRATE	0.01	STRONG BASES	0.1	0.01	0.1	PUREX	2397	3.7E-08
						0.1	PFP	20831	3.2E-07
						0.01	325 AL	15	2.3E-12
						0.01	325 WHC	2562	4.0E-10
						0.01	325 PNL	1573	2.5E-10
						0.01	327	13	2.0E-12
162	MERCURIC NITRATE	0.01	REDUCING AGENTS	0.1	0.01	0.1	PUREX	2397	3.7E-08
						0.1	PFP	20831	3.2E-07
						0.01	325 AL	15	2.3E-12
						0.01	325 WHC	2562	4.0E-10
						0.01	325 PNL	1573	2.5E-10
						0.01	327	13	2.0E-12
163	MERCURIC NITRATE	0.01	ETHYL ALCOHOL	0.1	.1	0.01	325 AL	15	2.3E-11
						0.01	325 WHC	2562	4.0E-09
						0.01	325 PNL	1573	2.5E-09
						0.01	327	13	2.0E-11
164	MERCURIC THIOCYANATE	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.01	222 S	309	4.8E-11
165	METHANOL	0.01	CARBON TETRACHLORIDE	0.01	0.1	0.01	PFP LAB	5000	7.8E-10
						0.01	325 AL	15	2.3E-12
						0.01	327	13	2.0E-12
166	METHANOL	0.01	HYDROGEN PEROXIDE	0.01	1	0.01	PFP LAB	5000	7.8E-09
						0.01	325 AL	15	2.3E-11
						0.01	327	13	2.0E-11
167	METHANOL	0.01	OXIDIZING AGENTS	0.1	0.01	0.01	PFP LAB	5000	7.8E-10

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
						0.01	325 AL	15	2.3E-12
						0.01	325 WHC	2562	4.0E-10
						0.01	325 PNL	1573	2.5E-0110
						0.01	327	13	2.0E-12
168	METHANOL	0.01	REDUCING AGENTS	0.1	0.01	0.01	PFP LAB	5000	7.8E-10
						0.01	325 AL	15	2.3E-12
						0.01	325 WHC	2562	4.0E-10
						0.01	325 PNL	1573	2.5E-0110
						0.01	327	13	2.0E-12
169	METHYL ETHYL KETONE	0.01	OXIDIZING AGENTS	0.1	.01	0.01	222 S	309	4.8E-11
						0.01	327	13	2.0E-12
170	METHYL ETHYL KETONE	0.01	STRONG REDUCING AGENTS	0.1	.01	0.01	222 S	309	4.8E-11
						0.01	327	13	2.0E-12
171	METHYL ETHYL KETONE	0.01	HYDROGEN PEROXIDE/ NITRIC ACID	0.001	0.1	0.01	222 S	309	4.8E-11
						0.01	327	13	2.0E-12
172	METHYL ISOBUTYL KETONE	0.01	OXIDIZING AGENTS	0.1	0.01	0.01	222 S	309	4.8E-11
173	METHYL ISOBUTYL KETONE	0.01	REDUCING AGENTS	0.1	0.01	0.01	222 S	309	4.8E-11
174	METHYL ISOBUTYL KETONE	0.01	STRONG BASES	0.1	0.01	0.01	222 S	309	4.8E-11
175	MOLYBDENUM	0.01	STRONG OXIDIZING AGENTS	0.1	0.1	0.1	PFP	20831	3.2E-06
						0.01	324 CE	16	2.5E-11
						0.01	325 WHC	2562	4.0E-09
						0.01	327	13	2.0E-11
176	MOLYBDENUM	0.01	NITRIC ACID	0.1	-0.01	0.1	PFP	20831	3.2E-07
						0.01	324 CE	16	2.5E-12
						0.01	325 WHC	2562	4.0E-10
						0.01	327	13	2.0E-12
177	MOLYBDENUM	0.01	SULFURIC ACID	0.1	0.01	0.01	325 WHC	2562	4.0E-10
						0.01	327	13	2.0E-12

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
178	MORPHOLINE	0.01	ACIDS	0.1	0.01	0.1	N-REACTOR	38	5.9E-10
179	MORPHOLINE	0.01	OXIDIZING AGENTS	0.1	0.01	0.1	N-REACTOR	38	5.9E-10
180	NAPTHYLAMINE	0.01	ACIDS	0.1	0.01	0.01	PFP LAB	5000	7.8E-10
181	NAPTHYLAMINE	0.01	OXIDIZING AGENTS	0.1	0.01	0.01	PFP LAB	5000	7.8E-10
182	NICKEL	0.01	ACIDS	0.1	.1	0.01	327	13	2.0E-11
183	NICKEL	0.01	OXIDIZING AGENTS	0.1	0.1	0.01	327	13	2.0E-11
184	NICKEL NITRATE	0.01	ORGANIC MATERIAL	0.1	1	0.01	324 CE	16	2.5E-11
185	NICKEL SULFATE	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.1	TANK FARMS	57	8.9E-10
186	NIRILOTRIACETIC ACID	0.01	OXIDIZING AGENTS	0.1	0.01	0.01	325 PNL	1573	2.5E-08
187	NITROUS ACID	0.01	ORGANIC MATERIAL	0.1	1	0.01	325 WHC	2562	4.0E-08
188	NORMAL PARAFFIN HYDROCARBONS	0.10	STRONG OXIDIZING AGENTS	0.1	0.01	0.1	PUREX	2397	3.7E-07
						0.01	222 S	309	4.8E-10
						0.01	325 WHC	2562	4.0E-09
						0.01	325 PNL	1573	2.5E-09
189	NORMAL PARAFFIN HYDROCARBONS	0.10	BASES	0.1	.01	0.1	PUREX	2397	3.7E-07
						0.01	222 S	309	4.8E-10
						0.01	325 WHC	2562	4.0E-09
						0.01	325 PNL	1573	2.5E-09
190	NORMAL PARAFFIN HYDROCARBONS	0.10	AMINES	0.01	1	0.01	222 S	309	4.8E-09
191	O-PHENATHROLINE	0.01	STRONG OXIDIZERS	0.1	0.01	0.01	222 S	309	4.8E-11
192	O-PHENATHROLINE	0.01	STRONG ACIDS	0.1	0.01	0.01	222 S	309	4.8E-11
193	OXALIC ACID	0.01	BASES	0.1	0.01	0.1	PUREX	2397	3.7E-08
						0.1	T-PLANT	34	5.3E-10
						0.1	PFP	20831	3.2E-07
						0.01	324 CE	16	2.5E-11
						0.01	325 AL	15	2.3E-11
						0.01	327	13	2.0E-11
194	OXALIC ACID	0.01	ACID CHLORIDES	0.01	0.01	0.1	PFP	20831	3.2E-08

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
						0.01	325 AL	15	2.3E-13
195	OXALIC ACID	0.01	SILVER	0.01	1	0.01	325 PNL	1573	2.5E-09
						0.01	327	13	2.0E-11
196	PENTASODIUM DIETHYLENE TRIAMINE PENTA ACETATE (DPTA)	0.01	OXIDIZING AGENTS	0.1	0.01	0.1	TANK FARMS	57	8.9E-10
						0.01	325 PNL	1573	2.5E-08
			BASES	0.1		0.1	TANK FARMS	57	8.9E-10
						0.01	325 PNL	1573	2.5E-10
197	PERCHLORIC ACID	0.01	CARBONACEOUS MATERIAL	0.1	1	0.1	PUREX	2397	3.7E-06
						0.01	325 AL	15	2.3E-10
198	PERCHLORIC ACID	0.01	CELLULOSE	0.1	1	0.1	PUREX	2397	3.7E-06
						0.01	325 AL	15	2.3E-10
199	PHOSPHORIC ACID	0.01	STRONG BASES	0.1	0.1	0.1	PUREX	2397	3.7E-07
						0.1	T-PLANT	34	5.3E-09
						0.1	N- REACTOR	38	5.9E-09
						0.1	PFP	20831	3.2E-06
						0.01	324 CE	16	2.5E-11
						0.01	325 AL	15	2.3E-11
						0.01	325 WHC	2562	4.0E-09
200	PHOSPHORIC ACID	0.01	FINELY POWDERED METALS	0.01	0.01	0.1	PUREX	2397	3.7E-09
						0.1	T-PLANT	34	5.3E-11
						0.1	N- REACTOR	38	5.9E-11
						0.1	PFP	20831	3.2E-08
						0.01	324 CE	16	2.5E-13
						0.01	325 AL	15	2.3E-13
						0.01	325 WHC	2562	4.0E-09
201	PHOSPHORUS PENTOXIDE	0.01	WATER	0.1	0.1	0.1	PUREX	2397	3.7E-07
						0.01	325 WHC	2562	4.0E-09
202	PHOSPHORUS PENTOXIDE	0.01	REDUCING MATERIALS	0.1	0.1	0.1	PUREX	2397	3.7E-07
						0.01	325 WHC	2562	4.0E-09

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
203	PLATINUM	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.01	325 PNL	1573	2.5E-10
						0.01	327	13	2.0E-12
204	POTASSIUM ACETATE	0.01	OXIDIZING AGENTS	0.1	0.01	0.01	PFP LAB	5000	7.8E-10
205	POTASSIUM BICARBONATE	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.01	325 WHC	2562	4.0E-10
206	POTASSIUM BICARBONATE	0.01	STRONG ACIDS	0.1	0.01	0.01	325 WHC	2562	4.0E-10
207	POTASSIUM CARBONATE	0.01	OXIDIZING AGENTS	0.1	0.01	0.1	PFP	20831	3.2E-07
						0.01	325 WHC	2562	4.0E-10
208	POTASSIUM CARBONATE	0.01	ACIDS	0.1	0.01	0.1	PFP	20831	3.2E-7
						0.01	325 WHC	2562	4.0E-10
209	POTASSIUM DICHROMATE	0.01	HYDRAZINE	0.01	1	0.01	PFP LAB	5000	7.8E-09
						0.01	325 WHC	2562	4.0E-09
210	POTASSIUM DICHROMATE	0.01	IRON	0.1	1	0.01	325 WHC	2562	4.0E-08
211	POTASSIUM FLUORIDE	0.01	STRONG ACIDS	0.1	0.01	0.1	PUREX	2397	3.7E-08
						0.01	222 S	309	4.8E-10
						0.1	T-PLANT	34	5.3E-10
212	POTASSIUM HYDROXIDE	0.01	ALUMINUM	0.01	0.1	0.1	T-PLANT	34	5.3E-10
						0.01	327	13	2.0E-12
213	POTASSIUM HYDROXIDE	0.10	ORGANIC MATERIALS	0.1	0.1	0.1	PUREX	2397	3.7E-06
						0.1	T-PLANT	34	5.3E-08
						0.01	325 AL	15	2.3E-10
						0.01	327	13	2.0E-10
214	POTASSIUM HYDROXIDE	0.10	ACID CHLORIDES	0.01	0.01	0.1	PUREX	2397	3.7E-08
						0.01	325 AL	15	2.3E-12
215	POTASSIUM HYDROXIDE	0.10	ACID ANHYDRIDES	0.1	0.01	0.1	PUREX	2397	3.7E-7
						0.1	T-PLANT	34	5.3E-09
						0.01	325 AL	15	2.3E-11
						0.01	327	13	2.0E-11
216	POTASSIUM OXALATE	0.01	OXIDIZING AGENTS	0.1	0.01	0.01	PUREX LAB	1484	2.3E-10

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
						0.01	222 S	309	4.8E-11
217	POTASSIUM PERMANGAMATE	0.01	WOOD	0.1	0.01	0.1	PUREX	2397	3.7E-08
						0.01	PUREX LAB	1484	2.3E-10
						0.01	222 S	309	4.8E-11
						0.1	T-PLANT	34	5.3E-10
						0.1	PFP	20831	3.2E-07
						0.1	N- REACTOR	38	5.9E-10
						0.01	PFP LAB	5000	7.8E-10
						0.1	TANK FARMS	57	8.9E-10
						0.01	324 CE	16	2.5E-12
						0.01	325 AL	15	2.3E-12
						0.01	325 WHC	2562	4.0E-10
						0.01	325 PNL	1573	2.5E-10
						0.01	327	13	2.0E-12
218	S-DIPHENYL CARBAZIDE	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.01	222 S	309	4.8E-11
219	SILICON	0.01	STRONG ACIDS	0.1	0.01	0.1	PUREX	2397	3.7E-08
						0.1	T-PLANT	34	5.3E-10
220	SILVER	0.01	STRONG ACIDS	0.1	0.01	0.01	327	13	2.0E-12
221	SILVER	0.01	STRONG BASES			0.01	327	13	2.0E-12
222	POTASSIUM PERMANGAMATE	0.01	SILVER	0.01	1	0.01	327	13	2.0E-11
223	SILVER NITRATE	0.01	AMMONIA	0.01	1	0.01	325 AL	15	2.3E-11
						0.01	325 WHC	2562	4.0E-09
224	SILVER NITRATE	0.01	ETHANOL	0.01	0.01	0.01	325 AL	15	2.3E-13
						0.01	325 WHC	2562	4.0E-11
225	SILVER NITRATE	0.01	ORGANICS	0.1	0.01	0.1	PUREX	2397	3.7E-8
						0.01	PUREX LAB	1484	2.3E-10
						0.01	325 AL	15	2.3E-12
						0.01	325 WHC	2562	4.0E-10
226	SILVER OXIDE	0.01	OXIDIZERS	0.1	0.01	0.1	PFP	20831	3.2E-07
227	SODIUM BISMUTHATE	0.01	ACIDS	0.1	0.01	0.1	T-PLANT	34	5.3E-10

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
228	SODIUM BISULFATE	0.01	STRONG BASES	0.1	0.01	0.01	PUREX LAB	1484	2.3E-10
						0.1	T-PLANT	34	5.3E-10
						0.1	PFP	20831	3.2E-07
						0.01	PFP LAB	5000	7.8E-10
						0.1	TANK FARMS	57	8.9E-10
						0.01	325 WHC	2562	4.0E-10
229	SODIUM BISULFATE	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.01	PUREX LAB	1483	2.3E-10
						0.1	T-PLANT	34	5.3E-10
						0.1	PFP	20831	3.2E-07
						0.01	PFP LAB	5000	7.8E-10
						0.1	TANK FARMS	57	8.9E-10
						0.01	325 WHC	2562	4.0E-10
230	SODIUM BROMATE	0.01	STRONG REDUCING AGENTS	0.1	0.01	0.1	PUREX	2397	3.7E-08
231	SODIUM BROMATE	0.01	FINELY POWDERED METALS	0.01	0.1	0.1	PUREX	2397	3.7E-08
232	SODIUM BROMATE	0.01	STRONG ACIDS	0.1	0.01	0.1	PUREX	2397	3.7E-08
233	SODIUM BROMATE	0.01	ORGANIC MATTER	0.1	0.1	0.1	PUREX	2397	3.7E-07
234	SODIUM CARBONATE	0.01	STRONG ACIDS	0.1	0.01	0.1	PUREX	2397	3.7E-08
						0.01	PUREX LAB	1484	2.7E-10
						0.1	T-PLANT	34	5.3E-10
						0.1	PFP	20831	3.2E-07
						0.1	TANK FARMS	57	8.9E-10
						0.01	324 CE	16	2.5E-12
						0.01	325 AL	15	2.3E-12
						0.01	325 WHC	2562	4.0E-10
235	SODIUM CARBONATE	0.01	ALUMINUM	0.01	0.1	0.1	PUREX	2397	3.7E-08
						0.1	T-PLANT	34	5.3E-10
						0.1	PFP	20831	3.2E-07
						0.01	325 WHC	2562	4.0E-10
236	SODIUM DICHROMATE	0.01	STRONG REDUCING AGENTS	0.1	1	0.01	222 S	309	4.8E-09

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
						0.1	T-PLANT	34	5.3E-08
						0.01	325 WHC	2562	4.0E-08
						0.01	325 PNL	1573	2.5E-08
237	SODIUM DICHROMATE	0.01	ALCOHOLS	0.01	0.01	0.01	325 WHC	2562	4.0E-11
						0.01	325 PNL	1573	2.53-11
238	SODIUM FLUORIDE	0.01	STRONG ACIDS	0.1	0.01	0.1	PUREX	2397	3.7E-08
						0.01	PUREX LAB	1484	2.3E-10
						0.01	222 S	309	4.8E-11
						0.1	T-PLANT	34	5.3E-10
						0.1	PFP	20831	3.2E-07
						0.1	N- REACTOR	38	5.9E-10
						0.01	PFP LAB	5000	7.8E-10
						0.1	TANK FARMS	57	8.9E-10
						0.01	324 CE	16	2.5E-12
						0.01	325 PNL	1573	2.5E-10
						0.01	325 AL	15	2.3E-12
						0.01	325 WHC	2562	4.0E-10
						0.01	327	13	2.0E-12
						0.01	340	117	11
239	SODIUM IODIDE	0.01	STRONG ACIDS	0.1	0.01	0.01	325 WHC	2562	4.100E-
240	SODIUM HYPOCHLORITE	0.01	STRONG ACIDS	0.1	.1	0.01	325 WHC	2562	4.0E10-
241	SODIUM NITRATE	0.01	STRONG REDUCING AGENTS	0.1	0.01	0.1	PUREX	2397	3.7E-08
						0.01	PUREX LAB	1484	2.3E-10
						0.1	PFP	20831	3.2E-07
						0.01	PFP LAB	5000	7.8E-10
						0.1	TANK FARMS	57	8.9E-10
						0.01	324 CE	16	2.5E-12
						0.01	325 WHC	2562	4.0E-10
						0.01	325 PNL	1573	2.5E-10
242	SODIUM NITRITE	0.01	FINELY POWDERED METALS	0.01	0.01	0.1	PUREX	2397	3.7E-09
						0.01	PUREX LAB	1484	2.3E-11

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
						0.1	PFP	20831	3.2E-08
						0.01	325 PNL	1573	2.5E-11
243	SODIUM NITRATE	0.01	STRONG ACIDS	0.1	0.1	0.1	PUREX	2397	3.7E-07
						0.01	PUREX LAB	1484	2.3E-09
						0.1	T-PLANT	34	5.3E-08
						0.1	PFP	20831	3.2E-06
						0.01	PFP LAB	5000	7.8E-09
						0.1	TANK FARMS	57	8.9E-09
						0.01	324 CE	16	2.5E-11
						0.01	325 AL	15	2.3E-11
244	SODIUM NITRATE	0.01	ALUMINUM/ OXIDANT	0.001	0.1	0.1	PUREX	2397	3.7E-08
						0.1	T-PLANT	34	5.3E-10
						0.1	PFP	20831	3.2E-07
						0.01	325 WHC	2562	4.0E-08
						0.01	325 PNL	1573	2.5E-08
245	SODIUM NITRITE	0.01	STRONG REDUCING AGENTS	0.1	0.01	0.1	PUREX	2397	3.7E-08
						0.01	222 S	309	4.8E-11
						0.1	T-PLANT	34	5.3E-10
						0.1	N-REACTOR	38	5.9E-10
						0.01	PFP LAB	5000	7.9E-10
						0.01	325 WHC	2562	4.0E-10
246	SODIUM NITRITE	0.01	FINELY POWDERED METALS	0.01	0.01	0.1	PUREX	2397	3.7E-09
						0.01	222 S	309	4.8E-12
						0.1	T-PLANT	34	5.3E-13
						0.1	N-REACTOR	38	5.9E-13
						0.01	PFP LAB	5000	7.9E-11
						0.01	325 WHC	2562	4.0E-11
247	SODIUM OXALATE	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.01	PFP LAB	5000	7.8E-10
						0.01	325 WHC	2562	4.0E-10
248	SODIUM PHOSPHATE	0.01	STRONG ACIDS	0.1	0.01	0.01	324 CE	16	2.5E-12

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
						0.01	325 WHC	2562	4.0E-10
						0.01	325 PNL	1573	2.5E-10
						0.01	327	13	2.0E-12
249	SODIUM SULFATE	0.01	STRONG ACIDS	0.1	0.01	0.01	325 WHC	2562	4.0E-10
						0.01	325 PNL	1573	2.5E-10
250	SODIUM SULFATE	0.01	ALUMINUM	0.01	0.1	0.01	325 WHC	2562	4.0E-10
251	SODIUM SULFIDE	0.01	ACIDS	0.1	0.01	0.1	TANK FARMS	57	8.9E-10
252	SODIUM SULFIDE	0.01	OXIDIZING AGENTS	0.1	0.01	0.1	TANK FARMS	57	8.9E-10
253	SODIUM TARTRATE	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.01	PFP LAB	5000	7.8E-10
254	SODIUM THIOSULFATE	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.1	PUREX	2397	3.7E-08
						0.1	T-PLANT	34	5.3E-10
255	SODIUM THIOSULFATE	0.01	STRONG ACIDS	0.1	0.01	0.1	PUREX	2397	3.7E-08
						0.1	T-PLANT	34	5.3E-10
256	STRONTIUM NITRATE	0.01	STRONG REDUCING AGENTS	0.1	0.1	0.01	325 AL	15	2.3E-11
						0.01	325 WHC	2562	4.0E-09
						0.01	325 PNL	1573	2.5E-09
257	STRONTIUM NITRATE	0.01	STRONG ACIDS	0.1	0.1	0.01	324 CE	16	2.5E-11
						0.01	325 AL	15	2.3E-11
						0.01	325 WHC	2562	4.0E-09
						0.01	325 PNL	1573	2.5E-09
258	STRONTIUM NITRATE	0.01	ALUMINUM POWDER/WATER	0.001	0.1	0.01	325 WHC	2562	4.0E-08
259	SUGAR	0.01	STRONG OXIDIZING AGENTS	0.1	0.1	0.1	PUREX	2397	3.7E-07
						0.01	325 WHC	2562	4.0E-09
260	SULFAMIC ACID	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.1	PUREX	2397	3.7E-08
						0.1	PFP	20831	3.2E-07
						0.01	PFP LAB	5000	7.8E-10
						0.01	324 CE	16	2.5E-12
261	SULFAMIC ACID	0.01	STRONG BASES	0.1	0.01	0.1	PUREX	2397	3.7E-08
						0.1	PFP	20831	3.2E-07

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
						0.01	PFP LAB	5000	7.8E-10
						0.01	324 CE	16	2.5E-12
262	SULFONIC ACID	0.01	ACIDS	0.1	0.01	0.01	PFP LAB	5000	7.8E-10
263	SULFONIC ACID	0.01	BASES	0.1	0.01	0.01	PFP LAB	5000	7.8E-10
264	SULFONIC ACID	0.01	ALCOHOLS	0.01	0.01	0.01	PFP LAB	5000	7.8E-11
265	SULFONIC ACID	0.01	METALS	0.1	0.1	0.01	PFP LAB	5000	7.8E-09
266	SULFONIC ACID	0.01	AMINES	0.01	0.01	0.01	PFP LAB	5000	7.8E-11
267	SULFONIC ACID	0.01	WATER	0.1	0.1	0.01	PFP LAB	5000	7.83-09
268	SULFURIC ACID	0.10	BASES	0.1	0.01	0.1	PUREX	2397	3.7E-07
						0.01	PUREX LAB	1484	2.3E-09
						0.01	222 S	309	4.8E-10
						0.1	T-PLANT	34	5.3E-09
						0.01	PFP LAB	5000	7.8E-09
						0.01	325 AL	15	2.3E-11
						0.01	325 WHC	2562	4.0E-09
						0.01	325 PNL	1573	2.5E-09
						0.01	327	13	2.0E-11
269	SULFURIC ACID	0.10	HALIDES	0.01	0.1	0.1	PUREX	2397	3.7E-07
						0.01	PUREX LAB	1484	2.3E-09
						0.01	222 S	309	4.8E-10
						0.1	T-PLANT	34	5.3E-09
						0.01	PFP LAB	5000	7.8E-09
						0.01	325 AL	15	2.3E-09
						0.01	325 WHC	2562	4.0E-09
						0.01	325 PNL	1573	2.5E-09
270	SULFURIC ACID	0.10	METALS	0.1	0.1	0.1	PUREX	2397	3.7E-06
						0.01	PUREX LAB	1484	2.3E-06
						0.01	222 S	309	4.8E-07
						0.1	T-PLANT	34	5.3E-08
						0.01	PFP LAB	5000	7.8E-06
						0.01	325 AL	15	2.3E-08

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
						0.01	325 WHC	2562	4.0E-06
						0.01	327	13	2.0E-=08
271	SULFURIC ACID	0.10	WATER	0.1	0.01	0.1	PUREX	2397	3.7E-07
						0.01	PUREX LAB	1484	2.3E-09
						0.01	222 S	309	4.8E-08
						0.1	T-PLANT	34	5.3E-09
						0.01	PFP LAB	5000	7.8E-09
						0.01	325 AL	15	2.3E-11
						0.01	325 WHC	2562	4.0E-09
						0.01	325 PNL	1573	2.5E-09
						0.01	327	13	2.0E-11
272	TANTALUM	0.001	STRONG BASES	0.1	0.1	0.01	327	13	2.0E-10
273	TANTALUM	0.001	HYDROGEN FLUORIDE	0.01	0.1	0.01	327	13	2.0E-13
274	TETRASODIUM ETHYLENE DIAMINE TETRAACETATE (EDTA)	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.01	325 AL	15	2.3E-12
						0.01	325 WHC	2562	4.0E-10
						0.01	325 PNL	1573	2.5E-10
275	TETRASODIUM ETHYLEN DIAMINE TETRAACETATE (EDTA)	0.01	STRONG BASES	0.1	0.01	0.01	325 AL	15	2.3E-12
						0.01	325 WHC	2562	4.0E-10
						0.01	325 PNL	1573	2.5E-10
276	TETRABROMO- ETHANE	0.01	STRONG BASES	0.1	0.01	0.01	222 S	309	4.8E-11
277	TETRABROMETHANE	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.01	222 S	309	4.8E-11
278	THENOYL TRIFLUROACETONE	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.1	PUREX	2397	3.7E-08
						0.01	PFP LAB	5000	7.8E-10
						0.01	325 AL	15	2.3E-12
						0.01	222 S	309	4.8E-11
279	THYMOLPTHALEIN	0.001	STRONG OXIDIZING AGENTS	0.1	0.01	0.01	PFP LAB	5000	7.8E-11
280	TITANIUM CHLORIDE	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.01	222 S	309	4.8E-11

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
281	TOLUENE	0.01	OXIDIZING AGENTS	0.1	0.1	0.01	PFP LAB	5000	7.8E-09
						0.01	327	13	2.0E-11
282	TRIBUTYL PHOSPHATE	0.10	STRONG OXIDIZING AGENTS	0.1	0.1	0.01	PFP LAB	5000	7.8E-08
						0.01	325 AL	15	2.3E-10
						0.01	325 WHC	2562	4.0E-08
						0.01	325 PNL	1573	2.5E-08
						0.01	222 S	309	4.8E-09
						0.01	PUREX	2397	3.7E-08
						0.1	PFP	20831	3.2E-05
283	TRIBUTYL PHOSPHATE	0.10	STRONG BASES	0.1	0.01	0.01	PFP LAB	5000	7.8E-09
						0.01	325 AL	15	2.3E-11
						0.01	325 WHC	2562	4.0E-07
						0.01	325 PNL	1573	2.5E-07
						0.01	222 S	309	4.8E-10
						0.1	PUREX	2397	3.7E-07
						0.1	PFP	20831	3.2E-06
284	TRICHLOROETHANE	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.1	T-PLANT	34	5.3E-10
						0.01	325 AL	15	2.3E-12
						0.01	327	13	2.0E-12
						0.1	PUREX	2397	3.7E-10
285	TRI-N-DODECYLAMINE	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.1	T-PLANT	34	5.3E-10
						0.01	325 AL	15	2.3E-12
						0.01	327	13	2.0E-12
						0.1	PUREX	2397	3.7E-08
286	TRI-ISO-OCTYLAMINE	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.01	PFP LAB	5000	7.8E-10
						0.01	222 S	309	4.8E-11
287	TRI-N OCTYLAMENE	0.01	ACIDS	0.1		0.01	325 AL	15	2.3E-12
						0.01	222 S	309	4.8E-11
288	TRI-N-OCTYLAMENE	0.01	ACID CHLORIDES	0.01		0.01	325 AL	15	2.3E-12

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
						0.01	222 S	309	4.8E-11
289	TRI-N-OCTYLAMENE	0.01	ACID ANHYDRIDES	0.1		0.01	325 AL	15	2.3E-12
						0.01	222 S	309	4.8E-11
290	TRI-N-OCTYLAMENE	0.01	OXIDIZING AGENTS	0.1		0.01	325 AL	15	2.3E-12
						0.01	222 S	309	4.8E-11
291	TRIS (HYDR-OXYLMETHYL) AMINO METHANE	0.01	BASES			0.01	PFP LAB	5000	7.8E-10
292	TRIS (HYDR-OXYLMETHYL) AMINO METHANE BASES	0.01	OXIDIZING AGENTS	0.1	0.01	0.01	PFP LAB	5000	7.8E-10
293	TRISODIUM HYDROXYETHYL-ETHYLENE DIAMINE TRIACETATE (HEDTA)	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.01	325 PNL	1573	2.5E-10
294	UREA	0.01	OXIDIZING AGENTS	0.1	0.1	0.01	325 WHC	2562	4.0E-09
295	VANADIUM	0.01	STRONG ACIDS	0.1	0.01	0.01	325 WHC	2562	4.0E-10
296	VANADIUM	0.01	STRONG OXIDIZING AGENTS	0.1	0.01	0.01	325 WHC	2562	4.0E-10
297	XYLENE	0.01	OXIDIZERS	0.1	0.01	0.01	222 S	309	4.8E-11
						0.01	PFP LAB	5000	7.8E-10
						0.01	325 AL	15	2.3E-12
						0.01	327	13	2.0E-12
298	YTTRIUM NITRATE	0.01	OXIDIZERS	0.1		0.01	325 PNL	1573	2.5E-09
299	ZINC NITRATE	0.01	STRONG REDUCING AGENTS	0.1	0.01	0.01	325 WHC	2562	4.0E-10
						0.01	325 PNL	1573	2.5E-10
300	ZINC NITRATE	0.01	ALUMINUM/ WATER	0.001	0.1	0.01	325 WHC	2562	4.0E-10
301	ZIRCONIUM	0.01	SODIUM HYDROXIDE	0.1	0.1	0.01	327	13	2.0E-11
					-	0.01	325 WHC	2562	4.0E-09
302	ZIRCONIUM	0.01	POTASSIUM HYDROXIDE	0.1	0.1	0.01	327	13	2.0E-11
303	ZIRCONIUM	0.01	SODIUM DICHROMATE	0.01	1	0.01	325 WHC	2562	4.0E-09
304	ZIRCONIUM	0.01	POTASSIUM DICHROMATE	0.01	1	0.01	325 WHC	2562	4.0E-09
305	ZIRCONIUM	0.01	CARBON TETRACHLORIDE	0.01	1	0.01	327	13	2.0E-11
315	ZIRCONYL NITRATE	0.01	STRONG ACIDS	0.1		0.1	T-PLANT	34	5.3E-09

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TABLE 4
PROBABILITY OF ADVERSE CHEMICAL REACTION

No.	Compound	Prob/ Drum	Compound	Prob/ Drum	Haz. Indx	Quant. Indx	Facility	# of Drums	Probab. of Reaction
						0.01	325 AL	15	2.3E-11
316	ZIRCONYL NITRATE	0.01	ALUMINUM POWDER/WATER	0.001		0.01	325 AL	15	2.3E-10

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APPENDIX F CONSEQUENCES OF EXPLOSIONS

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Table 5
Conditions of Failure of Peak Overpressure-Sensitive Elements

Structural Element	Failure mode	Approximate Incident Blast Overpressure (lb/in^2)
Glass windows, large and small	Shattering usuallly, occasional frame failure	0.5-1
Corrugated asbestos siding	Shattering	1-2
Corrugated steel or aluminum paneling	Connection failure followed by buckling	1-2
Wood siding panels, standard house construction	Usually failure occurs in main connections allowing a whole panel to be blown in	1-2
Concrete or cinder-block wall panels 8 in or 12 in thick (not reinforced	Shattering of the wall	2-3
Self-framing steel panel building	Collapse	3-4
Oil storage tanks	Rupture	3-4
Wooden utility poles	Snapping failure	5
Loaded rail cars	Overturning	7
Brick wall panel, 8 in. or 12 in thick (not reinforced)	Shattering and flexure failures	7-8

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Table 6
Physiological Effects of Blast Waves

Physiological Effect	Peak Overpressure (lb/in^2)
Knock personnel down	1
Eardrum rupture	5
Lung damage	15
Threshold for fatalities	35
50% fatalities	50
99% fatalities	65

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DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	J. M. Siemer	Date June 2, 1993
Project Title/Work Order		EDT No. 152227
Probability of an Explosion in WRAP-1 Gloveboxes		ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
D. E. Ball	G6-46				
G. F. Boothe (3)	G6-46				
B. J. Broomfield	N3-13				
W. R. Brown	H6-30				
E. T. Coenenbert (2)	H6-25				
J. P. Estrellado	H4-70				
J. P. Hinckley	H4-66				
R. D. Lichfield	L6-30				
D. R. Lucas	G6-46				
R. L. Martin	R3-20				
B. A. Mayancsik	H5-33				
M. M. McCarthy	N3-13				
J. R. McGee	G6-46				
W. W. Olson	H4-70				
R. D. Pierce	N3-13				
J. G. Riddelle	H5-33				
R. J. Roberts	N3-13				
J. M. Siemer	B4-08				
J. G. Starkey	G6-46				
J. A. Swenson	G6-45				
J. R. Weidert	G6-46				
T. L. Yount	H1-60				
WRAP/DMC (5)	G6-51				
~~CORRESPONDENCE CONTROL~~	~~A3-01~~				
CENTRAL FILES	L8-04				

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