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of Transportation

**Federal Railroad
Administration**

Hazardous Materials Car Placement In A Train Consist

**Office of Research and
Development
Washington, DC 20590**

Volume I | Appendices

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DOT/FRA/ORD-92/18.II

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Final Report

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15. Supplementary Notes

16. Abstract

In response to major derailments involving hazardous materials cars, the Federal Railroad Administration (FRA) initiated this review of the consequences of hazardous materials car placement in a train consist. The review and analysis consisted of six task items: (1) review of accident trends and regulations, (2) an analysis of hazardous materials compatibility, (3) railroad operational constraints, (4) a cost/benefit analysis, (5) recommendations, and (6) preparation of a final report.

A review of the 1982-1985 Railroad Accident/Incident Reporting System (RAIRS) data showed the rear quarter to be statistically the "safest" location in a mainline freight train. Analysis confirmed that the longer the train, or the higher the speed, the more cars derailed on the average. Also, the top 101 hazardous commodities (by volume movement) plus fuming nitric acid were analyzed for chemical incompatibility, a total of 5,151 binary combinations. Of these, 1,210 combinations were judged incompatible. Combinations involving non-oxidizing mineral acids (ASTM Chemical Reactivity Group 1), oxidizing mineral acids (Group 2) and caustics (Group 10) dominate the list of incompatible chemicals. Consequence-based and risk-based rankings were established. Calculations established a post-derailment separation distance of 40 meters minimum to prevent mixing of incompatible chemicals. This can be accomplished by a conservative (worst-case) in-train separation by 30 cars for incompatible hazmat cargos, although a 15-car separation may accomplish this for most accident scenarios. It was noted that mixing of hazmat materials was not cited in any NTSB accident report as a specific problem.

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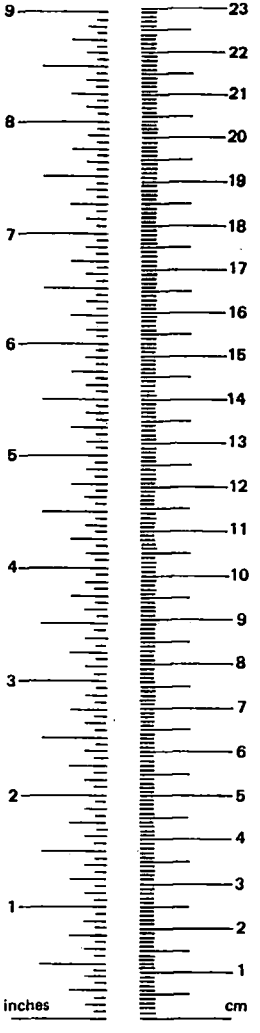
Unclassified	Unclassified	271	

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

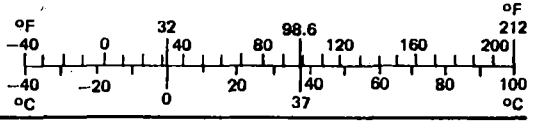
Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
TEMPERATURE (exact)				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in. = 2.54 cm (exactly). For other exact conversions and more detail tables see NBS Misc. Publ. 286, Units of Weight and Measures. Price $2.25 SD Catalog No. C13 10 286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	36	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
TEMPERATURE (exact)				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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APPENDIX A

FORM FRA F6180-54 (12-74)
RAIL EQUIPMENT ACCIDENT/INCIDENT REPORT

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION

RAIL EQUIPMENT ACCIDENT/INCIDENT REPORT

FORM APPROVED
OMB NO. 04R4008

1. NAME OF REPORTING RAILROAD — Amtrak ☐ Autotrain ☐ | 1a. Alphabetic Code | 1b. Railroad Accident/Incident No.

2. NAME OF OTHER RAILROAD INVOLVED IN TRAIN ACCIDENT/INCIDENT | 2a. Alphabetic Code | 2b. Railroad Accident/Incident No.

3. NAME OF RAILROAD RESPONSIBLE FOR TRACK MAINTENANCE *(single entry)* | 3a. Alphabetic Code | 3b. Railroad Accident/Incident No.

4. U. S. DOT-AAR GRADE CROSSING IDENTIFICATION NUMBER | 5. DATE OF ACCIDENT/INCIDENT — month / day / year | 6. TIME OF ACCIDENT/INCIDENT — am ☐ pm ☐

7. TYPE OF ACCIDENT/INCIDENT *(enter number in code box, single entry)* — CODE

1. Derailment 2. Head on collision 3. Rear end collision 4. Side collision 5. Raking collision 6. Broken train collision 7. Rail-Hwy crossing 8. RR grade crossing 9. Obstruction 10. Explosion-Detonation 11. Fire or violent rupture 12. Other *(specify)*

HAZARDOUS MATERIALS *(number of)*

8. CARS CARRYING	9. CARS DAMAGED OR DERAILED	10. CARS WHICH RELEASED HAZ. MAT.	11. PEOPLE EVACUATED *(est.)*

LOCATION

12. DIVISION	13. NEAREST STATION	14. MILEPOST *(to nearest tenth)*	15. STATE *(two letter code)* CODE

ENVIRONMENTAL CONDITIONS

16. TEMPERATURE *(specify if minus)* °F

17. VISIBILITY *(single entry)* CODE — 1. Dawn 2. Day 3. Dusk 4. Dark

18. WEATHER *(single entry)* CODE — 1. Clear 2. Cloudy 3. Rain 4. Fog 5. Sleet 6. Snow

OPERATIONAL DATA

19. METHOD *(place X in appropriate box(es))*

1 ☐ Manual block 2 ☐ Interlocking 3 ☐ Cab signal 4 ☐ Automatic block 5 ☐ Traffic control 6 ☐ Auto. train stop 7 ☐ Yard rules 8 ☐ Time table 9 ☐ Radio 10 ☐ Auto. train control 11 ☐ Verbal permission 12 ☐ Train orders 13 ☐ Other *(specify)*

20. SPEED *(recorded speed, if available)* Est. ☐ MPH Recorded ☐ | 21. TRAIN NUMBER | 22. TIME TABLE DIRECTION — 1. North 2. South 3. East 4. West — CODE

EQUIPMENT

23. TRAILING TONS *(gross tonnage, excluding power units)*

24. TYPE OF EQUIPMENT CONSIST *(single entry)* CODE — 1. Freight train 2. Passenger train 3. Mixed train 4. Work train 5. Single car 6. Cut of cars 7. Yard/switching 8. Light loco(s)

25. WAS THE EQUIPMENT IDENTIFIED IN ITEM 24 UNATTENDED? CODE — 1. Yes 2. No

26. TRACK NUMBER OR NAME

27. FRA TRACK CLASSIFICATION

28. ANNUAL TRACK DENSITY *(gross tons in millions)*

29. TYPE OF TRACK CODE — 1. Main 2. Yard 3. Siding 4. Industry

30. PRINCIPLE CAR/UNIT	30a. Initial and Number	30b. Position in Train	30c. Loaded *(yes or no)*
(1) First Involved *(derailed, struck, striking, etc.)*			
(2) Causing *(mechanical failures)*			

31. LOCOMOTIVE UNITS *(no. of)*	a. Head End	Mid Train b. Manned	Mid Train c. Remote	Rear End d. Manned	Rear End e. Remote
(1) Total in Train					
(2) Total Derailed					

32. CARS *(no. of)*	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Equipment Consist					
(2) Total Derailed					

PROPERTY DAMAGE *(estimated cost, including labor, to repair or replace)*

33. EQUIPMENT DAMAGE *(to be reported for this equipment consist only)* $

34. TRACK, SIGNAL, WAY AND STRUCTURES DAMAGE *(to be reported by railroad in item 3 only)* $

ACCIDENT/INCIDENT CAUSE CODE

35. PRIMARY CAUSE CODE | 36. CONTRIBUTING CAUSE CODE | 37. If no code available, explain cause.

CASUALTIES

38. NUMBER OF PERSONS INJURED	39. ESTIMATED TOTAL DAYS DISABILITY	40. NUMBER OF FATALITIES

CREW *(no. of)*

41. ENGINEERS	42. FIREMEN	43. CONDUCTORS	44. BRAKEMEN

HOURS ON DUTY

45. ENGINEER	46. CONDUCTOR
Hrs: Mins:	Hrs: Mins:

47. TYPED NAME AND TITLE	48. SIGNATURE	49. DATE

50. NARRATIVE DESCRIPTION – *Describe the cause, nature and circumstances of accident/incident*

FORM FRA F 6180-54 (12-74) REPLACES FORM FRA F 6180-15 (11-72) WHICH IS OBSOLETE

GPO 884-005

APPENDIX B

DATA RELATED TO DERAILMENT ANALYSIS

PLACEMENT OF HAZARDOUS MATERIALS CARS IN TRAIN CONSISTS
SUMMARY ANALYSIS OF DOT/FRA ACCIDENT/INCIDENT (RAIRS) DATA
FOR CALENDAR YEARS 1982 TO 1985
DERAILMENTS OF FREIGHT OR MIXED TRAINS, MAINLINE TRACK, ONLY
"UNITS" DEFINED AS LOCOMOTIVES + CARS + CABOOSE

NUMBER OF DERAILMENTS IN DATA FILE	=	6425
NUMBER OF DERAILMENTS USED IN ANALYSIS	=	5562 *
NUMBER OF TIMES FIRST UNIT FIRST INVOLVED	=	489
TOTAL NUMBER OF UNITS IN CONSISTS	=	451220
AVERAGE LENGTH OF TRAIN	=	81
TOTAL NUMBER OF DERAILED UNITS	=	44823
AVERAGE DERAILED UNITS PER TRAIN	=	8.1
TOTAL NUMBER OF HAZ MAT CARS IN CONSISTS	=	4691
HAZ MAT CARS DAMAGED IN DERAILMENTS	=	1223
HAZ MAT CARS RELEASING IN DERAILMENTS	=	289
TOTAL NUMBER OF PEOPLE EVACUATED	=	23259
NUMBER OF FIRST UNITS DERAILED THAT ARE LOADED	=	3703
EMPTY	=	1859
NUMBER OF CAUSING UNITS THAT ARE LOADED	=	1103
EMPTY	=	400

DERAILMENT ANALYSIS BY TRAIN SPEED --

SPEED (MPH) FROM	TO	NUMBER TRAINS	TOTAL UNITS	AVERAGE LENGTH	DERAILED UNITS	DERAILED UNITS/TRAIN
0	0	70	6388	91	310	4.4
1	10	1766	127951	72	9290	5.3
11	20	1111	89850	80	7022	6.3
21	30	1194	98990	82	10474	8.8
31	40	736	69400	94	8657	11.8
41	50	450	40471	89	5880	13.1
51	60	203	16229	79	2763	13.6
61	70	32	1941	60	427	13.3

ECONOMIC IMPACT --

DAMAGE TO EQUIPMENT, TRAINS WITHOUT HAZMAT	=	390835050
DAMAGE TO TRACK, TRAINS WITHOUT HAZMAT	=	86282755
DAMAGE TO EQUIPMENT, TRAINS WITH HAZMAT	=	78246154
DAMAGE TO TRACK, TRAINS WITH HAZMAT	=	13722037

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*After removal of "bad data" items.

PLACEMENT OF HAZARDOUS MATERIALS CARS IN TRAIN CONSISTS
SUMMARY ANALYSIS OF DOT/FRA ACCIDENT/INCIDENT (RAIRS) DATA
FOR CALENDAR YEARS 1982 TO 1985
DERAILMENTS OF FREIGHT OR MIXED TRAINS, MAINLINE TRACK, ONLY
"UNITS" DEFINED AS LOCOMOTIVES + CARS + CABOOSE

DERAILMENT ANALYSIS BY TRAIN LENGTH:
SHORT TRAINS (LESS THAN 11 LOCOMOTIVES/CARS) --

NUMBER OF DERAILMENTS USED IN ANALYSIS	=	111
TOTAL NUMBER OF UNITS IN CONSISTS	=	812
AVERAGE LENGTH OF TRAIN	=	7
TOTAL NUMBER OF DERAILED UNITS	=	322
AVERAGE DERAILED UNITS PER TRAIN	=	2.9
TRAINS WITH DERAILED/DAMAGED/RELEASING HAZMAT CARS	=	6
NUMBER OF DERAILED HAZMAT CARS	=	14

TRAINS OF 11-50 LOCOMOTIVES/CARS --

NUMBER OF DERAILMENTS USED IN ANALYSIS	=	1188
TOTAL NUMBER OF UNITS IN CONSISTS	=	38861
AVERAGE LENGTH OF TRAIN	=	32
TOTAL NUMBER OF DERAILED UNITS	=	6900
AVERAGE DERAILED UNITS PER TRAIN	=	5.8
TRAINS WITH DERAILED/DAMAGED/RELEASING HAZMAT CARS	=	93
NUMBER OF DERAILED HAZMAT CARS	=	242

ANALYSIS BY THIRDS --

TRAIN 3RD	FIRST UNIT INVOLVED	PER CENT	CAUSING UNIT	TOTAL DERAILED	PER CENT
1	513	43.2	68	2323	33.7
2	352	29.6	68	2563	37.1
3	323	27.2	58	2014	29.2

ANALYSIS BY QUARTERS --

TRAIN 4TH	FIRST UNIT INVOLVED	PER CENT	CAUSING UNIT	TOTAL DERAILED	PER CENT
1	408	34.3	52	1630	23.6
2	291	24.5	55	2070	30.0
3	247	20.8	44	1712	24.8
4	242	20.4	43	1488	21.6

PLACEMENT OF HAZARDOUS MATERIALS CARS IN TRAIN CONSISTS
SUMMARY ANALYSIS OF DOT/FRA ACCIDENT/INCIDENT (RAIRS) DATA
FOR CALENDAR YEARS 1982 TO 1985
DERAILMENTS OF FREIGHT OR MIXED TRAINS, MAINLINE TRACK, ONLY
"UNITS" DEFINED AS LOCOMOTIVES + CARS + CABOOSE

DERAILMENT ANALYSIS BY TRAIN LENGTH:
TRAINS OF 51-100 LOCOMOTIVES/CARS --

NUMBER OF DERAILMENTS USED IN ANALYSIS	=	2468
TOTAL NUMBER OF UNITS IN CONSISTS	=	187722
AVERAGE LENGTH OF TRAIN	=	76
TOTAL NUMBER OF DERAILED UNITS	=	20549
AVERAGE DERAILED UNITS PER TRAIN	=	8.3
TRAINS WITH DERAILED/DAMAGED/RELEASING HAZMAT CARS	=	199
NUMBER OF DERAILED HAZMAT CARS	=	546

ANALYSIS BY THIRDS --

TRAIN 3RD	FIRST UNIT INVOLVED	PER CENT	CAUSING UNIT	TOTAL DERAILED	PER CENT
1	940	38.1	221	6613	32.2
2	816	33.1	260	7876	38.3
3	712	28.8	187	6060	29.5

ANALYSIS BY QUARTERS --

TRAIN 4TH	FIRST UNIT INVOLVED	PER CENT	CAUSING UNIT	TOTAL DERAILED	PER CENT
1	737	29.9	160	4732	23.0
2	593	24.0	186	5843	28.4
3	653	26.5	190	5894	28.7
4	485	19.7	132	4080	19.9

PLACEMENT OF HAZARDOUS MATERIALS CARS IN TRAIN CONSISTS
SUMMARY ANALYSIS OF DOT/FRA ACCIDENT/INCIDENT (RAIRS) DATA
FOR CALENDAR YEARS 1982 TO 1985
DERAILMENTS OF FREIGHT OR MIXED TRAINS, MAINLINE TRACK, ONLY
"UNITS" DEFINED AS LOCOMOTIVES + CARS + CABOOSE

DERAILMENT ANALYSIS BY TRAIN LENGTH:
LONG TRAINS (GREATER THAN 100 LOCOMOTIVES/CARS) --

NUMBER OF DERAILMENTS USED IN ANALYSIS	=	1795
TOTAL NUMBER OF UNITS IN CONSISTS	=	223825
AVERAGE LENGTH OF TRAIN	=	124
TOTAL NUMBER OF DERAILED UNITS	=	17052
AVERAGE DERAILED UNITS PER TRAIN	=	9.5
TRAINS WITH DERAILED/DAMAGED/RELEASING HAZMAT CARS	=	146
NUMBER OF DERAILED HAZMAT CARS	=	421

ANALYSIS BY THIRDS --

TRAIN 3RD	FIRST UNIT INVOLVED	PER CENT	CAUSING UNIT	TOTAL DERAILED	PER CENT
1	710	39.6	266	6011	35.3
2	599	33.4	220	6439	37.8
3	486	27.1	144	4602	27.0

ANALYSIS BY QUARTERS --

TRAIN 4TH	FIRST UNIT INVOLVED	PER CENT	CAUSING UNIT	TOTAL DERAILED	PER CENT
1	545	30.4	197	4583	26.9
2	473	26.4	190	4656	27.3
3	426	23.7	144	4541	26.6
4	351	19.6	99	3272	19.2

PLACEMENT OF HAZARDOUS MATERIALS CARS IN TRAIN CONSISTS
SUMMARY ANALYSIS OF DOT/FRA ACCIDENT/INCIDENT (RAIRS) DATA
FOR CALENDAR YEARS 1982 TO 1985
DERAILMENTS OF FREIGHT OR MIXED TRAINS, MAINLINE TRACK, ONLY
"UNITS" DEFINED AS LOCOMOTIVES + CARS + CABOOSE

DERAILMENT ANALYSIS BY TRAIN LENGTH, A SUMMARY:
ALL TRAINS OVER 10 LOCOMOTIVES/CARS IN LENGTH --

NUMBER OF DERAILMENTS USED IN ANALYSIS	=	5451
TOTAL NUMBER OF UNITS IN CONSISTS	=	450408
AVERAGE LENGTH OF TRAIN	=	82
TOTAL NUMBER OF DERAILED UNITS	=	44501
AVERAGE DERAILED UNITS PER TRAIN	=	8.2
TRAINS WITH DERAILED/DAMAGED/RELEASING HAZMAT CARS	=	438
NUMBER OF DERAILED HAZMAT CARS	=	1209

ANALYSIS BY THIRDS --

TRAIN 3RD	FIRST UNIT INVOLVED	PER CENT	CAUSING UNIT	TOTAL DERAILED	PER CENT
1	2163	39.7	555	14947	33.6
2	1767	32.4	548	16878	37.9
3	1521	27.9	389	12676	28.5

ANALYSIS BY QUARTERS --

TRAIN 4TH	FIRST UNIT INVOLVED	PER CENT	CAUSING UNIT	TOTAL DERAILED	PER CENT
1	1690	31.0	409	10945	24.6
2	1357	24.9	431	12569	28.2
3	1326	24.3	378	12147	27.3
4	1078	19.8	274	8840	19.9

NOTE: THIS SUMMARY IGNORES SHORT TRAINS (< 11 UNITS IN LENGTH)

APPENDIX C

REVIEW OF SELECTED RAILROAD ACCIDENTS INVOLVING MULTIPLE HAZARDOUS MATERIALS

REVIEW OF SELECTED RAILROAD ACCIDENTS INVOLVING MULTIPLE HAZARDOUS MATERIALS

E.R. Zamejc/H. P. Beneke

May 6, 1988

The following examples of train derailment accidents which resulted in hazardous materials mixing were reviewed.:

- NTSB/HZM-87-01 (Miamisburg, Ohio, 7-8-86)
- NTSB/RAR-86-04 (Pine Bluff, Arkansas, 6-9-86)
- NTSB/RAR-83-05 (Livingston, Louisiana, (9-28-82)
- NTSB/HZM-80-01 (Paxton, Texas, 6-8-75)

The review focused on whether or not mixing of the hazardous materials caused or worsened the consequences following the accident--i.e. fire and/or explosions. For the purpose of this analysis the following assumptions were made:

- Only binary combinations of chemicals were evaluated.
- All possible binary combinations were evaluated even though in some cases the tank cars remained intact and, as such, could not have contributed to the consequences. The purpose of this approach is to determine if the situation could have become even worse if the tank car leaked or ruptured.
- The thermal effects of fire on the stability of the chemical in tank cars was considered.

Results of the evaluations are given as follows:

The tank cars of chemicals involved in this derailment and resultant fate are :

- Yellow phosphorus - spilled and burned
- Molten sulfur - spilled and mixed
- Tallow - spilled and mixed

Anticipated binary chemical compatibilities are as follows :

- Yellow phosphorus/molten sulfur - forms P_2S_5 with the generation of heat. P_2S_5 is the chemical used in the tips of friction matches and, as such, can be easily ignited by friction and less likely by heat (autoignition temperature = 527°F). Combustion of P_2S_5 forms toxic and corrosive fumes of SO_2 and P_2O_5.
- Yellow phosphorus/tallow - no reaction expected. Note : tallow is an animal fat containing C_{16} to C_{18}. It is combustible with a flash point of 509°F.
- Molten sulfur/tallow - no reaction expected.

Thus, no incompatible reactions are expected. Other considerations are as follows :

- Yellow phosphorus, by itself, is pyrophoric which indicates it burns spontaneously in air at 86°F or above (no ignition source required). Combustion of yellow phosphorus produces toxic P_2O_5.
- Tallow, because of its high flash point, could have prevented the fire if dumped on top of the phosphorus.
- Based on the observations, tallow was mixed with the molten sulfur but the mixture did not burn. The tallow may have minimized or prevented the molten sulfur from burning and, as such, may have mitigated the consequences.

In conclusion, mixing of the chemicals during this train derailment

did not make matters worse as compared with the consequences of spilling the chemicals without mixing, but rather, may have somewhat mitigated the consequences.

NTSB/RAR-86/04

The tank cars of chemicals involved in this derailment and resultant fate are :

- Vinyl chloride (2 cars) - insulated, remained intact, saved by fire fighters
- Polymethylene polyphenylisocyanate (2 cars) - one car exploded, the other burned in resulting fire
- Polyethylene/polypropylene pellets (4 cars) - burned in fire
- Butyl acrylate (2 cars) - spilled and burned in fire
- Acrylic acid - disposition unknown
- Ethylene oxide - exploded in fire

The polyethylene/polypropylene pellets are chemically inert in that they have no residual reactive groups so incompatible reactions are not possible with the other chemicals involved in the derailment. Other anticipated binary chemical compatibilities are as follows :

- Vinyl chloride/polymethylene polyphenylisocyanate - no reaction expected.
- Vinyl chloride/butyl acrylate - no reaction expected.
- Vinyl chloride/acrylic acid - vinyl chloride would dissolve in acrylic acid which could initiate vigorous polymerization if the mixture is concentrated in either of the components. This would result in the generation of heat (probably insufficient amount to initiate a fire). However, the low boiling point of vinyl chloride (-14°C) reduces the potential risk. This is because in an unconfined (i.e. open) liquid pool, such as would result following a tank rupture, a majority of the vinyl chloride would vaporize

before it could react.

- Vinyl chloride/ethylene oxide - no reaction expected.
- Polymethylene polyphenylisocyanate/butyl acrylate - no reaction expected.
- Polymethylene polyphenylisocyanate/acrylic acid - addition reaction causing generation of some heat (probably insufficient amount to initiate a fire).
- Polymethylene polyphenylisocyanate/ethylene oxide - no reaction expected.
- Butyl acrylate/acrylic acid - butyl acrylate would dissolve in acrylic acid which could initiate polymerization if the mixture is concentrated in either of the components. This would result in the generation of heat (probably insufficient amount to initiate a fire).
- Butyl acrylate/ethylene oxide - no reaction expected.
- Acrylic acid/ethylene oxide - ethylene oxide could dissolve in acrylic acid (or vice versa) which would initiate acid catalyzed polymerization of ethylene oxide (potentially violent). However, the low boiling point of ethylene oxide (11°C) reduces the potential risk. The polymerization reaction would generate heat that may initiate a fire.

Thus, polymerization reactions resulting in the formation of heat may have occurred during the derailment. It is possible that the heat generated from these reactions initiated a fire as well as caused formation of flammable vapors which intensified the fire. For example, ethylene oxide vapors are heavier than air and may flash back to their origin upon ignition from a distant source away from the spill. Other considerations are as follows :

- Polymethylene polyphenylisocyanate is shipped as a 50 wt.% solution of methylene diphenylisocyanate plus 50 wt.% polymer (CHRIS Hazardous Chemical Data). If the tank cars containing this mixture are exposed to excessive heat such as in the case of a fire then violent and rapid polymerization could occur. This could result in

the rupture of the container (i.e. explosion) because the rate of pressure rise exceeds the capability of the relief valve's venting rate. Also, relief valves and other safety venting devices may be initially successful in relieving the over-pressure caused by the polymerization reaction but may become blocked during the course of venting. Blockage may be caused by deposition of reaction products or if the tank car had rolled over onto its side. When blocked, the container is likely to explode especially if exposed to a fire.

- The ethylene oxide explosion was probably caused by a runaway thermal decomposition reaction. Initiation of an ethylene oxide runaway can occur when it is heated to a temperature of 200°C or above in a closed system[1].

In conclusion, mixing of the chemicals during this train derailment may have worsened the consequences as compared with the consequences of spilling the chemicals without mixing. Also, because of the potential for thermal instability of chemicals such as ethylene oxide and polymerizable chemicals when heated in confined containers such as tank cars, segregation of these chemicals from other flammable chemicals in a train should be considered.

NTSB/RAR-83/05

The tank cars of chemicals involved in this derailment and resultant fate are :

- Vinyl chloride (1,241,000 lb) - consumed by fire, one car exploded
- Styrene monomer (176,000 lb) - consumed by fire
- Motor fuel anti-knock compound (75,000 lb) - consumed by fire, one car exploded (Note: this was assumed to be tetraethyl lead.)
- Toluene diisocyanate (23,000 lb) - consumed by fire

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1 "Thermal Stability and Deflagration of Ethylene Oxide" by L.G. Britton, Paper 62d, AIChE Spring National Meeting, New Orleans, March 8, 1988.

- Phosphoric acid (2,100,000 lb) - spilled and adsorbed by ground
- Hydrofluosilicic acid (200,000 lb) - spilled and adsorbed by ground
- Sodium hydroxide (195,000 lb) - spilled and adsorbed by ground
- Perchloroethylene (190,000 lb) - spilled and adsorbed by ground
- Ethylene glycol (194,000 lb) - spilled and adsorbed by ground

The anticipated binary chemical compatibilities are as follows :

- Vinyl chloride/styrene - no reaction expected.
- Vinyl chloride/tetraethyl lead - Tetraethyl lead, as an organometallic compound, could initiate a potentially violent polymerization of vinyl chloride. This would result in the generation of heat (may be sufficient amount to initiate a fire). However, the high volatility of vinyl chloride would minimize the consequences because most of the spilled vinyl chloride would rapidly vaporize when spilled.
- Vinyl chloride/toluene diisocyanate - no reaction expected.
- Vinyl chloride/phosphoric acid - Phosphoric acid could initiate the polymerization of vinyl chloride if an appreciable quantity dissolves in phosphoric acid. Same consequences as in "vinyl chloride/tetraethyl lead" but less likely.
- Vinyl chloride/hydrofluosilicic acid - Same reaction and consequences as in "vinyl chloride/phosphoric acid".
- Vinyl chloride/sodium hydroxide - Violent polymerization could result if the mixture is concentrated in either of the components. This would result in the generation of heat (probably insufficient amount to initiate a fire). The consequences would be minimized by the high volatility of vinyl chloride and low solubility of vinyl chloride in aqueous sodium hydroxide solution.
- Vinyl chloride/perchloroethylene - no reaction expected.
- Vinyl chloride/ethylene glycol - no reaction expected.
- Styrene/tetraethyl lead - Tetraethyl lead, as an organometallic compound, could initiate a potentially violent anionic polymerization of styrene. This would result in the generation of heat (may be sufficient amount to initiate a fire).

- Styrene/toluene diisocyanate - no reaction expected.
- Styrene/phosphoric acid - Phosphoric acid could initiate a potentially violent or explosive cationic polymerization of styrene. A fire may be initiated.
- Styrene/hydrofluosilicic acid - Same reaction and consequences as in "styrene/phosphoric acid".
- Styrene/sodium hydroxide - Violent polymerization could result if the mixture is concentrated in either of the components. This would result in the generation of heat (may be sufficient amount to initiate a fire).
- Styrene/perchloroethylene - no reaction expected.
- Styrene/ethylene glycol - no reaction expected.
- Tetraethyl lead/toluene diisocyanate - no reaction expected.
- Tetraethyl lead/phosphoric acid - potential liberation of ethane gas and resulting fire.
- Tetraethyl lead/hydrofluosilicic acid - Same reaction and consequences as in "tetraethyl lead/phosphoric acid".
- Tetraethyl lead/sodium hydroxide - no reaction expected.
- Tetraethyl lead/perchloroethylene - possible addition reaction or polymerization with the generation of heat.
- Tetraethyl lead/ethylene glycol - no reaction expected.
- Toluene diisocyanate/phosphoric acid - Rapid hydrolysis to the amine if water is present with subsequent reaction with remaining isocyanate functionality. Reaction may be violent.
- Toluene diisocyanate/hydrofluosilicic acid - Same reaction and consequences as in "toluene diisocyanate/phosphoric acid".
- Toluene diisocyanate/sodium hydroxide - nearly explosive hydrolysis of isocyanate functionality and generation of CO_2.
- Toluene diisocyanate/perchloroethylene - no reaction expected.
- Toluene diisocyanate/ethylene glycol - potentially explosive polymerization of both reagents to form polyurethane.
- Phosphoric acid/hydrofluosilicic acid - no reaction expected.
- Phosphoric acid/sodium hydroxide - violent neutralization reaction.
- Phosphoric acid/perchloroethylene - no reaction expected.
- Phosphoric acid/ethylene glycol - exothermic elimination reaction

and probable formation of ethylene oxide (fire hazard).

- Hydrofluosilicic acid/sodium hydroxide - violent neutralization reaction.
- Hydrofluosilicic acid/perchloroethylene - no reaction expected.
- Hydrofluosilicic acid/ethylene glycol - exothermic elimination reaction and probable formation of ethylene oxide (fire hazard).
- Sodium hydroxide/perchloroethylene - potential exothermic addition reaction or polymerization reaction.
- Sodium hydroxide/ethylene glycol - slightly exothermic acid/base reaction.
- Perchloroethylene/ethylene glycol - no reaction expected.

Reactions, some of which are violent, may have occurred during the derailment. The resultant formation of considerable heat and flammable products (i.e. ethane gas) could have contributed to the initiation and intensity of the fire. Other considerations are as follows:

- The explosion of the tank car of tetraethyl lead was probably caused by exposure to the intense fire. Tetraethyl lead begins to decompose above 230°F forming ethane gas (CHRIS Hazardous Chemical Data). If the decomposition reaction occurred rapidly then the relief valves could have been unable to prevent the pressure from exceeding the burst pressure of the tank car (500 psig for DOT Spec. 105A100W). The estimated maximum pressure rise assuming a 34,500 gallon capacity tank car containing 75,000 pounds of 50 weight percent tetraethyl lead in solvents (e.g. ethylene dichloride, ethylene dibromide, and toluene) and assuming complete decomposition of the tetraethyl lead at 230°F is about 745 psig. Relief valves may not be able to prevent the burst pressure from being exceeded because of the rapidity of the decomposition reaction.

- Vinyl chloride could violently and rapidly polymerize when exposed to excessive heat such as in the case of a fire. This could result in the rupture of the container (i.e. explosion) because the rate of pressure rise exceeds the capability of the relief valve's venting rate[2].

In conclusion, mixing of the chemicals during this train derailment may have worsened the consequences as compared with the consequences of spilling the chemicals without mixing. Also, because of the potential for thermal instability of chemicals such as tetraethyl lead and polymerizable chemicals such as vinyl chloride when heated in confined containers such as tank cars, segregation of these chemicals from other flammable chemicals in a train should be considered.

NTSB/HZM-80/01

The tank cars of chemicals involved in this derailment and resultant fate are:

- Isobutylene (1 car) - breached by fire and burned.
- Butadiene (4 cars) - 1 car released and burned, 1 car exposed to fire and survived, 2 cars survived.
- Tetrahydrofuran (1 car) - violent rupture in fire.
- Hydrogen fluoride (1 car) - survived.
- Propylene glycol (3 cars) - leaked.
- Dibasic ester (1 car) - survived.
- Ethylene oxide (1 car) - violent rupture in fire.
- Vinyl acetate (2 cars) - 1 car spilled and burned, the other survived.
- Ethylene glycol (1 car) - spilled.
- Methanol (1 car) - leaked and burned.
- Ethyl acrylate (1 car) - spilled and burned.
- Acetaldehyde (4 cars) - spilled and burned.
- Plastic pellets (3 cars) - disposition unknown.

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2 Another incident involving an explosion of a tank car of vinyl chloride is reported in "Vinyl Chloride Tank Car Incident", by R. D. Kogler, Loss Prevention Vol. 5 (1971), p26-28.

- Rubber (1 car) - disposition unknown.

The plastic pellets and rubber are chemically inert in that they have no residual reactive groups so incompatible reactions are not possible with the other chemicals involved in the derailment. Other anticipated binary chemical compatibilities are as follows :

- Isobutylene/butadiene - no reaction expected.
- Isobutylene or butadiene/tetrahydrofuran - no reaction expected.
- Isobutylene or butadiene/hydrogen fluoride - Both components are very volatile but hydrogen fluoride could initiate the polymerization of isobutylene or butadiene if the temperature was below the individual boiling points of 20°F for isobutylene, 24°F for butadiene, and 67°F for hydrogen fluoride. This would result in the generation of heat (probably insufficient amount to initiate a fire). The consequences would be minimized by the high volatility of isobutylene, butadiene and hydrogen fluoride.
- Isobutylene or butadiene/propylene glycol - no reaction expected.
- Isobutylene or butadiene/dibasic ester (e.g. dialkyl phthalates) - no reaction expected.
- Isobutylene or butadiene/ethylene oxide - no reaction expected.
- Isobutylene or butadiene/vinyl acetate - no reaction expected.
- Isobutylene or butadiene/ethylene glycol - no reaction expected.
- Isobutylene or butadiene/methanol - no reaction expected.
- Isobutylene or butadiene/ethyl acrylate - no reaction expected.
- Isobutylene or butadiene/acetaldehyde - no reaction expected.
- Tetrahydrofuran/hydrogen fluoride - no reaction expected.
- Tetrahydrofuran/propylene glycol - no reaction expected.
- Tetrahydrofuran/dibasic ester (e.g. dialkyl phthalates) - no reaction expected.
- Tetrahydrofuran/ethylene oxide - no reaction expected.
- Tetrahydrofuran/vinyl acetate - no reaction expected.
- Tetrahydrofuran/ethylene glycol - no reaction expected.
- Tetrahydrofuran/methanol - no reaction expected.
- Tetrahydrofuran/ethyl acrylate - no reaction expected.

- Tetrahydrofuran/acetaldehyde - no reaction expected.
- Hydrogen fluoride/propylene glycol - potentially violent and exothermic elimination reaction with formation of propylene oxide (fire hazard).
- Hydrogen fluoride/dibasic ester (e.g. dialkyl phthalates) - no reaction expected.
- Hydrogen fluoride/ethylene oxide - potentially violent polymerization of ethylene oxide. However, consequences are minimized because of high volatility of each component.
- Hydrogen fluoride/vinyl acetate - potentially violent polymerization of vinyl acetate.
- Hydrogen fluoride/ethylene glycol - Same as in "hydrogen fluoride/ propylene glycol".
- Hydrogen fluoride/methanol - potentially violent and exothermic formation of methyl fluoride (toxic and fire hazard).
- Hydrogen fluoride/ethyl acrylate - potentially violent polymerization of ethyl acrylate.
- Hydrogen fluoride/acetaldehyde - violent polymerization and aldol condensation of acetaldehyde.
- Propylene glycol/dibasic ester (e.g. dialkyl phthalates) - no reaction expected.
- Propylene glycol/ethylene oxide - slow ring opening polymerization or addition of ethylene oxide.
- Propylene glycol/vinyl acetate - no reaction expected.
- Propylene glycol/ethylene glycol - no reaction expected.
- Propylene glycol/methanol - no reaction expected.
- Propylene glycol/ethyl acrylate - no reaction expected.
- Propylene glycol/acetaldehyde - violent, possibly explosive, formation of acetal.
- Dibasic ester/ethylene oxide - no reaction expected.
- Dibasic ester/vinyl acetate - no reaction expected.
- Dibasic ester/ethylene glycol - no reaction expected.
- Dibasic ester/methanol - no reaction expected.
- Dibasic ester/ethyl acrylate - no reaction expected.
- Dibasic ester/acetaldehyde - slow condensation reaction.

- Ethylene oxide/vinyl acetate - no reaction expected.
- Ethylene oxide/ethylene glycol - potentially slow ring opening polymerization or addition of ethylene oxide.
- Ethylene oxide/methanol - potentially slow ring opening polymerization or addition of ethylene oxide.
- Ethylene oxide/ethyl acrylate - no reaction expected.
- Ethylene oxide/acetaldehyde - slow formation of cyclic acetal.
- Vinyl acetate/ethylene glycol - no reaction expected.
- Vinyl acetate/methanol - no reaction expected.
- Vinyl acetate/ethyl acrylate - no reaction expected.
- Vinyl acetate/acetaldehyde - slow condensation is expected in absence of a strong base giving a beta-hydroxy ester or its hydration product.
- Ethylene glycol/methanol - no reaction expected.
- Ethylene glycol/ethyl acrylate - no reaction expected.
- Ethylene glycol/acetaldehyde - violent or explosive reaction to form the cyclic acetal.
- Methanol/ethyl acrylate - no reaction expected.
- Methanol/acetaldehyde - violent or explosive reaction to form the cyclic acetal.
- Ethyl acrylate/acetaldehyde - Michael additions or Claisen condensations are expected to be slow in absence of bases.

Reactions, some of which are violent, may have occurred during the derailment that resulted in the formation of heat and flammable gaseous products. These reactions could have contributed to the initiation and intensity of the fire. Of primary concern are the reactions of acetaldehyde with acids (e.g. hydrogen fluoride), glycols (e.g. propylene glycol and ethylene glycol), and alcohols (e.g. methanol) and the reactions of acids such as hydrogen fluoride with ethylene oxide, vinyl acetate, glycols, and methanol. These combinations should be avoided by segregation of tank cars. Other considerations are as follows :

- The explosion of the tank car of tetrahydrofuran was probably

caused by exposure to the intense fire. Tetrahydrofuran, in the absence of inhibitors, is subject to auto-oxidation on exposure to air forming hydroperoxides. If the peroxides, which are thermally sensitive, are allowed to accumulate then an explosion hazard will be formed. Although stabilizers are normally added to tetrahydrofuran to prevent the peroxide formation, this particular batch may not have had sufficient stabilizer added or may have been stored for a prolonged period thereby allowing peroxides to form. Upon concentration, the peroxides will explode (CHRIS Hazardous Chemical Data). A second possible cause for the explosion is that the tank car had fallen over on its side such that the relief valve would be blocked. In this scenario, the tank car could explode by the vapor pressure increase as a result of heating the tank car in the fire.

- Explosion of tank cars containing ethylene oxide has been previously discussed.

In conclusion, mixing of the chemicals during this train derailment may have worsened the consequences as compared with the consequences of spilling the chemicals without mixing. Also, because of the potential for thermal instability of chemicals that can form organic peroxides (e.g. tetrahydrofuran), segregation of these chemicals from other flammable chemicals in a train should be considered.

APPENDIX D

U.S. DEPARTMENT OF TRANSPORTATION HAZMAT CAR PLACEMENT REGULATIONS

§ 174.81 Segregation and separation requirements for hazardous materials in rail cars.

(a) Charged electric storage batteries must not be loaded in the same car nor stored with any Class A explosive.

(b) Cyanides or cyanide mixtures must not be loaded or stored with acids or corrosive liquids.

(c) Gas identification sets may be loaded and transported with all articles named in the segregation and separation chart, except those in column c.

(d) Nitric acid, when loaded in the same car with other acids or other corrosive liquids in carboys, must be separated from the other carboys. A 2 by 6 inch plank, set on edge, should be nailed across the floor at least 12 inches from the nitric acid carboys, and the space between the plank and the carboys of nitric acid should be filled with sand, sifted ashes, or other incombustible absorbent material.

(e) Smokeless powder for small arms in quantities not exceeding 100 pounds net weight in one car shall be classed as flammable solid for purposes of transportation when examined for this classification by the Bureau of Explosives and approved by the Director, OHMT.

(f) Hazardous materials may not be loaded, transported, or stored together, except as provided in the following table:

Segregation and Separation Chart of Hazardous Materials

Footnotes

1. (Reserved)

2. Unless loaded in opposite ends of car, corrosive liquids must not be loaded with flammable solids, oxidizing materials, ammunition for cannon with or without projectiles, or propellant explosives, except that shippers loading carload shipments of corrosive liquids and flammable solids or oxidizing materials and who have obtained prior approval from the Department may load such materials together when it is known that the mixture of corrosives will not cause a dangerous evolution of heat or gas.

3. Explosives, class A, and explosives, class B must not be loaded or stored with chemical ammunition containing incendiary charges or white phosphorus either with or without bursting charges.

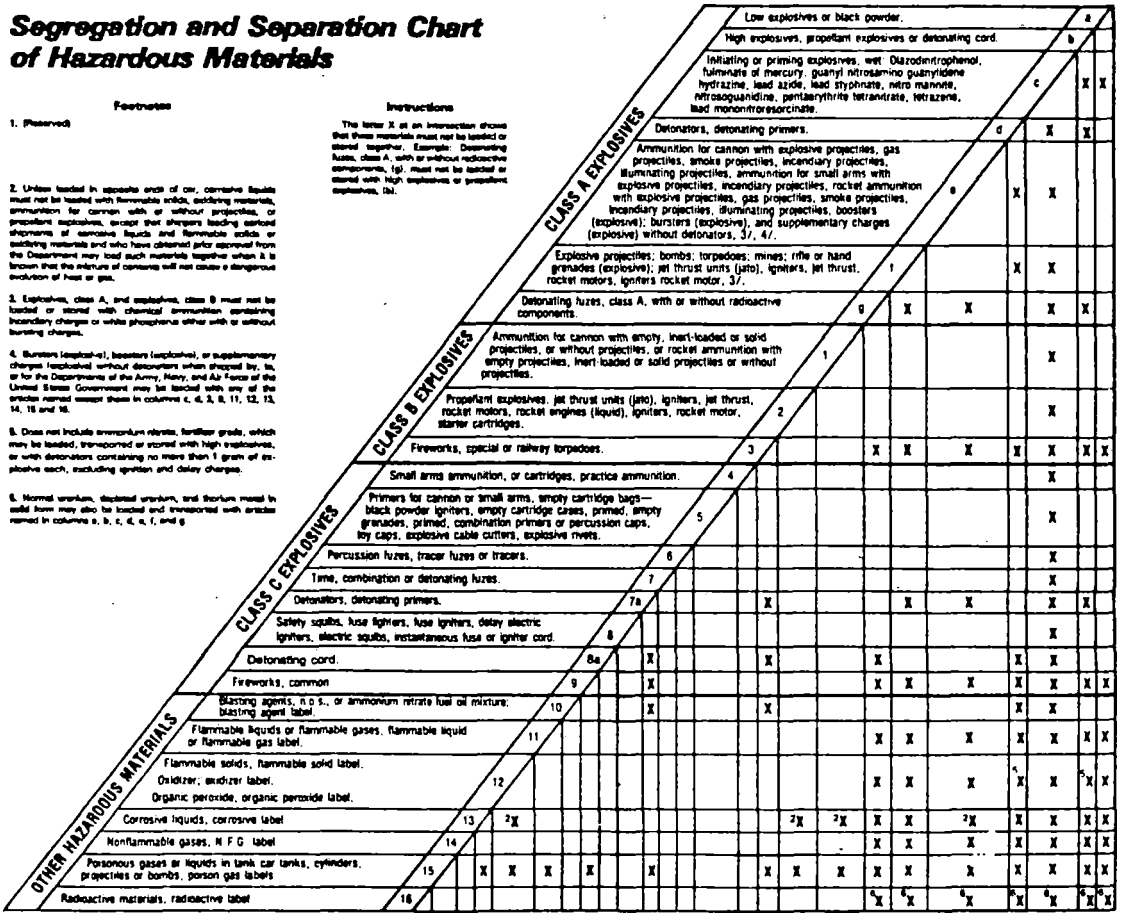
4. Bursters (explosive), boosters (explosive), or supplementary charges (explosive) without detonators when shipped by, to, or for the Departments of the Army, Navy, and Air Force of the United States Government may be loaded with any of the articles named except those in columns c, d, 3, 8, 11, 12, 13, 14, 15 and 16.

5. Does not include ammonium nitrate, fertilizer grade, which may be loaded, transported or stored with high explosives, or with detonators containing no more than 1 gram of explosive each, excluding ignition and delay charges.

6. Normal uranium, depleted uranium, and thorium metal in solid form may also be loaded and transported with articles named in columns a, b, c, d, e, f, and g.

Instructions

The letter X at an intersection shows that these materials must not be loaded or stored together. Example: Detonating fuzes, class A, with or without radioactive components, (g), must not be loaded or stored with high explosives or propellant explosives, (b).



(49 U.S.C. 1803, 1804, 1808; 49 CFR 1.53, App. A to Part 1)

[Amdt. 174-45, 49 FR 7385, Feb. 29, 1984; 49 FR 9188, Mar. 12, 1984, as amended by Amdt. 174-46, 50 FR 806, Jan. 7, 1985; Amdt. 174-59, 51 FR 5974, Feb. 18, 1986]

Subpart D—Handling of Placarded Cars

§ 174.83 Switching of cars containing hazardous materials.

(a) In switching operations where the use of hand brakes is necessary, a loaded placarded tank car, or a draft which includes a loaded placarded tank car, may not be cut off until the preceding car or cars clear the ladder track and the draft containing the loaded placarded tank car, or a loaded placarded tank car, shall in turn clear the ladder before another car is allowed to follow. In switching operations where hand brakes are used, it must be determined by trial whether a loaded placarded car, or a car occupied by a rider in a draft containing a placarded car, has its hand brakes in proper working condition before it is cut off.

(b) Any car placarded "EXPLOSIVE A" or "POISON GAS" and any Class DOT-113 tank car placarded "FLAMMABLE GAS" may not be:

(1) Cut off while in motion,

(2) Coupled into with more force than is necessary to complete the coupling, or

(3) Struck by any car moving under its own momentum.

(c) When transporting a car placarded "EXPLOSIVES A" in a terminal, yard, or on a side track, or siding, it must be separated from the engine by at least one non-placarded car.

(d) The doors of each closed car placarded "EXPLOSIVES A" must be closed, securely fastened, and the lading securely braced before it is moved.

(49 U.S.C. 1803, 1804, 1808; 49 CFR 1.53, App. A to Part 1)

[Amdt. 174-26, 41 FR 16092, Apr. 15, 1976, as amended by Amdt. 174-26A, 41 FR 40685, Sept. 20, 1976; Amdt. 74-43, 48 FR 27699, June 16, 1983; 48 FR 50440, 50442, Nov. 1, 1983]

§ 174.84 Switching of flatcars carrying placarded trailers, freight containers, portable tanks or IM portable tanks.

(a) A placarded flatcar or a flatcar carrying a placarded trailer, freight container, portable tank or IM portable tank under this subchapter may not be cut off while in motion.

(b) No rail car moving under its own momentum may be permitted to strike any placarded flatcar or any flatcar carrying a placarded trailer, freight container, portable tank or IM portable tank.

(c) No placarded flatcar or any flatcar carrying a placarded trailer, freight container, portable tank or IM portable tank may be coupled into with more force than is necessary to complete the coupling.

[Amdt. 174-40, 46 FR 9894, Jan. 29, 1981]

§ 174.85 Placement of freight cars placarded "EXPLOSIVES A" in yards, on sidings, or side tracks.

A rail car placarded "EXPLOSIVES A" while in a yard or on a siding or side track must be placed so that it will be safe from all probable danger of fire. A car so placarded may not be placed under a bridge or overhead highway crossing, not in or alongside a passenger shed or station except for loading or unloading purposes.

§ 174.86 Position in train of cars placarded "EXPLOSIVES A" or "POISON GAS" when accompanied by cars carrying guards or technical escorts.

A rail car placarded "EXPLOSIVES A" or "POISON GAS" in a moving or standing train must be next to and ahead of any car occupied by the guards or technical escorts accompanying this car. However, if a car occupied by guards or technical escorts is equipped with a lighted heater or stove, it must be the fourth car behind any car requiring "EXPLOSIVES A" placards.

[Amdt. 174-26, 41 FR 16092, Apr. 15, 1976, as amended by Amdt. 174-26A, 41 FR 40685, Sept. 20, 1976]

§ 174.87 Placarded cars prohibited in passenger trains, limited in mixed trains.

(a) A placarded rail car may not be transported in a passenger train. However, it may be transported in a mixed train, but only at such times and between such points that freight train service is not in operation and subject to the following limitations:

(1) A placarded car (other than one placarded "COMBUSTIBLE") may not be transported next to an occupied caboose or a car carrying passengers in mixed trains, except as provided in § 174.86.

(2) When a car containing hazardous materials requiring labels is moved in a mixed train and it is not occupied by an employee of the carrier, placards must be applied to the car as required by Subpart F of Part 172 of this subchapter.

§ 174.88 Position in train of cars placarded "EXPLOSIVES A".

In a moving or standing train, a car placarded "EXPLOSIVES A" may not be placed nearer than the sixth car from the engine or an occupied caboose. However, when the length of the train will not permit this car to be so placed, it must be placed as near the middle of the train as possible, but not less than the second car from the engine or occupied caboose.

[Amdt. 174-26, 41 FR 16092, Apr. 15, 1976, as amended by Amdt. 174-26B, 41 FR 57071, Dec. 30, 1976]

§ 174.89 Position in train of cars placarded "RADIOACTIVE".

In a moving or standing train, a car placarded "RADIOACTIVE" may not be placed next to any other loaded placarded car (other than one placarded "COMBUSTIBLE"), an engine, occupied caboose, or carload of undeveloped film. Cars placarded "RADIOACTIVE" may be placed next to each other.

[Amdt. 174-26, 41 FR 16092, Apr. 15, 1976, as amended by Amdt. 174-26A, 41 FR 40685, Sept. 20, 1976; Amdt. 174-26B, 41 FR 57071, Dec. 30, 1976]

§ 174.90 Separating cars placarded "EXPLOSIVES A" or "POISON GAS" from other cars in trains.

(a) In a moving or standing train, a car placarded "EXPLOSIVES A" or "POISON GAS" may not be placed next to:

(1) A passenger car or combination car that may be occupied except as provided in § 174.86;

(2) Any loaded placarded car other than a car placarded with the same placard or one placarded "COMBUSTIBLE".

(3) An engine;

(4) A wooden underframe car (except on narrow gauge railroads);

(5) A loaded flatcar, except that loaded cars placarded "EXPLOSIVES A" may be placed next to each other. A flatcar equipped with permanently attached ends of rigid construction is considered to be an open-top car. (See paragraph (a)(6) of this section.)

(6) An open-top car when any of the lading protrudes beyond the car ends or when any of the lading extending above the car ends is liable to shift so as to protrude beyond the car ends;

(7) A car with automatic refrigeration or heating apparatus in operation, or a car with open-flame apparatus in service, or with an internal combustion engine in operation;

(8) A car containing lighted heaters, stoves, or lanterns;

(9) A car occupied by any person, including any attendant for the cargo contained therein; or

(10) An occupied caboose, except as provided in § 174.86.

(b) In a moving or standing train, a car placarded "EXPLOSIVES A" may not be placed next to a car placarded "POISON GAS".

[Amdt. 174-26, 41 FR 16092, Apr. 15, 1976, as amended by Amdt. 174-26A, 41 FR 40685, Sept. 20, 1976]

§ 174.91 Position in train of loaded placarded tank car other than car placarded "COMBUSTIBLE".

Except for a tank car placarded "COMBUSTIBLE", a loaded placarded tank car in a moving or standing train may not be nearer than the sixth car from the engine, occupied caboose, or passenger car. However, when the length of the train will not permit a loaded placarded tank car to be so placed, it must be placed as near the middle of the train as possible and not nearer than the second car from the engine, occupied caboose, or passenger car.

[Amdt. 174-26, 41 FR 16092, Apr. 15, 1976, as amended by Amdt. 174-26A, 41 FR 40685, Sept. 20, 1976]

§ 174.92 Separating loaded placarded tank cars other than cars placarded "COMBUSTIBLE" from other cars in trains.

(a) In a moving or standing train a loaded placarded tank car, other than one placarded "COMBUSTIBLE", may not be placed next to:

(1) A passenger car or combination car, other than a car occupied by technical escorts and authorized personnel accompanying shipments;

(2) Any car placarded "EXPLOSIVES A", "RADIOACTIVE", or "POISON GAS";

(3) An engine or occupied caboose;

(4) A wooden underframe car (except on narrow gauge railroads);

(5) A loaded flatcar, other than a specially equipped car in trailer-on-flatcar or container-on-flatcar service or a flatcar loaded with vehicles secured by means of a device designed for that purpose and permanently installed on the flatcar, and of a type generally accepted for handling in interchange between railroads subject to the following:

(i) A flatcar equipped with permanently attached ends of rigid construction is considered to be an open-top car (see paragraph (a)(6) of this section); and

(ii) This exception for cars in trailer-on-flatcar service does not apply to loaded flatbed trucks, loaded flatbed trailers, loaded open-top trailers, or loaded trucks or trailers without securely closed doors;

(6) An open-top car when any of the lading protrudes beyond the car ends or when any of the lading extending above the car ends is liable to shift so as to protrude beyond the car ends;

(7) A car with automatic refrigeration or heating apparatus in operation or a car with open-flame apparatus in service or with an internal combustion engine in operation;

(8) A car occupied by any person, including any attendant for the cargo contained therein.

[Amdt. 174-26, 41 FR 16092, Apr. 15, 1976, as amended by Amdt. 174-26A, 41 FR 40685, Sept. 20, 1976]

§ 174.93 Position in train of a tank car displaying RESIDUE placards.

Except for a tank car placarded COMBUSTIBLE—RESIDUE, a tank car displaying RESIDUE placards in a moving or standing train may not be placed nearer than the second car from an engine or occupied caboose.

[Amdt. 174-60, 51 FR 23079, June 25, 1986]

APPENDIX E

CANADIAN TRANSPORT COMMISSION
HAZMAT CAR PLACEMENT REGULATIONS

SUBPART E—HANDLING OF CARS BY CARRIERS

§ 74.575 Restrictions. (a) When local conditions make the acceptance, transportation, or delivery of commodities hazardous, local restrictions may be imposed by the carrier.

(b) All carriers must report to the Commission, for publication, full information as to restrictions which may be imposed against the acceptance, delivery, or transportation of dangerous commodities, over any portion of their lines.

§ 74.578 Flammable vapors. (a) A box car or container car placarded flammable liquid, division 3.1 or 3.2 or known to contain flammable liquids, must not be entered with a lighted open-flame lantern, torch, or other fire, until both car doors have been opened and sufficient time allowed for ventilation and escape of any vapors.

§ 74.580 Violations must be corrected. (a) All violations discovered must be corrected before forwarding shipments.

§ 74.581 Routing shipments. (a) Before any shipment of explosives, division 1.1 or division 1.2, destined to a point beyond the lines of the initial carrier, is accepted from a shipper, the initial carrier must ascertain that the shipment can go forward by the route designated, and to avoid delays en route the initial carrier must be in possession of full rate information, before forwarding the shipment.

§ 74.582 Movement to be expedited. (a) Carriers must forward shipments of dangerous commodities promptly and within 48 hours, Saturdays, Sundays, and holidays excluded after acceptance at originating point or receipt at any yard, transfer station, or interchange point, except that where bi-weekly or weekly service only is performed, shipments of dangerous commodities must be forwarded on the first available train.

(b) No car shall be received and held at any point so as to defeat the purpose of this section or of § 74.560.

§ 74.589 Handling cars. (a) Definitions. (1) "Person" means any individual, partnership, corporation, association, joint stock company, business trust or other organized group of persons, or any trustee, receiver, assignee, or personal representative, and includes any department or agency of the Government of Canada, any Province, or any other political, governmental or legal entity;

(2) "Railroad" means any person engaged in transportation as a common carrier by rail and includes its agent or employees;

(3) "Engine" means any locomotive, propelled by any form of energy, used by a railroad;

(4) "Freight car" means any vehicle used for the transportation of property by rail;

(5) "Passenger car" means any vehicle used for the transportation of passengers by rail;

(6) "Combination car" means any vehicle used for the transportation of both property and passengers by rail;

(7) "Occupied caboose" means any vehicle used by railroad employees, caretakers, or other authorized to ride therein;

(8) "A train" is one or more engines coupled together with or without cars displaying markers;

(9) "Freight train" means one or more engines coupled with one or more freight cars, displaying markers;

(10) "Passenger train" means one or more engines coupled with one or more passenger cars carrying passengers, displaying markers;

(11) "Mixed train" means one or more engines coupled with one or more freight cars and passenger cars carrying passengers, displaying markers;

(b) Placards on cars.

(1) Cars, containers and trailers requiring car certificates pursuant to § 74.525 (d) and placards pursuant to the Transportation of Dangerous Goods Regulations shall not be transported unless they are at all times placarded and certified as required. Placards and car certificates lost in transit shall be replaced at the next inspection point, and those not required shall be removed at the next terminal where the train is classified.

(2) At points where trains are inspected, cars placarded with a placard with a square background and adjacent cars shall be inspected. Such cars shall continue in transit only when inspection shows them to be in condition for safe transportation.

(c) Switching of cars containing dangerous commodities.

(1) In switching operations where the use of hand brakes is necessary, a loaded, placarded tank car, or a draft which includes a loaded, placarded tank car shall not be cut off until the preceding car or cars clear the ladder track, and the draft containing the loaded, placarded tank car, or a loaded, placarded tank car, shall in turn clear the ladder before another car is allowed to follow. In switching operations where hand brakes are used, it must be determined by trial whether a loaded, placarded car, or a car occupied by a rider in a draft containing a placarded car has its hand brakes in proper working condition before it is cut off.

(2) No car bearing a placard with a square background shall be cut off while in motion or coupled into with more force than is necessary to complete the coupling. No car moving under its own momentum shall be allowed to strike any car placarded with a placard with a square background.

(3) When transporting a car placarded with a placard with a square background in a terminal, or yard, or on a side track or siding, the car shall be separated from the engine by at least one non-placarded car.

(4) The doors of each closed car placarded with a placard with a square background shall be closed, securely fastened, and the lading securely braced before the car is moved.

(5) A placarded flatcar or a flatcar carrying a placarded trailer or freight container shall not be cut off while in motion.

(6) No rail car moving under its own momentum shall be permitted to strike any placarded flatcar or any flatcar carrying a placarded trailer or freight container.

(7) No placarded flatcar or flatcar carrying a placarded trailer or freight container shall be coupled into with more force than is necessary to complete the coupling.

(8) No spec. 112 or 114 tank car shall be coupled with any other car at a relative coupling speed in excess of four miles per hour, unless

(i) the tank is empty, and

(ii) the tank has been cleaned and purged.

(d) Placement of freight cars placarded with a placard with a square background in yards, on sidings, or side tracks. A rail car placarded with a placard with a square background shall be placed while in a yard, on a siding or side track so that it

will be safe from all probable danger of fire. A car so placarded shall not be placed under a bridge or overhead highway crossing, nor in or alongside a passenger shed or station.

(e) Notice to train crews of placarded cars.

(1) Train crews shall have in their possession a document indicating the position in the train of each loaded placarded car containing dangerous commodities, except when the position is changed or the placarded car is placed in the train by a member of the train crew. A train consist may be used to meet this requirement.

(2) One member of a train crew of a train transporting dangerous commodities shall have in his possession a copy of all Emergency Response Forms required pursuant to § 73.429.

(f) Position of cars in trains. A car carrying dangerous goods shall not be marshalled next to a car described in a column other than column 3 or 4 of the table shown on page 173 if an X appears in that column on the line corresponding to type of car carrying the dangerous goods (as described in column 1) and the placard groups of the dangerous goods (as indicated in column 2).

POSITION IN FREIGHT OR MIXED TRAIN OF CARS CONTAINING DANGEROUS COMMODITIES

1	2	3	4	5	6	7	8	9	10	11
		When train length permits must not be nearer than 6th from engine, occupied caboose or occupied car	When train length does not permit must be near middle of train but not nearer than 2nd from engine, occupied caboose or occupied car (d)	Open-top car when lading protrudes beyond car or when lading above car end is liable to shift	Loaded flat car (a)	Any car piggyback or container with automatic heating or refrigeration, lighted heater, stoves lanterns or internal combustion engines	Car Placarded			
Type of Car	Placard group no.						Group 1	Group 2	Group 3	Group 4
Any car (includes Flat cars, carrying Trailers, or Containers)	Group 1	X	X	X	X	X		X	X	X
Tank Cars	Group 2	X(b)	X(b)	X	X	X	X	(c)	X	X
Other than Tank Cars	Group 2						X		X	X
Any Car	Group 3	X	X	X	X	X	X	X		X
Any Car	Group 4	X	X				X	X	X	
Tank Car	Group 5	Must not be placed next to engine or occupied caboose (b)								
Any Car	Group 6	NO MARSHALLING REQUIRED								

PLACARD GROUP

1. Group 1 consists of Division 1.1 and 1.2

2. Group 2 consists of Divisions 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4, 3.1, 3.2, 4.1, 4.2, 4.3, 5.1, 5.2, 6.1, 6.2, and Class 8.

3. Group 3 consists of Cyanogen Chloride, Hydrogen Cyanide, Nitric Oxide, Phosgene, Nitrogen Dioxide, Phosphine, Diborane or Diborane Mixtures, Arsine, Boron Trifluoride, Carbonyl Sulfide, Cyanogen, Nitric Oxide and Nitrogen Tetroxide Mixtures, Nitrogen Oxides n.o.s. and Nitrogen Trioxide.

4. Group 4 consists of Class 7.

5. Group 5 consists of tank cars carrying Division 3.3 flammable liquids or tank cars placarded "RESIDUE" or "EMPTY"

6. Group 6 consists of Class 9, and of Class 6 bearing St. Andrews cross placards.

FOOTNOTES:

(a) Except trailer-on-flat-car, container-on-flat-car, tri-level and bi-level cars and any other car specially equipped with tie down devices for handling vehicles. Permanent end bulk head flat cars considered the same as an open-top car.

(b) Except when train consists only of placarded tank cars.

(c) Tank cars containing flammable gases Division 1 of Class 2 must be separated from tank car shipments of Chlorine, Anhydrous Ammonia and Sulphur Dioxide by 5 cars.

(d) When train length does not permit means not having sufficient buffer cars to provide the 5 car separation.

Revised July, 1986.

APPENDIX F

HAZARDOUS MATERIALS DEFINITIONS

U.S. Department of Transportation
Research and Special Programs Administration

HAZARDOUS MATERIALS TRANSPORTATION

HAZARDOUS MATERIALS DEFINITIONS

The following definitions have been abstracted from the Code of Federal Regulations, Title 49-Transportation, Parts 100-177. Refer to the referenced sections for complete details. NOTE: The plus (+) in Column (1), Sec. 172.101, Hazardous Materials Table) fixes the proper shipping name and hazard class for that entry without regard to whether the material meets the definition of that class. [Sec. 172.101(a)(1)]

HAZARDOUS MATERIAL - A substance or material which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety and property when transported in commerce, and which has been so designated. (Sec. 171.8).

MULTIPLE HAZARDS - A material meeting the definition of more than one hazard class is classed according to the provisions set forth in Sec. 173.2(a) and (b).

HAZARD CLASS	UN No	DEFINITIONS
		An Explosive - Any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion, i.e., with substantially instantaneous release of gas and heat, unless such compound, mixture, or device is otherwise specifically classified in Parts 171-179. (Sec. 173.50)
CLASS A EXPLOSIVE	1	Detonating or otherwise of maximum hazard. The nine types of Class A explosives are defined in Sec. 173.53.
CLASS B EXPLOSIVE	1	In general, function by rapid combustion rather than detonation and include some explosive devices such as special fireworks, flash powders, etc. (Sec. 173.88)
CLASS C EXPLOSIVE	1	Certain types of manufactured articles containing Class A or Class B explosives, or both, as components but in restricted quantities, and certain types of fireworks. (Sec. 173.100)
BLASTING AGENT	1	A material designed for blasting which has been tested in accordance with Sec. 173.114a(b) and found to be so insensitive that there is very little probability of accidental initiation to explosion or of transition from deflagration to detonation. [Sec. 173.114a(b)]
		Compressed Gas - Any material or mixture having in the container a pressure EXCEEDING 40 psia at 70°F., or a pressure exceeding 104 psia at 130°F.; or any liquid flammable material having a vapor pressure exceeding 40 psia at 100°F. [Sec. 173.300(a)]
		Non-liquefied compressed gas is a gas, other than gas in solution, which under the charged pressure is entirely gaseous at a temperature of 70°F.
		Liquefied compressed gas is a gas which, under the charged pressure, is partially liquid at a temperature of 70°F.
		Compressed gas in solution is a nonliquefied compressed gas which is dissolved in a solvent.
FLAMMABLE GAS	2	Any compressed gas meeting the requirements for lower flammability limit, flammability limit range, flame projection, or flame propagation criteria as specified in Sec. 173.300(b).
NONFLAMMABLE GAS	2	Any compressed gas other than a flammable compressed gas.

HAZARD CLASS	UN No	DEFINITIONS
COMBUSTIBLE LIQUID	3	Any liquid having a flash point at or above 100°F. and below 200°F. as determined by tests listed in Sec. 173.115(d). Exceptions are found in Sec. 173.115(b).
FLAMMABLE LIQUID	3	Any liquid having a flash point below 100°F. as determined by tests listed in Sec. 173.115(d). For exceptions, see Sec. 173.115(a). Pyroforic Liquid - Any liquid that ignites spontaneously in dry or moist air at or below 130°F. [Sec. 173.115(c)]
FLAMMABLE SOLID	4	Any solid material, other than an explosive, which is liable to cause fires through friction, retained heat from manufacturing or processing, or which can be ignited readily and when ignited, burns so vigorously and persistently as to create a serious transportation hazard. Included in this class are spontaneously combustible and water-reactive materials. (Sec. 173.150) Spontaneously Combustible Material (Solid) - A solid substance (including sludges and pastes) which may undergo spontaneous heating or self-ignition under conditions normally incident to transportation or which may, upon contact with the atmosphere, undergo an increase in temperature and ignite. (Sec. 171.8) Water Reactive Material (Solid) - Any solid substance (including sludges and pastes) which, by interaction with water, is likely to become spontaneously flammable or to give off flammable or toxic gases in dangerous quantities. (Sec. 171.8)
ORGANIC PEROXIDE	5	An organic compound containing the bivalent -0-0 structure and which may be considered a derivative of hydrogen peroxide where one or more of the hydrogen atoms have been replaced by organic radicals must be classed as an organic peroxide unless...[See Sec. 173.151(a) for details].
OXIDIZER	5	A substance such as chlorate, permanganate, inorganic peroxide, or a nitrate, that yields oxygen readily to stimulate the combustion of organic matter. (See Sec. 173.151)
POISON A	2	Extremely Dangerous Poisons - Poisonous gases or liquids of such nature that a very small amount of the gas, or vapor of the liquid, mixed with air is dangerous to life. (Sec. 173.326)
POISON B	6	Less Dangerous Poisons - Substances, liquids or solids (including pastes and semi-solids), other than Class A or Irritating materials, which are known to be so toxic to man as to afford a hazard to health during transportation; or which, in the absence of adequate data on human toxicity, are presumed to be toxic to man. (Sec. 173.343)
IRRITATING MATERIAL	6	A liquid or solid substance which, upon contact with fire or when exposed to air, gives off dangerous or intensely irritating fumes, but not including any poisonous material, Class A. (Sec. 173.381)
ETIOLOGIC AGENT	6	An "etiologic agent" means a viable micro-organism, or its toxin, which causes, or may cause, human disease. (Sec. 173.386)
RADIOACTIVE MATERIAL	7	Any material, or combination of materials, that spontaneously emits ionizing radiation, and having a specific activity greater than 0.002 microcuries per gram. (Sec. 173.389) [See Sec. 173.389(a) through (1) for details]

HAZARD CLASS	UN No.	DEFINITIONS
CORROSIVE MATERIAL	8	Any liquid or solid that causes visible destruction or irreversible alterations in human skin tissue or a liquid that has a severe corrosion rate on steel. [See Sec. 173.240(a) and (b) for details]
ORM - OTHER REGULATED MATERIALS		(1) Any material that may pose an unreasonable risk to health and safety or property when transported in commerce; and (2) Does not meet any of the definitions of the other hazard classes specified in this subpart; or (3) Has been reclassed an ORM (specifically or permissively) according to this subchapter. [Sec. 173.500(a)] NOTE: A material with a flashpoint of 100°F. to 200°F. must be classed as a combustible rather than as an ORM if it is a hazardous waste or is offered in a packaging having a rated capacity of more than 110 gallons.
ORM-A	9	A material which has an anesthetic, irritating, noxious, toxic, or other similar property and which can cause extreme annoyance or discomfort to passengers and crew in the event of leakage during transportation. [Sec. 173.500(b)(1)]
ORM-B	9	A material (including a solid when wet with water) capable of causing significant damage to a transport vehicle from leakage during transportation. Materials meeting one or both of the following criteria are ORM-B materials: (1) A liquid substance that has a corrosion rate exceeding 0.250 inch per year (IPY) on aluminum (nonclad 7075-T6) at a test temperature of 130°F. An acceptable test is described in NACE Standard TM-01-69; and/or (2) Specifically designated by name in Sec. 172.101. [Sec. 173.500(b)(2)]
ORM-C	9	A material which has other inherent characteristics not described as an ORM-A or ORM-B but which makes it unsuitable for shipment, unless properly identified and prepared for transportation. Each ORM-C material is specifically named in Sec. 172.101. [Sec.173.500(b)(3)]
ORM-D	9	A material such as a consumer commodity which, though otherwise subject to the regulations of this subchapter, presents a limited hazard during transportation due to its form, quantity and packaging. They must be materials for which exceptions are provided in Sec. 172.101. A shipping description applicable to each ORM-D material or category of ORM-D materials is found in Sec. 172.101. [Sec. 173.500(b)(4)]
ORM-E	9	A material that is not included in any other hazard class, but is subject to the requirements of this subchapter. Materials in this class include (1) hazardous waste and (2) hazardous substance, as defined in Sec. 171.8. [Sec. 173.500(b)(5)]

THE FOLLOWING ARE OFFERED TO EXPLAIN SOME OF THE ADDITIONAL TERMS USED IN PREPARATION OF HAZARDOUS MATERIALS FOR SHIPMENT. (Sec. 171.8)

CONSUMER COMMODITY (See ORM-D above)		A material that is packaged or distributed in a form intended and suitable for sale through retail sales agencies or instrumentalities for consumption by individuals for purposes of personal care of household use. This term also includes drugs and medicines. (Sec. 171.8)
FLASH POINT		The minimum temperature at which a substance gives off flammable vapors which, in contact with a spark or flame, will ignite. For liquids, see Sec. 173.115; for solids, see Sec. 173.150.

TERM	DEFINITION
FORBIDDEN	Material is prohibited from being offered or accepted for transportation. This prohibition does not apply if these materials are diluted, stabilized, or incorporated in devices and they are classed in accordance with the definitions of hazardous materials. [Sec. 172.101(d)(1)]
HAZARDOUS SUBSTANCE	For transportation purposes, a material and its mixtures or solutions, that is identified by the letter "E" in Column (1) of the Hazardous Materials Table, Sec. 172.101, when offered for transportation in one package, or in one transport vehicle if not packaged, and when the quantity of the material therein equals or exceeds the reportable quantity (RQ). For details, refer to Sec. 171.8 and Sec. 172.101 (Hazardous Materials Table).
HAZARDOUS WASTE	Any material that is subject to the hazardous waste manifest requirements of the Environmental Protection Agency specified in the CFR, Title 40, Part 262 or would be subject to these requirements in the absence of an interim authorization to a State under Title 40, CFR, Part 123, Subpart F. (Sec. 171.8). Questions regarding EPA hazardous waste regulations, call Toll Free: (800) 424-9065 or in Washington: 554-1404.
LIMITED QUANTITY	The maximum amount of a hazardous material as specified in those sections applicable to the particular hazard class for which there is a specific labeling and packaging exception from the requirements. See Sec. 173.118, 173.118(a), 173.153, 173.244, 173.306, 173.345, 173.364 and 173.391.
REPORTABLE QUANTITY	The quantity of hazardous substance specified in the Hazardous Materials Table (Sec. 172.101) and identified by the letter "E" in Column (1). (Sec. 171.8)

* THIS HANDOUT IS DESIGNED AS A TRAINING AID FOR ALL INTERESTED PARTIES WHO MAY BECOME INVOLVED WITH HAZARDOUS MATERIALS. IT DOES NOT RELIEVE PERSONS FROM COMPLYING WITH THE DEPARTMENT OF TRANSPORTATION'S HAZARDOUS MATERIALS REGULATIONS. SPECIFIC CRITERIA FOR HAZARD CLASSES AND RELATED DEFINITIONS ARE FOUND IN THE CODE OF FEDERAL REGULATIONS (CFR), TITLE 49, PARTS 100-177.

Information Services Division, DMT-11
Office of Operations and Enforcement
Materials Transportation Bureau
Department of Transportation
Washington, D.C. 20590

APPENDIX G

TABLE OF POSITION IN TRAIN REQUIREMENTS

APPENDIX II
POSITION IN TRAIN OF PLACARDED CARS CONTAINING HAZARDOUS MATERIALS

			PLACARD APPLIED ON CAR	EXPLOSIVES A	POISON GAS	POISON GAS	RADIOACTIVE	ANY PLACARDED LOAD OTHER THAN COMBUSTIBLE OR POISON GAS	OTHER THAN EXPLOSIVES A POISON GAS OR COMBUSTIBLE	PLACARDED EMPTY EXCEPT COMBUSTIBLE	COMBUSTIBLE
			TYPE OF CAR	ANY CARS	TANK CAR	OTHER THAN TANK CAR	ANY CAR	TANK CAR	OTHER THAN TANK CAR	TANK CAR	TANK CAR
3		RESTRICTIONS									
4	WHEN TRAIN LENGTH PERMITS	Must not be nearer than 6th from engine, occupied caboose or passenger car	√	√			√			
5	WHEN TRAIN LENGTH DOES NOT PERMIT	Must be near middle of train but not nearer than 2nd from engine, occupied caboose.	√	√			√			
6	MUST NOT BE PLACED NEXT TO	Loaded flat car. A flatcar equipped with permanently attached ends of rigid construction is considered to be an open-top car.	√①	√	√		√②			
7		*An open-top car* when any of the lading protrudes beyond the car ends or when any of the lading extending above the car ends is liable to shift so as to protrude beyond the car ends:	√	√	√		√			
8		ENGINE	√	√	√	√	√		√	
9		Except as provided in lines 10 and 11, a car occupied by any person or a passenger car or combination car that *may be occupied.*	√③	√③	√③	√	√	√④	√	
10		OCCUPIED CABOOSE	√③	√③	√③	√	√		√	
11		OCCUPIED GUARD CAR	√③	√③	√③		√			
12		UNDEVELOPED FILM				√				
13		A car with automatic refrigeration or heating apparatus in operation, or a car with open-flame apparatus in service, or with an internal combustion engine in operation:	√	√	√		√			
14		*A car containing lighted heaters,* stoves, or lanterns:	√	√	√					
15	CAR PLACARDED	EXPLOSIVES A		√	√	√	√	√		
16		POISON GAS	√			√	√	√		
17		Loaded placarded car, other than a car placarded with the same placard or the "combustible" placard.	√	√	√	√				
18		RADIOACTIVE	√	√	√		√	√		

FOOTNOTES:

① Loaded cars placarded "EXPLOSIVES A" may be placed next to each other.

② A specially equipped car in trailer-on-flatcar or container-on-flatcar service or a flatcar loaded with vehicles secured by means of a device designed for that purpose and permanently installed on the flatcar, and of a type generally accepted for handling in interchange between railroads may be placed next to these placarded loaded tank cars subject to the following: this exception for cars in trailer-on-flatcar service does not apply to loaded flatbed trucks, loaded flatbed trailers, loaded open-top trailers, or loaded trucks or trailers without securely closed doors.

③ A rail car placarded "EXPLOSIVES A" or "POISON GAS" in a moving or standing train must be next to and ahead of any car occupied by the guards or technical escorts accompanying this car. However, if a car occupied by guards or technical escorts is equipped with a lighted heater or stove, it must be the fourth car behind any car requiring "EXPLOSIVES A" placards.

④ Applies only in mixed train service, see section 174.87.

NOTE: This chart was extracted from Union Pacific Railroad Company Timetable No. 1 (2-12-78).

APPENDIX H

CHEMICAL REACTIVITIES OF BINARY COMBINATIONS

APPENDIX H

Chemical Reactivities of Binary Combinations

The results from the binary chemical evaluations are given in the tables on pages H-7 through H-111. The tables contain the following information:

1st Column : ASTM Chemical Reactivity Group for the 1st Chemical,
2nd Column : Name of the 1st Chemical,
3rd Column : STC Number of the First Chemical,
4th Column : ASTM Chemical Reactivity Group for the 2nd Chemical,
5th Column : Name of the 2nd Chemical,
6th Column : STC Number of the 2nd Chemical,
7th Column : General description of the compatibility or consequences of the combination,
8th Column : General comments on the reaction,
9th Column : Reference Number (See Page H- ??? for the Reference List).

The chemicals are arranged in alphabetic order with the lower ASTM Chemical Reactivity Number being the 1st Chemical. For example information on the compatibility of chlorine and hydrocyanic acid can be found by searching the 2nd Column for Hydrocyanic Acid and the 5th column for chlorine. Hydrocyanic acid is the 1st chemical because it has a lower ASTM Group number than chlorine (Group 1 as opposed to Group 104). To facilitate the location of combinations, Table H1 on pages H-2 through H-4 provides an alphabetic list of chemicals and their corresponding ASTM Chemical Reactivity Groups. A comparison between the ASTM and Coast Guard Chemical Reactivity Groups is given in Table H2 on pages H-5 and H-6.

TABLE H1. List of Chemical Names and Their Corresponding ASTM Reactivity Group

Chemical Name	STC Number	Rank by Volume	Hazard Class	Movements per Year	ASTM Group	ASTM Chemical Reactivity Group Name
Acetaldehyde	4907210	41	FL	3520	5	Aldehydes
Acetic Acid, Glacial	4931303	48	CM	2953	3	Organic Acids
Acetic Anhydride	4931304	68	CM	1533	107	Water Reactive Substances
Acetone	4908105	46	FL	2971	19	Ketones
Acrylic Acid	4931405	88	CM	1031	3	Organic Acids
Acrylonitrile	4906420	36	FL	4811	26	Nitriles
Alcoholic Beverage	4910102	77	CL	1276	4	Alcohols and Glycols
Alkaline Liquid, n.o.s.	4935220	92	CM	975	10	Caustics
Ammonium Nitrate Solution	4918774	65	OM	1860	106	Water and Mixtures Containing Water
Anhydrous Ammonia	4904210	4	NG	42526	10	Caustics
Aniline Oil, Liquid	4921410	85	PB	1088	7	Aliphatic and Aromatic Amines
Benzene	4908110	33	FL	5067	16	Aromatic Hydrocarbons
Butadiene	4905704	25	FG	7025	28	Unsaturated, Aliphatic Hydrocarbons
Butadiene, Inhibited	4905703	90	FG	1005	28	Unsaturated, Aliphatic Hydrocarbons
Butane	4905702	18	FG	9473	29	Saturated Aliphatic Hydrocarbons
Butane	4905706	13	FG	12215	29	Saturated Aliphatic Hydrocarbons
Butyl Acrylate (Corr. L., n.o.s.)	4912215	63	CL	1957	13	Esters
Butyl Alcohol	4909129	87	FL	1052	4	Alcohols and Glycols
Butyraldehyde	4908119	98	FL	870	5	Aldehydes
Carbon Dioxide, Refrigerated Liquid	4904509	20	NG	8172		
Carbon Disulfide	4908125	89	FL	1013	20	Mercaptans and Other Organic Sulfides
Carbon Tetrachloride	4940320	72	OA	1343	17	Halogenated Compounds
Chlorine	4904120	2	NG	46686	104	Strong Oxidizing Agents
Chloroprene, Inhibited	4907223	97	FL	889	17	Halogenated Compounds
Coal Tar Distillate	4915363	78	CL	1259	101	Combustible and Flammable Materials
Combustible Liquid, n.o.s.	4915185	45	CL	3139	101	Combustible and Flammable Materials
Compound, Cleaning, Liquid	4915147	75	CL	1281	101	Combustible and Flammable Materials
Corrosive Liquid, n.o.s.	4936540	50	CM	2916		
Crude Oil Petroleum	4910165	17	FL	9995	101	Combustible and Flammable Materials
Cyclohexane	4908132	61	FL	2089	29	Saturated Aliphatic Hydrocarbons
Denatured Alcohol	4909141	44	FL	3140	4	Alcohols and Glycols
Denatured Alcohol	4909151	19	FL	8947	4	Alcohols and Glycols
Dinitrotoluene, Liquid	4963120	100	OE	866	27	Nitro Compounds
Distillate Fuel Oil	2911315	26	CL	6549	101	Combustible and Flammable Materials
Ethyl Acetate	4909160	86	FL	1066	13	Esters
Ethyl Acrylate, inhibited	4907215	76	FL	1281	13	Esters
Ethyl Alcohol	4909159	99	FL	867	4	Alcohols and Glycols
Ethylene Oxide	4906610	27	FL	6535	34	Epoxides
Ferric Chloride Solution	4932342	64	CM	1883	104	Strong Oxidizing Agents
Flammable Liquid, n.o.s.	4910185	59	FL	2256	101	Combustible and Flammable Materials
Formaldehyde Solution	4913144	95	CL	901	5	Aldehydes
Formaldehyde Solution	4913168	60	CL	2157	5	Aldehydes
Fuel Oil	4915112	11	CL	17767	101	Combustible and Flammable Materials
Fuel Oil	4915113	24	CL	7443	101	Combustible and Flammable Materials
Fuel Oil	4915111	12	CL	14038	101	Combustible and Flammable Materials

TABLE H1. List of Chemical Names and Their Corresponding ASTM Reactivity Group (Cont.)

Chemical Name	STC Number	Rank by Volume	Hazard Class	Movements per Year	ASTM Group	ASTM Chemical Reactivity Group Name
Fuel, Aviation, Turbine Engine	4909215	35	FL	4874	101	Combustible and Flammable Materials
Fuel, Aviation, Turbine Engine	4915167	74	CL	1283	101	Combustible and Flammable Materials
Gasoline	4908178	22	FL	7676	101	Combustible and Flammable Materials
Gasoline, nec	2911190	70	FL	1410	101	Combustible and Flammable Materials
Glycol Ethers, nec (C.L., n.o.s.)	4913194	94	CL	902	14	Ethers
Hexamethylene Diamine Solution	4935645	31	CM	5580	7	Aliphatic and Aromatic Amines
Hexane	4908183	69	FL	1454	29	Saturated Aliphatic Hydrocarbons
Hydrochloric Acid	4930228	14	CM	10973	1	Non-oxidizing Mineral Acids
Hydrocyanic acid	4920125	80	PA	1226	1	Non-oxidizing Mineral Acids
Hydrofluorosilicic Acid	4930026	93	CM	930	1	Non-oxidizing Mineral Acids
Hydrogen Fluoride	4930024	58	CM	2464	1	Non-oxidizing Mineral Acids
Hydrogen Peroxide Solution	4918335	67	OM	1646	104	Strong Oxidizing Agents
Hydroiodic Acid	4930226	96	CM	897	1	Non-oxidizing Mineral Acids
Isopropanol	4909205	52	FL	2848	4	Alcohols and Glycols
Liquefied Petroleum Gas	4905752	5	FG	37043	28	Unsaturated, Aliphatic Hydrocarbons
Liquefied Petroleum Gas (Butene)	4905707	53	FG	2806	28	Unsaturated, Aliphatic Hydrocarbons
Liquefied Petroleum Gas (Butylene)	4905711	84	FG	1139	28	Unsaturated, Aliphatic Hydrocarbons
Liquefied Petroleum Gas (Isobutane)	4905747	23	FG	7582	29	Saturated Aliphatic Hydrocarbons
Liquefied Petroleum Gas (Isobutane)	4905750	32	FG	5360	29	Saturated Aliphatic Hydrocarbons
Liquefied Petroleum Gas (Isobutylene)	4905748	79	FG	1258	28	Unsaturated, Aliphatic Hydrocarbons
Liquefied Petroleum Gas (Propane)	4905781	8	FG	21793	29	Saturated Aliphatic Hydrocarbons
Liquefied Petroleum Gas (Propylene)	4905782	30	FG	5707	28	Unsaturated, Aliphatic Hydrocarbons
Maleic Anhydride	4941161	81	OA	1168	107	Water Reactive Substances
Methyl Alcohol	4909237	54	FL	2630	4	Alcohols and Glycols
Methyl Alcohol	4909230	10	FL	18109	4	Alcohols and Glycols
Methyl Chloride	4905761	82	FG	1168	17	Halogenated Compounds
Methyl Ethyl Ketone	4909243	73	FL	1318	19	Ketones
Methyl Methacrylate Monomer, inhib.	4907250	49	FL	2927	13	Esters
Motor Fuel Antiknock Compound	4921445	91	PB	1000	24	Toxic Metals and Metal Compounds
Nitric Acid, Fuming	4918529		CM	441	2	Oxidizing Mineral Acids
Octyl Alcohol (C.L., n.o.s.)	4913158	66	CL	1671	4	Alcohols and Glycols
Oil	4915245	71	CL	1407	101	Combustible and Flammable Materials
Oleum	4930030	43	CM	3243	2	Oxidizing Mineral Acids
Petroleum Naphtha	4910259	39	CL	4132	101	Combustible and Flammable Materials
Petroleum Naphtha	4915259	28	CL	6061	101	Combustible and Flammable Materials
Petroleum Naphtha	4915257	42	CL	3348	101	Combustible and Flammable Materials
Petroleum Residual Fuel Oil	2911715	21	CL	7907	101	Combustible and Flammable Materials
Petroleum, Partially Refined	2911735	16	CL	10658	101	Combustible and Flammable Materials
Phenol	4921220	29	PB	5974	31	Phenols and Cresols
Phosphoric Acid	4930247	6	CM	28008	1	Non-oxidizing Mineral Acids
Phosphorus, White or Yellow	4916141	40	FS	3533	105	Strong Reducing Agents
Potassium Hydroxide, Liq. or solution	4935230	55	CM	2622	10	Caustics
Propylene Oxide	4906620	34	FL	4913	34	Epoxides
Pulp Mill Liquid (F.L., n.o.s.)	4910320	83	FL	1159	101	Combustible and Flammable Materials

TABLE H1. List of Chemical Names and Their Corresponding ASTM Reactivity Group (Cont.)

Chemical Name	STC Number	Rank by Volume	Hazard Class	Movements per Year	ASTM Group	ASTM Chemical Reactivity Group Name
Sodium Hydroxide, liq. or solution	4935243	1	CM	48367	10	Caustics
Sodium Hydroxide, Liq. or solution	4935240	7	CM	27274	10	Caustics
Sodium Metal	4916456	101	FS	855	21	Elemental Alkali, Alkaline Earth Metals
Styrene Monomer, Inhibited	4907265	15	FL	10859	16	Aromatic Hydrocarbons
Sulfur Dioxide	4904290	47	NG	2959	105	Strong Reducing Agents
Sulfuric Acid	4930040	3	CM	46265	2	Oxidizing Mineral Acids
Sulfuric Acid, spent	4930042	37	CM	4809	2	Oxidizing Mineral Acids
Toluene	4909305	62	FL	2084	16	Aromatic Hydrocarbons
Toluene Diisocyanate	4921575	56	PB	2610	18	Isocyanates
Vinyl Acetate	4907270	38	FL	4431	13	Esters
Vinyl Chloride	4905792	9	FG	20081	17	Halogenated Compounds
Xylene	4909351	51	FL	2869	16	Aromatic Hydrocarbons
Xylene	4909350	57	FL	2546	16	Aromatic Hydrocarbons

TABLE H2. A Comparison of the ASTM and Coast Guard Chemical Reactivity Groups

ASTM No.	ASTM Group	Coast Guard No.	Coast Guard Cargo Group
		0	Unassigned Cargoes
1	Non-oxidizing Mineral Acids	1	Non-oxidizing Mineral Acids
2	Oxidizing Mineral Acids	2	Sulfuric Acids
2	Oxidizing Mineral Acids	3	Nitric Acid
3	Organic Acids	4	Organic Acids
10	Caustics	5	Caustics
10	Caustics	6	Ammonia
7	Aliphatic and Aromatic Amines	7	Aliphatic Amines
7	Aliphatic and Aromatic Amines	8	Alkanolamines
7	Aliphatic and Aromatic Amines	9	Aromatic Amines
6	Amides	10	Amides
107	Water Reactive Substances	11	Organic Anhydrides
18	Isocyanates	12	Isocyanates
13	Esters	13	Vinyl Acetate
14	Ethers	13	Vinyl Acetate
103	Polymerizable Compounds	14	Acrylates
13	Esters	14	Acrylates
26	Nitriles	15	Substituted Allyls
17	Halogenated Organics	15	Substituted Allyls
4	Alcohols and Glycols	15	Substituted Allyls
34	Epoxides	16	Alkylene Oxides
103	Polymerizable Compounds	16	Alkylene Oxides
34	Epoxides	17	Epichlorohydrin
17	Halogenated Compounds	17	Epichlorohydrin
19	Ketones	18	Ketones
5	Aldehydes	19	Aldehydes
4	Alcohols and Glycols	20	Alcohols,Glycols
31	Phenols and Cresols	21	Phenols and Cresols
-		22	Caprolactum Solution
28	Unsaturated, Aliphatic Hydrocarbons	30	Olefins
29	Saturated Aliphatic Hydrocarbons	31	Paraffins
16	Aromatic Hydrocarbons	32	Aromatic Hydrocarbons
101	Combustible and Flammable Materials	33	Miscellaneous Hydrocarbon Mixtures
13	Esters	34	Esters
103	Polymerizable Compounds	35	Vinyl Halides
17	Halogenated Organics	35	Vinyl Halides
17	Halogenated Organics	36	Halogenated Hydrocarbons
26	Nitriles	37	Nitriles
20	Mercaptans and Other Organic Sulfides	38	Carbon Disulfide
-		39	Sulfolane
14	Ethers	40	Glycol Ethers

TABLE H2. A Comparison of the ASTM and Coast Guard Chemical Reactivity Groups (Cont.)

ASTM No.	ASTM Group	Coast Guard No.	Coast Guard Cargo Group
4	Alcohols and Glycols	40	Glycol Ethers
14	Ethers	41	Ethers
27	Nitro Compounds	42	Nitro compounds
106	Water and Mixtures Containing Water	43	Miscellaneous Water Solutions
8	Azo and Diazo Compounds, Hydrazine	-	
9	Carbamates	-	
11	Cyanides	-	
12	Dithiocarbamates	-	
15	Inorganic Fluorides	-	
21	Elemental Alkali, Alkaline Earth Metals	-	
22	Other Elemental Metals(Foam,Sponge,etc.)	-	
23	Other Elemental Metals(Sheets,Rods,etc.)	-	
24	Toxic Metals and Metal Compounds	-	
25	Nitrides	-	
30	Organic Peroxides and Hydroperoxides	-	
32	Organophosphates, Phosphothiates	-	
33	Inorganic Sulfides	-	
106	Explosives	-	
104	Strong Oxidizing Agents	-	
105	Strong Reducing Agents	-	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
5	Acetaldehyde	4907210	107	Acetic Anhydride	4931304	Heat	Condensation reaction (abnormal Perkins reaction) is probably slow. Forms vinyl acetate.	1
5	Acetaldehyde	4907210	19	Acetone	4908105	Compatible	No reaction expected.	
5	Acetaldehyde	4907210	10	Alkaline Liquid, n.o.s.	4935220	Heat/Polymerization	Violent aldol condensation forms 3-hydroxybutanal and polymerization through carbonyl group.	1
5	Acetaldehyde	4907210	10	Anhydrous Ammonia	4904210	Heat/Polymerization	Potentially violent reaction forms ethaneimine and vigorous polymerization.	
5	Acetaldehyde	4907210	7	Aniline Oil, Liquid	4921410	Heat/Polymerization	Reacts vigorously with probable polymerization and imine formation - N-ethylidenebenzeneamine.	5
5	Acetaldehyde	4907210	104	Chlorine	4904120	Heat/Fire	Violent reaction forming chloral under basic or acidic conditions. Also, oxidation of aldehyde group	1
5	Acetaldehyde	4907210	27	Dinitrotoluene, Liquid	4963120	Heat/Explosion	Potentially vigorous reaction under basic conditions.	
5	Acetaldehyde	4907210	34	Ethylene Oxide	4906610	Compatible	Slow cyclic acetal formation at ambient temperatures.	
5	Acetaldehyde	4907210	104	Ferric Chloride Solution	4932342	Heat/Polymerization	Evolves heat and forms a black spongy material. Dilution of acetaldehyde in water moderates reaction	6
5	Acetaldehyde	4907210	14	Glycol Ethers, nec (C.L., n.o.s.)	4913194	Compatible		
5	Acetaldehyde	4907210	7	Hexamethylene Diamine Solution	4935645	Heat/Polymerization	Polymerization and formation of N,N'-diethylidene-1,6-hexanediamine moderated by presence of water.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
5	Acetaldehyde	4907210	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Forms extremely explosive poly(ethylidene) peroxide - accelerated by acidic or basic conditions.	2
5	Acetaldehyde	4907210	31	Phenol	4921220	Heat/Fire	Reacts vigorously forming 1,1-bis(4-hydroxyphenyl) ethane. Promoted by acid.	
5	Acetaldehyde	4907210	105	Phosphorus, White or Yellow	4916141	Heat	Reacts vigorously.	5
5	Acetaldehyde	4907210	10	Potassium Hydroxide, Liq. or solution	4935230	Heat/Polymerization	Violent aldol condensation forms 3-hydroxybutanal and polymerization through carbonyl group.	1
5	Acetaldehyde	4907210	34	Propylene Oxide	4906620	Compatible	Slow reaction at ambient temperature - slower than ethylene oxide reaction.	
5	Acetaldehyde	4907210	10	Sodium Hydroxide, liq. or solution	4935243	Heat/Polymerization	Violent aldol condensation forms 3-hydroxybutanal and polymerization through carbonyl group.	1
5	Acetaldehyde	4907210	10	Sodium Hydroxide, Liq. or solution	4935240	Heat/Polymerization	Violent aldol condensation forms 3-hydroxybutanal and polymerization through carbonyl group.	1
5	Acetaldehyde	4907210	21	Sodium Metal	4916456	Heat/Fire	Very vigorous reaction forms pinacol dianion.	
5	Acetaldehyde	4907210	105	Sulfur Dioxide	4904290	Unknown		
5	Acetaldehyde	4907210	18	Toluene Diisocyanate	4921575	Heat	Potential reaction of enol.	5
3	Acetic Acid, Glacial	4931303	5	Acetaldehyde	4907210	Heat/Polymerization	Potentially violent/explosive polymerization of acetaldehyde.	1
3	Acetic Acid, Glacial	4931303	107	Acetic Anhydride	4931304	Heat	Violent acid catalyzed hydrolysis of acetic anhydride if mixed with aqueous acetic acid(need water).	2

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
3	Acetic Acid, Glacial	4931303	26	Acrylonitrile	4906420	Heat/Polymerization	Exotherm observed when mixture was heated between 100 and 200 degrees C.	12
3	Acetic Acid, Glacial	4931303	10	Alkaline Liquid, n.o.s.	4935220	Heat/Neutralization	Violent neutralization.	
3	Acetic Acid, Glacial	4931303	106	Ammonium Nitrate Solution	4918774	Heat	May ignite when warmed, especially if concentrated. Reaction mitigated by water content.	1
3	Acetic Acid, Glacial	4931303	10	Anhydrous Ammonia	4904210	Heat/Neutralization	Violent neutralization forms ammonium acetate.	
3	Acetic Acid, Glacial	4931303	7	Aniline Oil, Liquid	4921410	Heat/Neutralization	Minimal heat generated.	12
3	Acetic Acid, Glacial	4931303	5	Butyraldehyde	4908119	Heat/Polymerization	Exotherm observed when mixture was heated between 200 and 300 degrees C.	12
3	Acetic Acid, Glacial	4931303	104	Chlorine	4904120	Heat/Fire	Potentially vigorous/violent reaction.	
3	Acetic Acid, Glacial	4931303	17	Chloroprene, Inhibited	4907223	Heat/Polymerization	Potential vigorous/violent polymerization initiated by acetic acid.	
3	Acetic Acid, Glacial	4931303	34	Ethylene Oxide	4906610	Heat/Polymerization	Potentially vigorous polymerization with heat liberation will occur in contact with acids.	1
3	Acetic Acid, Glacial	4931303	5	Formaldehyde Solution	4913168	Heat/Polymerization	Polymerization of formaldehyde initiated by acetic acid.	
3	Acetic Acid, Glacial	4931303	5	Formaldehyde Solution	4913144	Heat/Polymerization	Polymerization of formaldehyde initiated by acetic acid.	
3	Acetic Acid, Glacial	4931303	7	Hexamethylene Diamine Solution	4935645	Heat/Neutralization	Heat of neutralization.	
3	Acetic Acid, Glacial	4931303	104	Hydrogen Peroxide Solution	4918335	Heat/Explosion	Mixing and heating of dilute solutions will form heat and peracetic acid which explodes at 110 C.	1

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
3	Acetic Acid, Glacial	4931303	105	Phosphorus, White or Yellow	4916141	Compatible	No reactivity found below 60 degrees C.	12
3	Acetic Acid, Glacial	4931303	10	Potassium Hydroxide, Liq. or solution	4935230	Heat/Neutralization	Violent neutralization.	
3	Acetic Acid, Glacial	4931303	34	Propylene Oxide	4906620	Heat/Polymerization	Exotherm observed when mixture was heated between 100 and 200 degrees C. Potential polymerization.	12
3	Acetic Acid, Glacial	4931303	10	Sodium Hydroxide, Liq. or solution	4935240	Heat/Neutralization	Excessive heat generated.	12
3	Acetic Acid, Glacial	4931303	10	Sodium Hydroxide, liq. or solution	4935243	Heat/Neutralization	Excessive heat generated.	12
3	Acetic Acid, Glacial	4931303	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Vigorous hydrogen evolution with possible explosion.	
3	Acetic Acid, Glacial	4931303	18	Toluene Diisocyanate	4921575	Heat/Gas	Vigorous reaction forming ArNHC(O)OC(O)CH3, CO2 gas and some heat - polymerization if water present.	
19	Acetone	4908105	104	Chlorine	4904120	Heat/Fire	Potentially vigorous/violent oxidation reaction with possible ignition.	
19	Acetone	4908105	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Readily forms dimeric, trimeric or polymeric peroxides which are explosive.	2
19	Acetone	4908105	105	Phosphorus, White or Yellow	4916141	Compatible	No reaction expected.	
19	Acetone	4908105	21	Sodium Metal	4916456	Heat	Potentially violent reaction reduces acetone to give 40 to 50% pinacolate dianion.	5
3	Acrylic Acid	4931405	5	Acetaldehyde	4907210	Heat/Polymerization	Potentially violent/explosive polymerization of acetaldehyde (same as with acetic acid).	
3	Acrylic Acid	4931405	107	Acetic Anhydride	4931304	Heat	Violent acid catalyzed hydrolysis of acetic anhydride if mixed with aqueous acrylic acid (need H2O).	2

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
3	Acrylic Acid	4931405	26	Acrylonitrile	4906420	Compatible	No exotherm was observed when the mixture was heated up to 200 degrees C.	12
3	Acrylic Acid	4931405	10	Alkaline Liquid, n.o.s.	4935220	Heat/Neutralization	Potentially vigorous polymerization of acrylic acid as well as neutralization reaction.	
3	Acrylic Acid	4931405	106	Ammonium Nitrate Solution	4918774	Heat	Mixture may ignite by analogy to acetic acid/ammonium nitrate mixture. Reaction mitigated by water.	
3	Acrylic Acid	4931405	10	Anhydrous Ammonia	4904210	Heat/Polymerization	Violent polymerization.	5
3	Acrylic Acid	4931405	7	Aniline Oil, Liquid	4921410	Heat/Polymerization	Violent polymerization.	5
3	Acrylic Acid	4931405	5	Butyraldehyde	4908119	Compatible	No reaction observed when mixture was heated up to 300 degrees C.	12
3	Acrylic Acid	4931405	104	Chlorine	4904120	Heat/Fire	Probably more vigorous than acetic acid/chlorine mixture.	
3	Acrylic Acid	4931405	17	Chloroprene, Inhibited	4907223	Heat/Polymerization	Expected polymerization of chloroprene initiated by acrylic acid.	
3	Acrylic Acid	4931405	34	Ethylene Oxide	4906610	Heat/Polymerization	Potentially vigorous polymerization with heat liberation may occur in contact with acids.	1
3	Acrylic Acid	4931405	104	Ferric Chloride Solution	4932342	Compatible	Probably minimal reaction.	
3	Acrylic Acid	4931405	5	Formaldehyde Solution	4913168	Heat/Polymerization	Polymerization of formaldehyde initiated by acrylic acid.	
3	Acrylic Acid	4931405	5	Formaldehyde Solution	4913144	Heat/Polymerization	Polymerization of formaldehyde initiated by acrylic acid.	
3	Acrylic Acid	4931405	7	Hexamethylene Diamine Solution	4935645	Heat/Polymerization	Violent polymerization or neutralization.	5

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
3	Acrylic Acid	4931405	104	Hydrogen Peroxide Solution	4918335	Heat/Explosion	Will form explosive peracid which should have explosivity similar to peracetic acid.	
3	Acrylic Acid	4931405	105	Phosphorus, White or Yellow	4916141	Compatible	No exotherm observed when mixture heated to 60 degrees C.	12
3	Acrylic Acid	4931405	10	Potassium Hydroxide, Liq. or solution	4935230	Heat/Polymerization/ Neutralization	Moderate heat generation. Also, potential anionic polymerization by analogy to acrolein/hydroxide.	
3	Acrylic Acid	4931405	34	Propylene Oxide	4906620	Compatible	No exotherm observed when mixture heated to 200 C.	12
3	Acrylic Acid	4931405	10	Sodium Hydroxide, liq. or solution	4935243	Heat/Polymerization/ Neutralization	Moderate heat generation. Also, potential anionic polymerization by analogy to acrolein/hydroxide.	12
3	Acrylic Acid	4931405	10	Sodium Hydroxide, Liq. or solution	4935240	Heat/Polymerization/ Neutralization	Moderate heat generation. Also, potential anionic polymerization by analogy to acrolein/hydroxide.	12
3	Acrylic Acid	4931405	21	Sodium Metal	4916456	Heat/Polymerization/ Flammable Gas/Fire	Vigorous hydrogen evolution with possible explosion.	
3	Acrylic Acid	4931405	18	Toluene Diisocyanate	4921575	Heat/Gas	Vigorous reaction forming ArNHC(O)OC(O)CH=CH2, CO2 gas, and heat - polymerization if water present.	
26	Acrylonitrile	4906420	107	Acetic Anhydride	4931304	Compatible	No exotherm observed when mixture heated up to 300 degrees C.	12
26	Acrylonitrile	4906420	106	Ammonium Nitrate Solution	4918774	Compatible	Minimal reaction anticipated.	
26	Acrylonitrile	4906420	104	Chlorine	4904120	Heat/Fire	Potential explosion because, by analogy, bromine has caused acrylonitrile to explode.	
26	Acrylonitrile	4906420	104	Ferric Chloride Solution	4932342	Heat/Polymerization	Possible vigorous polymerization of acrylonitrile by FeCl3.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
26	Acrylonitrile	4906420	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Epoxidation of vinyl group (accelerated by base) and resulting exotherm.	
26	Acrylonitrile	4906420	31	Phenol	4921220	Heat/Polymerization	Possible polymerization of acrylonitrile by phenol	
26	Acrylonitrile	4906420	105	Phosphorus, White or Yellow	4916141	Compatible	No exotherm observed when mixture heated up to 60 degrees C.	12
26	Acrylonitrile	4906420	105	Sulfur Dioxide	4904290	Unknown		
4	Alcoholic Beverage	4910102	5	Acetaldehyde	4907210	Heat	Reacts vigorously forming acetal but reaction will be significantly moderated by water content.	5
4	Alcoholic Beverage	4910102	5	Butyraldehyde	4908119	Heat	Potential vigorous reaction that is significantly moderated by water content.	
4	Alcoholic Beverage	4910102	104	Chlorine	4904120	Heat/Fire/Explosion	Forms ethyl hypochlorite which can explode on exposure to heat or sunlight - moderated by water.	1
4	Alcoholic Beverage	4910102	34	Ethylene Oxide	4906610	Heat/Polymerization	Slow reaction at room temperature, moderated by water content.	
4	Alcoholic Beverage	4910102	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Addition of alcohols to conc. H2O2 forms hydroperoxides that can be detonated by shock or heat.	2
4	Alcoholic Beverage	4910102	34	Propylene Oxide	4906620	Heat/Polymerization	Slow reaction at room temperature by analogy to alcoholic beverage/ethylene oxide reaction.	
4	Alcoholic Beverage	4910102	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Violent reaction evolves hydrogen.	2
4	Alcoholic Beverage	4910102	18	Toluene Diisocyanate	4921575	Heat/Polymerization	Vigorous or violent urethane formation plus polymerization.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
10	Alkaline Liquid, n.o.s.	4935220	107	Acetic Anhydride	4931304	Heat	Violent hydrolysis reaction with potentially explosive boiling. Forms acetate salt.	
10	Alkaline Liquid, n.o.s.	4935220	19	Acetone	4908105	Heat	Slow aldol condensation forms 4-hydroxy-4-methyl-2-pentanone.	
10	Alkaline Liquid, n.o.s.	4935220	26	Acrylonitrile	4906420	Heat/Polymerization	Violent polymerization occurs if alkaline is concentrated.	1
10	Alkaline Liquid, n.o.s.	4935220	106	Ammonium Nitrate Solution	4918774	Heat	Will form heat.	
10	Alkaline Liquid, n.o.s.	4935220	17	Carbon Tetrachloride	4940320	Heat/Toxic Gas	Forms CCl3OH which converts to phosgene and HCL gas.	
10	Alkaline Liquid, n.o.s.	4935220	17	Chloroprene, Inhibited	4907223	Heat/Polymerization	Potentially vigorous polymerization. Slight solubility in water will limit polymerization rate.	
10	Alkaline Liquid, n.o.s.	4935220	27	Dinitrotoluene, Liquid	4963120	Heat/Explosion	Presence of alkali reduces decomposition temperature. Requires temperature >~ 150 C for explosion.	2
10	Alkaline Liquid, n.o.s.	4935220	13	Ethyl Acetate	4909160	Heat	Potentially violent base initiated hydrolysis forming acetic acid and ethanol.	
10	Alkaline Liquid, n.o.s.	4935220	34	Ethylene Oxide	4906610	Heat/Polymerization/Fire	Potentially violent polymerization with heat liberation will occur in contact with bases.	1
10	Alkaline Liquid, n.o.s.	4935220	107	Maleic Anhydride	4941161	Heat	Decomposes explosively in presence of alkalis forming maleic acid salt.	1
10	Alkaline Liquid, n.o.s.	4935220	17	Methyl Chloride	4905761	Heat	Rapid formation of methanol and chloride salt. May be violent.	
10	Alkaline Liquid, n.o.s.	4935220	19	Methyl Ethyl Ketone	4909243	Heat	Slow aldol reaction.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
10	Alkaline Liquid, n.o.s.	4935220	105	Phosphorus, White or Yellow	4916141	Heat/Flammable Gas/Toxic Gas	Yields phosphine gas when the mixture is boiled.	1
10	Alkaline Liquid, n.o.s.	4935220	34	Propylene Oxide	4906620	Heat/Polymerization/Fire	Base catalyzed polymerization may be violent or explosive.	2
10	Alkaline Liquid, n.o.s.	4935220	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Forms hydrogen gas and heat.	8
10	Alkaline Liquid, n.o.s.	4935220	16	Styrene Monomer, Inhibited	4907265	Heat/Polymerization	Potential polymerization mitigated by low solubility of styrene in water.	
10	Alkaline Liquid, n.o.s.	4935220	105	Sulfur Dioxide	4904290	Heat/Neutralization	Reacts to form alkali sulfites in solution or bisulfites if excess SO2 present.	
10	Alkaline Liquid, n.o.s.	4935220	18	Toluene Diisocyanate	4921575	Heat/Polymerization/Gas	Exothermic hydrolysis to carbamate followed by polymerization will occur in contact with bases.	2
10	Alkaline Liquid, n.o.s.	4935220	13	Vinyl Acetate	4907270	Heat	Potentially violent base initiated hydrolysis forming acetic acid and acetaldehyde.	
10	Alkaline Liquid, n.o.s.	4935220	17	Vinyl Chloride	4905792	Heat/Polymerization/Flammable Gas	Potentially vigorous polymerization with acetylene formation. Mitigated by low solubility in water.	
106	Ammonium Nitrate Solution	4918774	107	Acetic Anhydride	4931304	Heat/Fire	Probably ignites by analogy to acetic acid/ammonium nitrate. Forms acetic acid.	
106	Ammonium Nitrate Solution	4918774	107	Maleic Anhydride	4941161	Heat	Reaction of maleic anhydride with cold water is slow and non-hazardous. Forms maleic acid.	11
10	Anhydrous Ammonia	4904210	107	Acetic Anhydride	4931304	Heat	Vigorous exothermic reaction with possible explosive boiling forms acetamide and ammonium acetate.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
10	Anhydrous Ammonia	4904210	19	Acetone	4908105	Heat	Possibly violent reaction forms 2-propaneimine Moderated by volatility of NH3.	
10	Anhydrous Ammonia	4904210	26	Acrylonitrile	4906420	Heat/Polymerization	Violent polymerization of acrylonitrile upon contact with amines but moderated by volatility of NH3.	5
10	Anhydrous Ammonia	4904210	106	Ammonium Nitrate Solution	4918774	Compatible	No reaction expected.	
10	Anhydrous Ammonia	4904210	17	Carbon Tetrachloride	4940320	Heat	Possible violent chloride displacement reactions.	
10	Anhydrous Ammonia	4904210	104	Chlorine	4904120	Heat/Explosion	Excess of chlorine in ammonia explodes due to formation of extremely unstable NCl3.	1
10	Anhydrous Ammonia	4904210	17	Chloroprene, Inhibited	4907223	Heat/Polymerization	Possible vigorous polymerization reaction initiated by NH3.	
10	Anhydrous Ammonia	4904210	27	Dinitrotoluene, Liquid	4963120	Heat		
10	Anhydrous Ammonia	4904210	13	Ethyl Acetate	4909160	Heat	Vigorous reaction forming acetamide and ethanol.	
10	Anhydrous Ammonia	4904210	34	Ethylene Oxide	4906610	Heat/Polymerization/Fire	Violent polymerization with heat liberation. Reaction moderated by volatility of NH3.	2
10	Anhydrous Ammonia	4904210	107	Maleic Anhydride	4941161	Heat	Decomposes explosively in amines forming maleic acid monoamide and aminosuccinic anhydride.	1
10	Anhydrous Ammonia	4904210	17	Methyl Chloride	4905761	Heat/Flammable Gas/Toxic Gas	Potentially violent displacement reaction forming CH3NH2 and HCl plus exothermic neutralization.	
10	Anhydrous Ammonia	4904210	19	Methyl Ethyl Ketone	4909243	Heat	Exothermic formation of 2-butaneimine.	
10	Anhydrous Ammonia	4904210	24	Motor Fuel Antiknock Compound	4921445	Heat/Flammable Gas	Potential ethane formation.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
10	Anhydrous Ammonia	4904210	34	Propylene Oxide	4906620	Heat/Polymerization/Fire	Violent polymerization reaction similar to ethylene oxide/ammonia reaction.	
10	Anhydrous Ammonia	4904210	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Reacts slowly to give $NaNH_2$ and H_2. Sodium amide is very reactive with water or air.	4
10	Anhydrous Ammonia	4904210	16	Styrene Monomer, Inhibited	4907265	Heat/Polymerization	Vigorous/violent reaction which may be mitigated by low volatility of NH_3.	
10	Anhydrous Ammonia	4904210	105	Sulfur Dioxide	4904290	Heat/Neutralization	SO_2 is soluble in liquid NH_3. Reacts to form amides such as $NH_4SO_2NH_2$.	
10	Anhydrous Ammonia	4904210	18	Toluene Diisocyanate	4921575	Heat	Violent reaction forms Ar-NHC(O)NH_2.	9
10	Anhydrous Ammonia	4904210	13	Vinyl Acetate	4907270	Heat/Polymerization	Vigorous reaction forming acetamide and acetaldehyde. Potential polymerization.	
10	Anhydrous Ammonia	4904210	17	Vinyl Chloride	4905792	Heat/Polymerization/Flammable Gas	Potentially violent polymerization. Acetylene can be formed.	
7	Aniline Oil, Liquid	4921410	107	Acetic Anhydride	4931304	Heat	Violent reaction with excessive heat generated forming N-phenylacetamide.	12
7	Aniline Oil, Liquid	4921410	26	Acrylonitrile	4906420	Heat/Polymerization	Violent polymerization of acrylonitrile upon contact with amines.	5
7	Aniline Oil, Liquid	4921410	17	Carbon Tetrachloride	4940320	Heat	Substitution reaction may occur at unknown rate.	
7	Aniline Oil, Liquid	4921410	104	Chlorine	4904120	Heat/Fire	Violent chloramine formation.	
7	Aniline Oil, Liquid	4921410	17	Chloroprene, Inhibited	4907223	Heat/Polymerization	Violent and rapid polymerization.	
7	Aniline Oil, Liquid	4921410	34	Ethylene Oxide	4906610	Heat/Polymerization	Expected rapid polymerization by analogy to ammonia/ethylene oxide.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
7	Aniline Oil, Liquid	4921410	104	Ferric Chloride Solution	4932342	Heat	Weak complexation.	
7	Aniline Oil, Liquid	4921410	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Exothermic conversion to hydroxylamine. Potential explosion of H2O2 caused by heating.	
7	Aniline Oil, Liquid	4921410	107	Maleic Anhydride	4941161	Heat	Decomposes explosively in presence of amines forming N-phenylmaleic acid monoamide.	1
7	Aniline Oil, Liquid	4921410	17	Methyl Chloride	4905761	Heat	Rapid, potentially violent alkylation of aniline forms N-methylaniline hydrochloride.	
7	Aniline Oil, Liquid	4921410	24	Motor Fuel Antiknock Compound	4921445	Heat/Flammable Gas	Potential ethane formation.	
7	Aniline Oil, Liquid	4921410	105	Phosphorus, White or Yellow	4916141	Compatible	No exotherm observed when mixture was heated to 60 degrees C.	12
7	Aniline Oil, Liquid	4921410	34	Propylene Oxide	4906620	Heat/Polymerization	Exotherm observed when mixture was heated between 200 and 300 C. Possible polymerization.	12
7	Aniline Oil, Liquid	4921410	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Violent electron transfer expected analagous to Birch reduction. Hydrogen evolution expected.	
7	Aniline Oil, Liquid	4921410	18	Toluene Diisocyanate	4921575	Heat	Violent reaction with urea formation.	12
7	Aniline Oil, Liquid	4921410	17	Vinyl Chloride	4905792	Heat/Polymerization/Flammable Gas	Potentially violent anionic polymerization. May form acetylene.	
16	Benzene	4908110	104	Chlorine	4904120	Heat/Fire	Explosion of benzene vapors and chlorine was initiated by light.	1
16	Benzene	4908110	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	May form combinations that are sensitive to heat or shock.	10

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
28	Butadiene	4905704	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
28	Butadiene	4905704	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
28	Butadiene	4905704	104	Ferric Chloride Solution	4932342	Heat/Polymerization	Analagous to AlCl3 in non-aqueous environment being used to polymerize butadiene.	
28	Butadiene	4905704	104	Hydrogen Peroxide Solution	4918335	Heat/Polymerization/ Explosion	Very reactive polymerization initiator with trace of Fe+2 (Fenton's reagent). Epoxidation may occur.	
28	Butadiene	4905704	31	Phenol	4921220	Heat/Polymerization	Pressure increased when combined in presence of a catalyst and solvent causing bottle to rupture.	1
28	Butadiene	4905704	105	Phosphorus, White or Yellow	4916141	Compatible	No exotherm observed when mixture was heated to 60 degrees C.	12
28	Butadiene, Inhibited	4905703	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
28	Butadiene, Inhibited	4905703	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
28	Butadiene, Inhibited	4905703	104	Ferric Chloride Solution	4932342	Heat/Polymerization	Probable slow polymerization as with non-inhibited material.	
28	Butadiene, Inhibited	4905703	104	Hydrogen Peroxide Solution	4918335	Heat/Polymerization/ Explosion	Exotherm from epoxidation and polymerization may cause H2O2 to explode.	
28	Butadiene, Inhibited	4905703	31	Phenol	4921220	Heat/Polymerization	Pressure increased when combined in presence of a catalyst and solvent causing bottle to rupture.	1

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
28	Butadiene, Inhibited	4905703	105	Phosphorus, White or Yellow	4916141	Compatible	No exotherm observed when mixture was heated to 60 degrees C.	12
29	Butane	4905702	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
29	Butane	4905706	104	Hydrogen Peroxide Solution	4918335	Compatible	No reaction anticipated.	
13	Butyl Acrylate (Corr. L., n.o.s.)	4912215	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
13	Butyl Acrylate (Corr. L., n.o.s.)	4912215	104	Chlorine	4904120	Heat/Fire	Potentially vigorous/violent oxidation.	
13	Butyl Acrylate (Corr. L., n.o.s.)	4912215	104	Ferric Chloride Solution	4932342	Heat/Polymerization	Possible polymerization.	
13	Butyl Acrylate (Corr. L., n.o.s.)	4912215	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Epoxidation (or polymerization) can lead to exotherm causing explosion of H2O2.	
13	Butyl Acrylate (Corr. L., n.o.s.)	4912215	105	Phosphorus, White or Yellow	4916141	Compatible	No reaction expected.	
13	Butyl Acrylate (Corr. L., n.o.s.)	4912215	21	Sodium Metal	4916456	Heat/Polymerization/Fire	Probable vigorous/violent polymerization with acyloin formation - 5-hydroxy-4-octanone.	
4	Butyl Alcohol	4909129	5	Acetaldehyde	4907210	Heat	Reacts vigorously forming 1,1-di(n-butoxy) ethane.	5
4	Butyl Alcohol	4909129	5	Butyraldehyde	4908119	Heat	Potential vigorous reaction forming 1,1-di(n-butoxy) butane.	
4	Butyl Alcohol	4909129	104	Chlorine	4904120	Heat/Fire/Explosion	Forms butyl hypochlorite which can violently explode on exposure to heat or sunlight.	1
4	Butyl Alcohol	4909129	34	Ethylene Oxide	4906610	Heat/Polymerization	Slow reaction at room temperature in absence of acidic or basic catalysts.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
4	Butyl Alcohol	4909129	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Addition of alcohols to conc. H2O2 forms hydroperoxides that can be detonated by shock or heat.	2
4	Butyl Alcohol	4909129	34	Propylene Oxide	4906620	Heat/Polymerization	Slow reaction at room temperature in absence of acidic or basic catalysts.	
4	Butyl Alcohol	4909129	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Hydrogen evolution.	
4	Butyl Alcohol	4909129	18	Toluene Diisocyanate	4921575	Heat	Violent urethane formation (ArNHCO2C8H17).	
5	Butyraldehyde	4908119	107	Acetic Anhydride	4931304	Heat	Condensation reaction (abnormal Perkins reaction) is probably slow. Forms vinyl acetate.	1
5	Butyraldehyde	4908119	10	Alkaline Liquid, n.o.s.	4935220	Heat/Polymerization	Potentially violent aldol condensation forms - 2-ethyl-3-hydroxybutanal and polymerization.	
5	Butyraldehyde	4908119	10	Anhydrous Ammonia	4904210	Heat/Polymerization	Potentially violent butaneimine formation and polymerization by analogy to acetaldehyde/ammonia.	
5	Butyraldehyde	4908119	7	Aniline Oil, Liquid	4921410	Heat/Polymerization	Minimal heat generated. Possible polymerization and imine formation - N-butylidenebenzeneamine.	12
5	Butyraldehyde	4908119	104	Chlorine	4904120	Heat/Fire	Probable rapid oxidation.	
5	Butyraldehyde	4908119	27	Dinitrotoluene, Liquid	4963120	Heat/Explosion	Potentially vigorous reaction under basic conditions.	
5	Butyraldehyde	4908119	34	Ethylene Oxide	4906610	Compatible	May form cyclic acetal but reaction is expected to be slow at ambient temperature.	
5	Butyraldehyde	4908119	104	Ferric Chloride Solution	4932342	Heat/Polymerization	Possible vigorous cationic polymerization by analogy to acetaldehyde/FeCl3.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
5	Butyraldehyde	4908119	7	Hexamethylene Diamine Solution	4935645	Heat/Polymerization	Potentially vigorous polymerization and imine formation - N,N'-dibutylidene-1,6-hexanediamine.	
5	Butyraldehyde	4908119	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Alpha-hydroperoxides will be formed which are explosive.	
5	Butyraldehyde	4908119	31	Phenol	4921220	Heat/Fire	Reacts vigorously forming 1,1-bis(4-hydroxyphenyl) ethane. Promoted by acid.	
5	Butyraldehyde	4908119	105	Phosphorus, White or Yellow	4916141	Compatible	No exotherm observed when mixture heated to 60 degrees C.	12
5	Butyraldehyde	4908119	10	Potassium Hydroxide, Liq. or solution	4935230	Heat/Polymerization	Potentially violent aldol condensation forms 2-ethyl-3-hydroxybutanal and polymerization.	
5	Butyraldehyde	4908119	34	Propylene Oxide	4906620	Compatible	Possible cyclic acetal formation. Slow reaction at ambient temperature.	
5	Butyraldehyde	4908119	10	Sodium Hydroxide, Liq. or solution	4935240	Heat/Polymerization	Potentially violent aldol condensation forms 2-ethyl-3-hydroxybutanal and polymerization.	
5	Butyraldehyde	4908119	10	Sodium Hydroxide, liq. or solution	4935243	Heat/Polymerization	Potentially violent aldol condensation forms 2-ethyl-3-hydroxybutanal and polymerization.	
5	Butyraldehyde	4908119	21	Sodium Metal	4916456	Heat/Fire	Very violent reaction forms pinacol dianion formation.	
5	Butyraldehyde	4908119	18	Toluene Diisocyanate	4921575	Heat	Potential reaction of enol.	
20	Carbon Disulfide	4908125	104	Chlorine	4904120	Heat/Fire/Toxic Gas	Liquid chlorine added to CS2 in presence of an iron surface resulted in an explosion.	1
20	Carbon Disulfide	4908125	34	Ethylene Oxide	4906610	Compatible	Exotherm expected if heated.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
20	Carbon Disulfide	4908125	104	Ferric Chloride Solution	4932342	Heat/Polymerization	Possible polymerization of CS2.	
20	Carbon Disulfide	4908125	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Toxic Gas/Explosion		
20	Carbon Disulfide	4908125	34	Propylene Oxide	4906620	Compatible	Exotherm observed when mixture was heated between 200 and 300 degrees C.	12
20	Carbon Disulfide	4908125	21	Sodium Metal	4916456	Heat/Fire	Mixtures of sodium and CS2 are shock-sensitive explosives.	2
20	Carbon Disulfide	4908125	105	Sulfur Dioxide	4904290	Compatible	SO2 is soluble in CS2 when heated, separates out when cooled.	6
17	Carbon Tetrachloride	4940320	20	Carbon Disulfide	4908125	Heat		
17	Carbon Tetrachloride	4940320	104	Chlorine	4904120	Compatible	Probably no reaction.	
17	Carbon Tetrachloride	4940320	104	Hydrogen Peroxide Solution	4918335	Compatible	No reaction expected.	
17	Carbon Tetrachloride	4940320	105	Phosphorus, White or Yellow	4916141	Compatible	No reaction expected.	
17	Carbon Tetrachloride	4940320	21	Sodium Metal	4916456	Heat	Reacts violently with hot sodium.	1
104	Chlorine	4904120	107	Acetic Anhydride	4931304	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
104	Chlorine	4904120	106	Ammonium Nitrate Solution	4918774	Heat/Explosion	Forms chloramine nitrate, nitrosyl chloride, NHCl2 and heat that may cause NH4NO3 to explode.	
104	Chlorine	4904120	107	Maleic Anhydride	4941161	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
104	Chlorine	4904120	105	Phosphorus, White or Yellow	4916141	Heat/Fire/Toxic Gas	White phosphorus burns spontaneously or reacts explosively in gaseous chlorine forming PCl3.	1

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
17	Chloroprene, Inhibited	4907223	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
17	Chloroprene, Inhibited	4907223	20	Carbon Disulfide	4908125	Compatible	Probably no reaction.	
17	Chloroprene, Inhibited	4907223	104	Chlorine	4904120	Heat/Fire	Potentially violent 1,2- and 1,4- chlorination of diene.	
17	Chloroprene, Inhibited	4907223	104	Ferric Chloride Solution	4932342	Heat/Polymerization	Possible rapid, violent polymerization mitigated by water content.	
17	Chloroprene, Inhibited	4907223	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Probable polymerization initiator. Heat could lead to H2O2 decomposition causing an explosion.	
17	Chloroprene, Inhibited	4907223	24	Motor Fuel Antiknock Compound	4921445	Heat/Polymerization	Potential anionic polymerization.	
17	Chloroprene, Inhibited	4907223	105	Phosphorus, White or Yellow	4916141	Compatible	No reaction expected.	
17	Chloroprene, Inhibited	4907223	21	Sodium Metal	4916456	Heat/Polymerization/Fire	Sodium forms explosive mixtures with chlorinated hydrocarbons. Violent anionic polymerization.	1
101	Coal Tar Distillate	4915363	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
101	Coal Tar Distillate	4915363	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
101	Coal Tar Distillate	4915363	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Heat evolution if alkenes, aldehydes, ketones, or alcohols are present - peroxidation/epoxidation.	
101	Combustible Liquid, n.o.s.	4915185	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
101	Combustible Liquid, n.o.s.	4915185	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
101	Combustible Liquid, n.o.s.	4915185	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Heat evolution if alkenes, aldehydes, ketones, or alcohols are present - peroxidation/epoxidation.	
101	Compound, Cleaning, Liquid	4915147	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
101	Compound, Cleaning, Liquid	4915147	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
101	Compound, Cleaning, Liquid	4915147	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Heat evolution if alkenes, aldehydes, ketones, or alcohols are present - peroxidation/epoxidation.	
101	Crude Oil Petroleum	4910165	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
101	Crude Oil Petroleum	4910165	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
101	Crude Oil Petroleum	4910165	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Heat evolution if contains alkenes. May form combinations that are sensitive to heat or shock.	10
29	Cyclohexane	4908132	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
29	Cyclohexane	4908132	104	Hydrogen Peroxide Solution	4918335	Compatible	May form combinations that are sensitive to heat or shock.	10
4	Denatured Alcohol	4909151	5	Acetaldehyde	4907210	Heat	Reacts vigorously forming acetal (b.p. = 103 C).	5

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
4	Denatured Alcohol	4909141	5	Acetaldehyde	4907210	Heat	Reacts vigorously forming acetal (b.p. = 103 C).	5
4	Denatured Alcohol	4909151	5	Butyraldehyde	4908119	Heat	Potential vigorous reaction forming 1,1-diethoxybutane.	
4	Denatured Alcohol	4909141	5	Butyraldehyde	4908119	Heat	Potential vigorous reaction forming 1,1-diethoxybutane.	
4	Denatured Alcohol	4909151	104	Chlorine	4904120	Heat/Fire/Explosion	Forms ethyl hypochlorite which can violently explode on exposure to heat or sunlight.	1
4	Denatured Alcohol	4909141	104	Chlorine	4904120	Heat/Fire/Explosion	Forms ethyl hypochlorite which can violently explode on exposure to heat or sunlight.	1
4	Denatured Alcohol	4909151	34	Ethylene Oxide	4906610	Heat/Polymerization	Slow reaction at room temperature in absence of acidic or basic catalysts.	1
4	Denatured Alcohol	4909141	34	Ethylene Oxide	4906610	Heat/Polymerization	Slow reaction at room temperature in absence of acidic or basic catalysts.	1
4	Denatured Alcohol	4909151	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Addition of alcohols to conc. H2O2 forms hydroperoxides that can be detonated by shock or heat.	2
4	Denatured Alcohol	4909141	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Addition of alcohols to conc. H2O2 forms hydroperoxides that can be detonated by shock or heat.	2
4	Denatured Alcohol	4909151	34	Propylene Oxide	4906620	Heat/Polymerization	Slow reaction at room temperature in absence of acidic or basic catalysts.	
4	Denatured Alcohol	4909141	34	Propylene Oxide	4906620	Heat/Polymerization	Slow reaction at room temperature in absence of acidic or basic catalysts.	
4	Denatured Alcohol	4909151	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Violent reaction evolves hydrogen.	2

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
4	Denatured Alcohol	4909141	21	Sodium Metal	4916458	Heat/Flammable Gas/Fire	Violent reaction evolves hydrogen.	2
4	Denatured Alcohol	4909151	18	Toluene Diisocyanate	4921575	Heat/Fire	Potentially violent urethane formation (ArNHCO2C8H17) with excessive heat generation.	12
4	Denatured Alcohol	4909141	18	Toluene Diisocyanate	4921575	Heat/Fire	Potentially violent urethane formation (ArNHCO2C8H17) with excessive heat generation.	12
27	Dinitrotoluene, Liquid	4963120	107	Acetic Anhydride	4931304	Heat	Slow acetylation of methyl group - catalyzed by bases.	
27	Dinitrotoluene, Liquid	4963120	104	Chlorine	4904120	Heat/Explosion	Potentially violent chlorination (oxidation) of methyl groups.	
27	Dinitrotoluene, Liquid	4963120	104	Ferric Chloride Solution	4932342	Compatible	Reaction not self-evident.	
27	Dinitrotoluene, Liquid	4963120	104	Hydrogen Peroxide Solution	4918335	Heat/Explosion	Have activated methyl hydrogen atoms for abstraction by hydroxyl radical with potential exotherm.	
27	Dinitrotoluene, Liquid	4963120	107	Maleic Anhydride	4941161	Heat/Polymerization	Slow conjugate addition and consequent polymerization.	
27	Dinitrotoluene, Liquid	4963120	105	Phosphorus, White or Yellow	4916141	Heat/Explosion		
101	Distillate Fuel Oil	2911315	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
101	Distillate Fuel Oil	2911315	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
101	Distillate Fuel Oil	2911315	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	If unsaturation exists, heat evolution can occur. May form combinations sensitive to heat or shock.	10
13	Ethyl Acetate	4909160	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
13	Ethyl Acetate	4909160	104	Chlorine	4904120	Heat/Fire	Potentially violent oxidation reaction.	
13	Ethyl Acetate	4909160	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Possible formation of perester {CH3C(O)OOCH2CH3} can lead to exotherm causing explosion of H2O2.	
13	Ethyl Acetate	4909160	105	Phosphorus, White or Yellow	4916141	Compatible	No reaction expected.	
13	Ethyl Acetate	4909160	21	Sodium Metal	4916456	Heat/Fire	Potentially violent acyloin reaction forming 3-hydroxy-2-butanone.	
13	Ethyl Acrylate, inhibited	4907215	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
13	Ethyl Acrylate, inhibited	4907215	104	Chlorine	4904120	Heat/Fire	Potentially violent addition and oxidation reactions.	
13	Ethyl Acrylate, inhibited	4907215	104	Ferric Chloride Solution	4932342	Heat/Polymerization	Possible polymerization.	
13	Ethyl Acrylate, inhibited	4907215	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Epoxidation (or polymerization) can lead to exotherm causing explosion of H2O2.	
13	Ethyl Acrylate, inhibited	4907215	105	Phosphorus, White or Yellow	4916141	Compatible	No reaction expected.	
13	Ethyl Acrylate, inhibited	4907215	21	Sodium Metal	4916456	Heat/Polymerization/Fire	Violent polymerization and acyloin condensation forms 4-hydroxy-1,5-hexadien-3-one.	
4	Ethyl Alcohol	4909159	5	Acetaldehyde	4907210	Heat	Reacts vigorously forming acetal (b.p. = 103 C).	5
4	Ethyl Alcohol	4909159	5	Butyraldehyde	4908119	Heat	Potential vigorous reaction forming 1,1-diethoxybutane.	
4	Ethyl Alcohol	4909159	104	Chlorine	4904120	Heat/Fire/Explosion	Forms ethyl hypochlorite which can violently explode on exposure to heat or sunlight.	1

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
4	Ethyl Alcohol	4909159	34	Ethylene Oxide	4906610	Heat/Polymerization	Slow reaction at room temperature in absence of acidic or basic catalysts.	1
4	Ethyl Alcohol	4909159	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Addition of alcohols to conc. H2O2 forms hydroperoxides that can be detonated by shock or heat.	2
4	Ethyl Alcohol	4909159	34	Propylene Oxide	4906620	Heat/Polymerization	Slow reaction at room temperature in absence of acidic or basic catalysts.	
4	Ethyl Alcohol	4909159	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Violent reaction evolves hydrogen.	2
4	Ethyl Alcohol	4909159	18	Toluene Diisocyanate	4921575	Heat/Fire	Potentially violent urethane formation (ArNHCO2C8H17) with excessive heat generation.	12
34	Ethylene Oxide	4906610	106	Ammonium Nitrate Solution	4918774	Compatible	Slow, non-hazardous reaction forms ethylene glycol in water.	11
34	Ethylene Oxide	4906610	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	
34	Ethylene Oxide	4906610	104	Ferric Chloride Solution	4932342	Heat/Polymerization	Polymerization with heat liberation may occur in contact with aqueous iron chlorides.	1
34	Ethylene Oxide	4906610	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Alpha positions are activated to attack by hydroxyl radicals generating hydroperoxides - explosive.	
34	Ethylene Oxide	4906610	105	Phosphorus, White or Yellow	4916141	Heat/Polymerization		
34	Ethylene Oxide	4906610	105	Sulfur Dioxide	4904290	Unknown		
104	Ferric Chloride Solution	4932342	107	Acetic Anhydride	4931304	Heat	Vigorous hydrolysis forms a solution that is electrically conductive.	6

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
104	Ferric Chloride Solution	4932342	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium salts dissolve in aqueous solution with cooling.	
104	Ferric Chloride Solution	4932342	104	Hydrogen Peroxide Solution	4918335	Heat/Explosion	Potentially violent release of oxygen by Fe+3 catalyzed decomposition of H2O2.	
104	Ferric Chloride Solution	4932342	107	Maleic Anhydride	4941161	Heat	Potentially vigorous hydrolysis of anhydride catalyzed by FeCl3 forming maleic acid.	
104	Ferric Chloride Solution	4932342	105	Phosphorus, White or Yellow	4918141	Heat	Forms phosphoric acid and ferrous chloride.	6
101	Flammable Liquid, n.o.s.	4910185	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
101	Flammable Liquid, n.o.s.	4910185	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
101	Flammable Liquid, n.o.s.	4910185	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Heat evolution if liquid contains unsaturated hydrocarbons, aldehydes, ketones, alcohols.	
5	Formaldehyde Solution	4913144	107	Acetic Anhydride	4931304	Heat	Abnormal Perkin reaction may occur slowly (catalyzed in basic conditions). Also, hydrolysis reaction.	
5	Formaldehyde Solution	4913168	107	Acetic Anhydride	4931304	Heat	Abnormal Perkin reaction may occur slowly (catalyzed in basic conditions). Also, hydrolysis reaction.	
5	Formaldehyde Solution	4913168	10	Alkaline Liquid, n.o.s.	4935220	Heat/Polymerization	Potentially violent polymerization. Also, Cannizzaro reaction forming methanol and formic acid.	
5	Formaldehyde Solution	4913144	10	Alkaline Liquid, n.o.s.	4935220	Heat/Polymerization	Potentially violent polymerization. Also, Cannizzaro reaction forming methanol and formic acid.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
5	Formaldehyde Solution	4913168	10	Anhydrous Ammonia	4904210	Heat/Polymerization	Condensation reaction forming methaneimine or hexamethylene tetramine. Potential polymerization.	13
5	Formaldehyde Solution	4913144	10	Anhydrous Ammonia	4904210	Heat/Polymerization	Condensation reaction forming methaneimine or hexamethylene tetramine. Potential polymerization.	13
5	Formaldehyde Solution	4913168	7	Aniline Oil, Liquid	4921410	Heat/Polymerization	Vigorous reaction forms N-methylidenebenzeneamine. Mitigated by water content.	
5	Formaldehyde Solution	4913144	7	Aniline Oil, Liquid	4921410	Heat/Polymerization	Vigorous reaction forms N-methylidenebenzeneamine. Mitigated by water content.	
5	Formaldehyde Solution	4913168	104	Chlorine	4904120	Heat/Fire	May be violent.	
5	Formaldehyde Solution	4913144	104	Chlorine	4904120	Heat/Fire	May be violent.	
5	Formaldehyde Solution	4913168	27	Dinitrotoluene, Liquid	4963120	Compatible	No reaction expected.	
5	Formaldehyde Solution	4913144	27	Dinitrotoluene, Liquid	4963120	Compatible	No reaction expected.	
5	Formaldehyde Solution	4913168	34	Ethylene Oxide	4906610	Heat	Acetal formation may be faster than acetaldehyde/ethylene oxide rate but moderated by water content.	
5	Formaldehyde Solution	4913144	34	Ethylene Oxide	4906610	Heat	Acetal formation may be faster than acetaldehyde/ethylene oxide rate but moderated by water content.	
5	Formaldehyde Solution	4913168	104	Ferric Chloride Solution	4932342	Heat/Polymerization	Polymerization of formaldehyde moderated by water content.	
5	Formaldehyde Solution	4913144	104	Ferric Chloride Solution	4932342	Heat/Polymerization	Polymerization of formaldehyde moderated by water content.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
5	Formaldehyde Solution	4913144	7	Hexamethylene Diamine Solution	4935645	Heat/Polymerization	Polymerization of formaldehyde and formation of amine N-methylols and imines.	
5	Formaldehyde Solution	4913168	7	Hexamethylene Diamine Solution	4935645	Heat/Polymerization	Polymerization of formaldehyde and formation of amine N-methylols and imines.	
5	Formaldehyde Solution	4913144	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Impact sensitive compounds may be formed depending upon hydroxyhydroperoxides concentration.	3
5	Formaldehyde Solution	4913168	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Impact sensitive compounds may be formed depending upon hydroxyhydroperoxides concentration.	3
5	Formaldehyde Solution	4913144	105	Phosphorus, White or Yellow	4916141	Compatible	No reaction expected.	
5	Formaldehyde Solution	4913168	105	Phosphorus, White or Yellow	4916141	Compatible	No reaction expected.	
5	Formaldehyde Solution	4913144	10	Potassium Hydroxide, Liq. or solution	4935230	Heat/Polymerization	Vigorous polymerization and Cannizzaro reaction forming methanol and formic acid.	
5	Formaldehyde Solution	4913168	10	Potassium Hydroxide, Liq. or solution	4935230	Heat/Polymerization	Vigorous polymerization and Cannizzaro reaction forming methanol and formic acid.	
5	Formaldehyde Solution	4913144	34	Propylene Oxide	4906620	Compatible	Probably slow rate of formation of cyclic acetal at ambient temperature.	
5	Formaldehyde Solution	4913168	34	Propylene Oxide	4906620	Compatible	Probably slow rate of formation of cyclic acetal at ambient temperature.	
5	Formaldehyde Solution	4913144	10	Sodium Hydroxide, Liq. or solution	4935240	Heat/Polymerization	Vigorous polymerization and Cannizzaro reaction forming methanol and formic acid.	
5	Formaldehyde Solution	4913144	10	Sodium Hydroxide, liq. or solution	4935243	Heat/Polymerization	Vigorous polymerization and Cannizzaro reaction forming methanol and formic acid.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
5	Formaldehyde Solution	4913168	10	Sodium Hydroxide, Liq. or solution	4935240	Heat/Polymerization	Vigorous polymerization and Cannizzaro reaction forming methanol and formic acid.	
5	Formaldehyde Solution	4913168	10	Sodium Hydroxide, liq. or solution	4935243	Heat/Polymerization	Vigorous polymerization and Cannizzaro reaction forming methanol and formic acid.	
5	Formaldehyde Solution	4913144	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Hydrogen evolution.	
5	Formaldehyde Solution	4913168	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Hydrogen evolution.	
5	Formaldehyde Solution	4913168	18	Toluene Diisocyanate	4921575	Heat	Potential reaction of enol.	
5	Formaldehyde Solution	4913144	18	Toluene Diisocyanate	4921575	Heat	Potential reaction of enol.	
101	Fuel Oil	4915113	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
101	Fuel Oil	4915112	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
101	Fuel Oil	4915111	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
101	Fuel Oil	4915112	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
101	Fuel Oil	4915111	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
101	Fuel Oil	4915113	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
101	Fuel Oil	4915112	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	If alkenes, aldehydes or ketones are present, heat will be evolved from peroxidation/epoxidation.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
101	Fuel Oil	4915111	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	If alkenes, aldehydes or ketones are present heat will be evolved from peroxidation/epoxidation.	
101	Fuel Oil	4915113	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	If alkenes, aldehydes or ketones are present, heat will be evolved from peroxidation/epoxidation.	
101	Fuel, Aviation, Turbine Engine	4915167	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
101	Fuel, Aviation, Turbine Engine	4909215	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
101	Fuel, Aviation, Turbine Engine	4909215	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
101	Fuel, Aviation, Turbine Engine	4915167	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
101	Fuel, Aviation, Turbine Engine	4909215	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Minimal effect expected unless fuel contains unsaturation, aldehydes, ketones or alcohols.	
101	Fuel, Aviation, Turbine Engine	4915167	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Minimal effect expected unless fuel contains unsaturation, aldehydes, ketones or alcohols.	
101	Gasoline	4908178	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
101	Gasoline	4908178	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
101	Gasoline	4908178	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Minimal effect due to lack of functionalization. May form combinations sensitive to heat or shock.	10

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
101	Gasoline, nec	2911190	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
101	Gasoline, nec	2911190	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
101	Gasoline, nec	2911190	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Minimal effect due to lack of functionalization. May form combinations sensitive to heat or shock.	10
14	Glycol Ethers, nec (C.L., n.o.s.)	4913194	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons, causing ignition.	
14	Glycol Ethers, nec (C.L., n.o.s.)	4913194	34	Ethylene Oxide	4906610	Compatible	No reaction expected.	
14	Glycol Ethers, nec (C.L., n.o.s.)	4913194	104	Ferric Chloride Solution	4932342	Heat	Complexation occurs.	
14	Glycol Ethers, nec (C.L., n.o.s.)	4913194	104	Hydrogen Peroxide Solution	4918335	Explosive Mixture	Ethers are used as solvents for H_2O_2 reactions but unstable hydroperoxides may form if Fe^{+2} present.	
14	Glycol Ethers, nec (C.L., n.o.s.)	4913194	34	Propylene Oxide	4906620	Compatible	No reaction expected (unless alcohol function is present)	
14	Glycol Ethers, nec (C.L., n.o.s.)	4913194	21	Sodium Metal	4916456	Compatible	No reaction expected if alcohol functionality is not present. Ether may be used as solvent for Na.	
14	Glycol Ethers, nec (C.L., n.o.s.)	4913194	18	Toluene Diisocyanate	4921575	Compatible	No reaction expected (unless alcohol function is present)	
7	Hexamethylene Diamine Solution	4935645	107	Acetic Anhydride	4931304	Heat	Potentially violent formation of N,N'-diacetyl-1,6-hexanediamine with explosive boiling.	
7	Hexamethylene Diamine Solution	4935645	26	Acrylonitrile	4906420	Heat/Polymerization	Violent polymerization upon contact with amines.	5

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
7	Hexamethylene Diamine Solution	4935645	17	Carbon Tetrachloride	4940320	Heat	Potential vigorous displacement or reaction.	
7	Hexamethylene Diamine Solution	4935645	104	Chlorine	4904120	Heat/Fire	Vigorous chloramine formation moderated by water content.	
7	Hexamethylene Diamine Solution	4935645	17	Chloroprene, Inhibited	4907223	Heat/Polymerization	Potentially vigorous or violent polymerization.	
7	Hexamethylene Diamine Solution	4935645	34	Ethylene Oxide	4906610	Heat/Polymerization	Potentially violent ring opening and polymerization.	
7	Hexamethylene Diamine Solution	4935645	104	Ferric Chloride Solution	4932342	Heat	Complexation.	
7	Hexamethylene Diamine Solution	4935645	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Forms hydroxylamines and other oxidation products. Potential explosion of H2O2 caused by heating.	
7	Hexamethylene Diamine Solution	4935645	107	Maleic Anhydride	4941161	Heat	Decomposes explosively in presence of amines.	1
7	Hexamethylene Diamine Solution	4935645	17	Methyl Chloride	4905761	Heat	Potentially violent displacement reaction.	
7	Hexamethylene Diamine Solution	4935645	24	Motor Fuel Antiknock Compound	4921445	Heat	Probable complexation.	
7	Hexamethylene Diamine Solution	4935645	105	Phosphorus, White or Yellow	4916141	Compatible	No reaction expected.	
7	Hexamethylene Diamine Solution	4935645	34	Propylene Oxide	4906620	Heat/Polymerization	Potentially vigorous or violent ring opening and polymerization.	
7	Hexamethylene Diamine Solution	4935645	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Hydrogen evolution possible.	
7	Hexamethylene Diamine Solution	4935645	18	Toluene Diisocyanate	4921575	Heat/Polymerization	Violent polymerization.	
7	Hexamethylene Diamine Solution	4935645	17	Vinyl Chloride	4905792	Heat/Polymerization/Flammable Gas	Potentially vigorous/violent polymerization. Acetylene could be generated.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
29	Hexane	4908183	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
29	Hexane	4908183	104	Hydrogen Peroxide Solution	4918335	Compatible	No reaction anticipated.	
1	Hydrochloric Acid	4930228	5	Acetaldehyde	4907210	Heat/Polymerization	Vigorous polymerization in acids and aldol condensation forms 2-butenal and 3-hydroxybutanal.	2
1	Hydrochloric Acid	4930228	3	Acetic Acid, Glacial	4931303	Heat	Heat generated from hydration of glacial acetic acid.	5
1	Hydrochloric Acid	4930228	107	Acetic Anhydride	4931304	Heat/Fire	Mixing acetic anhydride with water can be explosive in aqueous mineral acids. Forms acetic acid.	1
1	Hydrochloric Acid	4930228	19	Acetone	4908105	Heat	Acid catalyzed aldol condensation generates some heat and diacetone alcohol (Slow reaction).	8
1	Hydrochloric Acid	4930228	3	Acrylic Acid	4931405	Heat/Polymerization	Heat could initiate slow polymerization but primarily a hydration reaction.	
1	Hydrochloric Acid	4930228	26	Acrylonitrile	4906420	Heat/Polymerization	Potentially a vigorous reaction with strong acids - hydrolysis plus polymerization.	5
1	Hydrochloric Acid	4930228	4	Alcoholic Beverage	4910102	Heat/Flammable Gas/Toxic Gas	Very slow displacement reaction generates ethyl chloride (b.p.=12.5 C), water and some heat.	8
1	Hydrochloric Acid	4930228	10	Alkaline Liquid, n.o.s.	4935220	Heat/Neutralization	Violent neutralization reaction.	5
1	Hydrochloric Acid	4930228	106	Ammonium Nitrate Solution	4918774	Compatible	May form NOCl if heated.	
1	Hydrochloric Acid	4930228	10	Anhydrous Ammonia	4904210	Heat/Neutralization	Violent neutralization generates NH_4Cl and heat that volatilizes excess NH_3.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrochloric Acid	4930228	7	Aniline Oil, Liquid	4921410	Heat/Neutralization	Vigorous acid/base neutralization reaction generates heat and aniline hydrochloride.	12
1	Hydrochloric acid	4930228	28	Butadiene	4905704	Heat/Polymerization	Moderate acid catalyzed cationic polymerization mitigated by low solubility of butadiene in water.	
1	Hydrochloric acid	4930228	28	Butadiene, Inhibited	4905703	Heat/Polymerization	Moderate acid catalyzed cationic polymerization mitigated by low solubility of butadiene in water.	
1	Hydrochloric acid	4930228	13	Butyl Acrylate (Corr. L., n.o.s.)	4912215	Heat/Polymerization	Potentially vigorous polymerization and hydrolysis reaction forms acrylic acid and butanol.	
1	Hydrochloric Acid	4930228	4	Butyl Alcohol	4909129	Heat	Slow displacement reaction generates butyl chloride, water, and some heat.	8
1	Hydrochloric Acid	4930228	5	Butyraldehyde	4908119	Heat/Polymerization	Minimal heat generated but potential polymerization through carbonyl group or aldol condensation.	12
1	Hydrochloric Acid	4930228	20	Carbon Disulfide	4908125	Compatible	No reaction expected because CS2 is insoluble in aqueous solutions.	
1	Hydrochloric Acid	4930228	17	Carbon Tetrachloride	4940320	Compatible	No reaction anticipated.	
1	Hydrochloric Acid	4930228	104	Chlorine	4904120	Heat	Liquid chlorine will be volatilized by warmer HCl solution to give chlorine gas and transpired HCl.	
1	Hydrochloric Acid	4930228	17	Chloroprene, Inhibited	4907223	Heat/Polymerization/Fire	Potentially vigorous/violent polymerization mitigated by low solubility of chloroprene in water.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrochloric Acid	4930228	101	Coal Tar Distillate	4915363	Heat	Minimal heat generated.	
1	Hydrochloric Acid	4930228	101	Combustible Liquid, n.o.s.	4915185	Heat	Minimal heat generated.	
1	Hydrochloric Acid	4930228	101	Compound, Cleaning, Liquid	4915147	Heat	Minimal heat generated.	
1	Hydrochloric Acid	4930228	101	Crude Oil Petroleum	4910165	Heat	Minimal heat generated.	
1	Hydrochloric Acid	4930228	4	Denatured Alcohol	4909151	Heat/Flammable Gas/Toxic Gas	Slow displacement reaction generates ethyl chloride (b.p.=12.5 C), water, and some heat.	8
1	Hydrochloric Acid	4930228	4	Denatured Alcohol	4909141	Heat/Flammable Gas/Toxic Gas	Slow displacement reaction generates ethyl chloride (b.p.=12.5 C), water, and some heat.	8
1	Hydrochloric Acid	4930228	101	Distillate Fuel Oil	2911315	Heat	Minimal heat generated.	
1	Hydrochloric Acid	4930228	13	Ethyl Acetate	4909160	Heat	Potentially vigorous acid catalyzed hydrolysis reaction forms acetic acid and ethanol.	
1	Hydrochloric Acid	4930228	13	Ethyl Acrylate, inhibited	4907215	Heat/Polymerization	Potentially vigorous polymerization and hydrolysis reaction forms acrylic acid and ethanol.	
1	Hydrochloric Acid	4930228	4	Ethyl Alcohol	4909159	Heat/Flammable Gas/Toxic Gas	Slow displacement reaction generates ethyl chloride (b.p.=12.5 C), water, and some heat.	8
1	Hydrochloric Acid	4930228	34	Ethylene Oxide	4906610	Heat/Polymerization	Polymerization may occur in contact with acids. Violent reaction by analogy to HCl/propylene oxide.	1
1	Hydrochloric Acid	4930228	101	Flammable Liquid, n.o.s.	4910185	Heat	Minimal heat generated.	
1	Hydrochloric Acid	4930228	5	Formaldehyde Solution	4913168	Heat/Polymerization	Potentially vigorous polymerization moderated by water content.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrochloric Acid	4930228	5	Formaldehyde Solution	4913144	Heat/Polymerization	Potentially vigorous polymerization moderated by water content.	
1	Hydrochloric Acid	4930228	101	Fuel Oil	4915111	Heat	Minimal heat generated.	
1	Hydrochloric Acid	4930228	101	Fuel Oil	4915113	Heat	Minimal heat generated.	
1	Hydrochloric Acid	4930228	101	Fuel Oil	4915112	Heat	Minimal heat generated.	
1	Hydrochloric Acid	4930228	101	Fuel, Aviation, Turbine Engine	4915167	Heat	Minimal heat generated.	
1	Hydrochloric Acid	4930228	101	Fuel, Aviation, Turbine Engine	4909215	Heat	Minimal heat generated.	
1	Hydrochloric Acid	4930228	101	Gasoline	4908178	Heat	Minimal heat generated.	
1	Hydrochloric Acid	4930228	101	Gasoline, nec	2911190	Heat	Minimal heat generated.	
1	Hydrochloric Acid	4930228	14	Glycol Ethers, nec (C.L., n.o.s.)	4913194	Heat/Flammable Gas/Toxic Gas	Generates 1,2-dichloroethane (b.p.= 83.5 C), water, and some heat.	8
1	Hydrochloric Acid	4930228	7	Hexamethylene Diamine Solution	4935645	Heat/Neutralization	Vigorous acid/base neutralization reaction generates heat and hexamethylene diamine dihydrochloride.	8
1	Hydrochloric Acid	4930228	104	Hydrogen Peroxide Solution	4918335	Heat/Toxic Gas/Explosion	Vigorous reaction forms chlorine, oxygen and water.	6
1	Hydrochloric Acid	4930228	4	Isopropanol	4909205	Heat/Flammable Gas/Toxic Gas	Slow displacement reaction generates isopropyl chloride (b.p.=34.8 C), water and some heat.	8
1	Hydrochloric Acid	4930228	107	Maleic Anhydride	4941161	Heat/Polymerization	Violent acid catalyzed hydrolysis of anhydride plus polymerization. Forms maleic acid.	
1	Hydrochloric Acid	4930228	4	Methyl Alcohol	4909237	Heat/Flammable Gas/Toxic Gas	Moderate displacement reaction generates methyl chloride (b.p.=-23.7 C), water and some heat.	8

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrochloric Acid	4930228	4	Methyl Alcohol	4909230	Heat/Flammable Gas/Toxic Gas	Moderate displacement reaction generates methyl chloride (b.p.=-23.7 C), water and some heat.	8
1	Hydrochloric Acid	4930228	17	Methyl Chloride	4905761	Compatible	No reaction anticipated.	
1	Hydrochloric Acid	4930228	19	Methyl Ethyl Ketone	4909243	Heat	Acid catalyzed aldol reaction (slow) with minimal heat generation.	12
1	Hydrochloric Acid	4930228	13	Methyl Methacrylate Monomer, inhib.	4907250	Heat/Polymerization	Potentially vigorous polymerization and hydrolysis reaction forms methacrylic acid and methanol.	
1	Hydrochloric Acid	4930228	24	Motor Fuel Antiknock Compound	4921445	Heat/Flammable Gas/Fire	Potential formation of ethane gas.	
1	Hydrochloric Acid	4930228	2	Nitric Acid, Fuming	4918529	Heat/Toxic Gas	Forms aqua regia. A large excess of HCL forms NOCL and chlorine gas. 3HCL + HNO3 -> NOCL + CL2 + H2O	6
1	Hydrochloric Acid	4930228	4	Octyl Alcohol (C.L., n.o.s.)	4913158	Heat	Slow displacement reaction generates octyl chloride, water and some heat.	8
1	Hydrochloric Acid	4930228	101	Oil	4915245	Heat	Minimal heat generated.	
1	Hydrochloric Acid	4930228	2	Oleum	4930030	Heat/Toxic Gas	Violent expulsion of HCl gas as oleum dissolves in HCl solution. Also forms chlorosulfonic acid.	5
1	Hydrochloric Acid	4930228	101	Petroleum Naphtha	4910259	Heat	Minimal heat generated.	
1	Hydrochloric Acid	4930228	101	Petroleum Naphtha	4915259	Heat	Minimal heat generated.	
1	Hydrochloric Acid	4930228	101	Petroleum Naphtha	4915257	Heat	Minimal heat generated.	
1	Hydrochloric Acid	4930228	101	Petroleum Residual Fuel Oil	2911715	Heat	Minimal heat generated.	
1	Hydrochloric Acid	4930228	101	Petroleum, Partially Refined	2911735	Heat	Minimal heat generated.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrochloric Acid	4930228	31	Phenol	4921220	Heat	Weak complexation.	
1	Hydrochloric Acid	4930228	105	Phosphorus, White or Yellow	4916141	Heat/Flammable Gas/Toxic Gas	Forms phosphine gas and PCl3 at 200 C. Potential explosion by analogy to Hydroiodic acid/phosphorus.	6
1	Hydrochloric Acid	4930228	10	Potassium Hydroxide, Liq. or solution	4935230	Heat/Neutralization	Violent eruption of acid when added to KOH.	2
1	Hydrochloric Acid	4930228	34	Propylene Oxide	4906620	Heat/Polymerization	Violent reaction.	5
1	Hydrochloric Acid	4930228	101	Pulp Mill Liquid (F.L., n.o.s.)	4910320	Heat	Minimal heat generated.	
1	Hydrochloric Acid	4930228	10	Sodium Hydroxide, liq. or solution	4935243	Heat/Neutralization	Violent neutralization reaction.	5
1	Hydrochloric Acid	4930228	10	Sodium Hydroxide, Liq. or solution	4935240	Heat/Neutralization	Violent neutralization reaction.	5
1	Hydrochloric Acid	4930228	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Sodium explodes on contact with aqueous hydrochloric acid, slowly if anhydrous. Hydrogen evolution.	2
1	Hydrochloric Acid	4930228	16	Styrene Monomer, Inhibited	4907265	Heat/Polymerization	Violent polymerization and addition forming a-chloroethyl benzene. Mitigated by insolubility.	
1	Hydrochloric Acid	4930228	2	Sulfuric Acid	4930040	Heat/Toxic Gas	Violent solubilization of sulfuric acid in HCl solution releases 250 vol. of hydrogen chloride gas.	5
1	Hydrochloric Acid	4930228	2	Sulfuric Acid, spent	4930042	Heat/Toxic Gas	Violent solubilization moderated by both HCl and H2SO4 being in aqueous solutions.	5
1	Hydrochloric Acid	4930228	18	Toluene Diisocyanate	4921575	Heat/Polymerization/Gas	Potentially vigorous acid catalyzed hydrolysis of isocyanate leading to polymerization.	9

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrochloric Acid	4930228	13	Vinyl Acetate	4907270	Heat/Polymerization	Violent polymerization and addition reaction forms acetic acid and acetaldehyde.	5
1	Hydrochloric Acid	4930228	17	Vinyl Chloride	4905792	Heat/Polymerization	Potentially vigorous polymerization mitigated by volatility of vinyl chloride.	
1	Hydrocyanic acid	4920125	5	Acetaldehyde	4907210	Heat/Polymerization	Reaction can be violent. Cyanohydrin (alpha-hydroxypropionitrile) will form in liquid HCN.	1
1	Hydrocyanic acid	4920125	107	Acetic Anhydride	4931304	Heat/Fire	Vigorous reaction forms acetonitrile and acetic acid.	
1	Hydrocyanic acid	4920125	19	Acetone	4908105	Heat	Potentially vigorous cyanohydrin formation.	
1	Hydrocyanic acid	4920125	26	Acrylonitrile	4906420	Heat/Polymerization	Expected vigorous polymerization of acrylonitrile catalyzed by HCN.	
1	Hydrocyanic Acid	4920125	4	Alcoholic Beverage	4910102	Heat	Displacement reaction generates propionitrile (b.p.=97.4 C), water, and some heat.	8
1	Hydrocyanic acid	4920125	10	Alkaline Liquid, n.o.s.	4935220	Heat/Polymerization	HCN can polymerize or decompose explosively particularly in contact with alkaline materials.	5
1	Hydrocyanic acid	4920125	106	Ammonium Nitrate Solution	4918774	Heat/Polymerization	Water in ammonium nitrate can catalyze self-polymerization of HCN.	
1	Hydrocyanic Acid	4920125	10	Anhydrous Ammonia	4904210	Heat/Neutralization	Neutralization reaction.	
1	Hydrocyanic acid	4920125	28	Butadiene	4905704	Heat/Polymerization	Moderate polymerization rate possible mitigated by low boiling point of butadiene (-5 C).	
1	Hydrocyanic acid	4920125	28	Butadiene, Inhibited	4905703	Heat/Polymerization	Moderate polymerization rate possible mitigated by low boiling point of butadiene (-5 C).	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrocyanic acid	4920125	13	Butyl Acrylate (Corr. L., n.o.s.)	4912215	Heat/Polymerization	Potentially vigorous polymerization, substitution or addition forms acrylonitrile and butanol.	
1	Hydrocyanic Acid	4920125	4	Butyl Alcohol	4909129	Heat	Displacement reaction generates pentanenitrile (b.p.=141 C), water, and some heat.	8
1	Hydrocyanic Acid	4920125	5	Butyraldehyde	4908119	Heat	Potentially vigorous reaction forms butyraldehyde cyanohydrin and significant quantities of heat.	
1	Hydrocyanic Acid	4920125	20	Carbon Disulfide	4908125	Compatible	No reaction expected because both are reducing agents.	
1	Hydrocyanic acid	4920125	17	Carbon Tetrachloride	4940320	Heat	Formation of nitriles (CCl_3CN - b.p.=83 degrees C) with some heat. Probably a slow reaction.	8
1	Hydrocyanic acid	4920125	104	Chlorine	4904120	Heat/Toxic Gas	Reacts to form cyanogen chloride, a lachrymator.	
1	Hydrocyanic acid	4920125	17	Chloroprene, Inhibited	4907223	Heat/Polymerization	Potentially vigorous polymerization.	
1	Hydrocyanic Acid	4920125	4	Denatured Alcohol	4909151	Heat	Displacement reaction generates propionitrile (b.p.=97.4 C), water, and some heat.	8
1	Hydrocyanic Acid	4920125	4	Denatured Alcohol	4909141	Heat	Displacement reaction generates propionitrile (b.p.=97.4 C), water, and some heat.	8
1	Hydrocyanic Acid	4920125	13	Ethyl Acetate	4909160	Heat	Potentially vigorous substitution reaction forms acetonitrile and ethanol.	
1	Hydrocyanic acid	4920125	13	Ethyl Acrylate, inhibited	4907215	Heat/Polymerization	Potentially vigorous polymerization or addition reaction.	
1	Hydrocyanic acid	4920125	4	Ethyl Alcohol	4909159	Heat	Displacement reaction generates propionitrile (b.p.=97.4 C), water, and some heat.	8

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrocyanic acid	4920125	34	Ethylene Oxide	4906610	Heat/Polymerization	Vigorous polymerization of ethylene oxide with heat liberation may occur in contact with acids.	1
1	Hydrocyanic acid	4920125	104	Ferric Chloride Solution	4932342	Heat	Anhydrous FeCl3 combines with HCN in excess solvent to form FeCl3-2HCN crystals - Mitigation.	6
1	Hydrocyanic Acid	4920125	5	Formaldehyde Solution	4913144	Heat	Potentially vigorous reaction moderated by presence of water. Forms formaldehyde cyanohydrin.	
1	Hydrocyanic Acid	4920125	5	Formaldehyde Solution	4913168	Heat	Potentially vigorous reaction moderated by presence of water. Forms formaldehyde cyanohydrin.	
1	Hydrocyanic Acid	4920125	14	Glycol Ethers, nec (C.L., n.o.s.)	4913194	Heat	Minimal cleavage and heat. However,hydroperoxides formed if previously exposed to air are explosive.	
1	Hydrocyanic acid	4920125	104	Hydrogen Peroxide Solution	4918335	Heat/Toxic Gas/Explosion	HCN is readily oxidized and may react explosively forming NOx gas.	8
1	Hydrocyanic Acid	4920125	4	Isopropanol	4909205	Heat	Displacement reaction generates 2-cyanopropane, water, and some heat.	8
1	Hydrocyanic acid	4920125	107	Maleic Anhydride	4941161	Heat/Polymerization	Potential ring opening of anhydride or polymerization (less violent than with HF).	
1	Hydrocyanic Acid	4920125	4	Methyl Alcohol	4909230	Heat	Displacement reaction generates acetonitrile (b.p.=82 C), water, and some heat.	8
1	Hydrocyanic Acid	4920125	4	Methyl Alcohol	4909237	Heat	Displacement reaction generates acetonitrile (b.p.=82 C), water, and some heat.	8
1	Hydrocyanic acid	4920125	17	Methyl Chloride	4905761	Heat	Formation of acetonitrile (CH3CN) with some heat.	8

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrocyanic acid	4920125	19	Methyl Ethyl Ketone	4909243	Heat	Potentially vigorous cyanohydrin formation.	
1	Hydrocyanic acid	4920125	13	Methyl Methacrylate Monomer, inhib.	4907250	Heat/Polymerization	Potentially vigorous polymerization, addition or substitution forms methacrylonitrile and ethanol.	
1	Hydrocyanic acid	4920125	24	Motor Fuel Antiknock Compound	4921445	Heat/Flammable Gas/Fire	Potential formation of ethane gas.	
1	Hydrocyanic Acid	4920125	2	Nitric Acid, Fuming	4918529	Heat	Reacts violently with cyanides.	5
1	Hydrocyanic acid	4920125	4	Octyl Alcohol (C.L., n.o.s.)	4913158	Heat	Displacement reaction generates nonanenitrile (C8H17CN), water, and some heat.	8
1	Hydrocyanic Acid	4920125	2	Oleum	4930030	Heat/Toxic Gas	Reacts to form CO gas and possible formation of NOx by analogy of HCN/H2O2.	
1	Hydrocyanic Acid	4920125	31	Phenol	4921220	Compatible	No reaction expected.	
1	Hydrocyanic acid	4920125	10	Potassium Hydroxide, Liq. or solution	4935230	Heat/Polymerization	HCN can polymerize or decompose explosively particularly in presence of alkaline materials.	5
1	Hydrocyanic acid	4920125	34	Propylene Oxide	4906620	Heat/Polymerization	Vigorous polymerization of propylene oxide.	
1	Hydrocyanic acid	4920125	10	Sodium Hydroxide, Liq. or solution	4935240	Heat/Polymerization	HCN can polymerize or decompose explosively particularly in the presence of alkaline materials.	5
1	Hydrocyanic acid	4920125	10	Sodium Hydroxide, liq. or solution	4935243	Heat/Polymerization	HCN can polymerize or decompose explosively particularly in the presence of alkaline materials.	5
1	Hydrocyanic acid	4920125	21	Sodium Metal	4916458	Heat/Flammable Gas/Fire	Reacts to form hydrogen gas and heat.	8
1	Hydrocyanic acid	4920125	16	Styrene Monomer, Inhibited	4907265	Heat/Polymerization	Potentially vigorous polymerization and addition reaction forms alpha-cyanoethyl benzene.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrocyanic acid	4920125	105	Sulfur Dioxide	4904290	Compatible	No reaction expected because both are reducing agents.	
1	Hydrocyanic Acid	4920125	2	Sulfuric Acid	4930040	Heat/Toxic Gas	Reacts to form CO, NH3 and H2O in concentrated sulfuric acid.	
1	Hydrocyanic Acid	4920125	2	Sulfuric Acid, spent	4930042	Heat/Toxic Gas	Reacts to form CO gas.	
1	Hydrocyanic acid	4920125	18	Toluene Diisocyanate	4921575	Heat	Potentially vigorous reaction forming ArNHC(O)CN. Possible polymerization if water present.	9
1	Hydrocyanic acid	4920125	13	Vinyl Acetate	4907270	Heat/Polymerization	Potentially violent polymerization, addition or substitution forms acetonitrile and acetaldehyde.	
1	Hydrocyanic acid	4920125	17	Vinyl Chloride	4905792	Heat/Polymerization	Potentially vigorous polymerization reaction.	
1	Hydrofluorosilicic Acid	4930026	5	Acetaldehyde	4907210	Heat/Polymerization	Potentially violent polymerization and aldol condensation to 2-butenal.	2
1	Hydrofluorosilicic Acid	4930026	3	Acetic Acid, Glacial	4931303	Heat	Heat generated from hydration of glacial acetic acid.	
1	Hydrofluorosilicic Acid	4930026	107	Acetic Anhydride	4931304	Heat/Fire	Mixing acetic anhydride with water can be explosive in aqueous mineral acids. Forms acetyl fluoride.	1
1	Hydrofluorosilicic Acid	4930026	19	Acetone	4908105	Heat	Slow acid catalyzed aldol condensation forms diacetone alcohol.	8
1	Hydrofluorosilicic Acid	4930026	3	Acrylic Acid	4931405	Heat/Polymerization	Heat could initiate slow polymerization but primarily a hydration reaction.	
1	Hydrofluorosilicic Acid	4930026	26	Acrylonitrile	4906420	Heat/Polymerization	Potentially vigorous polymerization.	
1	Hydrofluorosilicic Acid	4930026	4	Alcoholic Beverage	4910102	Heat/Flammable Gas	Vigorous displacement reaction generates heat and ethyl fluoride (b.p.=-37.7 C, low toxicity).	8

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrofluorosilicic Acid	4930026	10	Alkaline Liquid, n.o.s.	4935220	Heat/Neutralization	Forms SiO2 and NaF in excess alkaline or possibly SiF4 and HF vapor boil-off if acid in excess.	
1	Hydrofluorosilicic Acid	4930026	106	Ammonium Nitrate Solution	4918774	Heat/Toxic Gas	Modest reaction expected with release of gaseous HF and SiF4.	
1	Hydrofluorosilicic Acid	4930026	10	Anhydrous Ammonia	4904210	Heat/Neutralization	Forms (NH4)SiF6. Heat of neutralization causes boil-off of liquid ammonia (boiling point = -33 C).	
1	Hydrofluorosilicic Acid	4930026	7	Aniline Oil, Liquid	4921410	Heat/Neutralization	Vigorous acid/base neutralization reaction generates heat and aniline hydrofluoride.	8
1	Hydrofluorosilicic Acid	4930026	28	Butadiene	4905704	Heat/Polymerization	Acid catalyzed cationic polymerization mitigated by low solubility of butadiene in water.	
1	Hydrofluorosilicic Acid	4930026	28	Butadiene, Inhibited	4905703	Heat/Polymerization	Acid catalyzed cationic polymerization mitigated by low solubility of butadiene in water.	
1	Hydrofluorosilicic Acid	4930026	13	Butyl Acrylate (Corr. L., n.o.s.)	4912215	Heat/Polymerization	Potential vigorous/violent polymerization.	
1	Hydrofluorosilicic Acid	4930026	4	Butyl Alcohol	4909129	Heat	Vigorous displacement reaction generates heat and butyl fluoride.	8
1	Hydrofluorosilicic Acid	4930026	5	Butyraldehyde	4908119	Heat/Polymerization	Potentially violent polymerization and aldol condensation to 2-ethyl-2-hexenal.	
1	Hydrofluorosilicic Acid	4930026	20	Carbon Disulfide	4908125	Compatible	No reaction expected - CS2 soluble in liquid.	
1	Hydrofluorosilicic Acid	4930026	17	Carbon Tetrachloride	4940320	Heat/Toxic Gas	Possible formation of Cl3CF (b.p.=23.7 C).	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrofluorosilicic Acid	4930026	104	Chlorine	4904120	Compatible	No reaction - H2SiF6 is solvent for chlorine.	
1	Hydrofluorosilicic Acid	4930026	17	Chloroprene, Inhibited	4907223	Heat/Polymerization	Potentially violent polymerizatoin.	
1	Hydrofluorosilicic Acid	4930026	101	Coal Tar Distillate	4915363	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	101	Combustible Liquid, n.o.s.	4915185	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	101	Compound, Cleaning, Liquid	4915147	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	101	Crude Oil Petroleum	4910165	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	4	Denatured Alcohol	4909151	Heat/Flammable Gas	Vigorous displacement reaction generates heat and ethyl fluoride (b.p.=-37.7 C, low toxicity).	8
1	Hydrofluorosilicic Acid	4930026	4	Denatured Alcohol	4909141	Heat/Flammable Gas	Vigorous displacement reaction generates heat and ethyl fluoride (b.p.=-37.7 C, low toxicity).	8
1	Hydrofluorosilicic Acid	4930026	101	Distillate Fuel Oil	2911315	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	13	Ethyl Acetate	4909160	Heat	Potentially vigorous/violent hydrogen bonding.	
1	Hydrofluorosilicic Acid	4930026	13	Ethyl Acrylate, inhibited	4907215	Heat/Polymerization	Potentially vigorous/violent polymerization.	
1	Hydrofluorosilicic Acid	4930026	4	Ethyl Alcohol	4909159	Heat/Flammable Gas	Vigorous displacement reaction generates heat and ethyl fluoride (b.p.=-37.7 C, low toxicity).	8
1	Hydrofluorosilicic Acid	4930026	34	Ethylene Oxide	4906610	Heat/Polymerization	Potentially violent polymerization with heat liberation.	1

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrofluorosilicic Acid	4930026	101	Flammable Liquid, n.o.s.	4910185	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	5	Formaldehyde Solution	4913144	Heat/Polymerization	Polymerization possible but presence of water would mitigate reaction.	
1	Hydrofluorosilicic Acid	4930026	5	Formaldehyde Solution	4913168	Heat/Polymerization	Polymerization possible but presence of water would mitigate reaction.	
1	Hydrofluorosilicic Acid	4930026	101	Fuel Oil	4915113	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	101	Fuel Oil	4915111	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	101	Fuel Oil	4915112	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	101	Fuel, Aviation, Turbine Engine	4915167	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	101	Fuel, Aviation, Turbine Engine	4909215	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	101	Gasoline	4908178	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	101	Gasoline, nec	2911190	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	14	Glycol Ethers, nec (C.L., n.o.s.)	4913194	Heat/Flammable Gas/Toxic Gas	Potential Zeisel type ether cleavages forming 1,2-difluoroethane (b.p. = 30.7 C).	
1	Hydrofluorosilicic Acid	4930026	7	Hexamethylene Diamine Solution	4935645	Heat/Neutralization	Vigorous acid/base neutralization reaction generates heat and hexamethylene diamine dihydrofluoride.	8
1	Hydrofluorosilicic Acid	4930026	104	Hydrogen Peroxide Solution	4918335	Heat	Hydrolysis of H2SiF6. Trace metals catalyze oxygen release but not sudden.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrofluorosilicic Acid	4930026	4	Isopropanol	4909205	Heat	Vigorous displacement reaction generates heat and isopropyl fluoride.	8
1	Hydrofluorosilicic Acid	4930026	107	Maleic Anhydride	4941161	Heat/Polymerization	Potential violent/explosive ring opening of anhydride or polymerization. Forms maleoyl fluoride.	
1	Hydrofluorosilicic Acid	4930026	4	Methyl Alcohol	4909230	Heat/Flammable Gas	Vigorous displacement reaction generates heat and methyl fluoride (b.p.=-78.2 C, low toxicity).	8
1	Hydrofluorosilicic Acid	4930026	4	Methyl Alcohol	4909237	Heat/Flammable Gas	Vigorous displacement reaction generates heat and methyl fluoride (b.p.=-78.2 C, low toxicity).	8
1	Hydrofluorosilicic Acid	4930026	17	Methyl Chloride	4905761	Heat/Flammable Gas/Toxic Gas	Potential vigorous exchange reaction to form CH3F and HCL. Mitigated by volatlility of CH3CL.	
1	Hydrofluorosilicic Acid	4930026	19	Methyl Ethyl Ketone	4909243	Heat	Slow acid catalyzed aldol condensation.	8
1	Hydrofluorosilicic Acid	4930026	13	Methyl Methacrylate Monomer, inhib.	4907250	Heat/Polymerization	Potentially vigorous/violent polymerization.	
1	Hydrofluorosilicic Acid	4930026	24	Motor Fuel Antiknock Compound	4921445	Heat/Flammable Gas/Fire	Potential formation of ethane gas.	
1	Hydrofluorosilicic Acid	4930026	2	Nitric Acid, Fuming	4918529	Heat/Toxic Gas	Violent reaction with SiF4 in solution liberating HF gas.	
1	Hydrofluorosilicic Acid	4930026	4	Octyl Alcohol (C.L., n.o.s.)	4913158	Heat	Vigorous displacement reaction generates heat and octyl fluoride.	8
1	Hydrofluorosilicic Acid	4930026	101	Oil	4915245	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	2	Oleum	4930030	Heat/Toxic Gas	Reacts with water forming HF and H2SO4 mist and possibly fluorosulfonic acid - SO2(OH)F.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrofluorosilicic Acid	4930026	101	Petroleum Naphtha	4910259	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	101	Petroleum Naphtha	4915259	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	101	Petroleum Naphtha	4915257	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	101	Petroleum Residual Fuel Oil	2911715	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	101	Petroleum, Partially Refined	2911735	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	31	Phenol	4921220	Heat	Complexation reaction.	
1	Hydrofluorosilicic Acid	4930026	105	Phosphorus, White or Yellow	4916141	Heat	Possibly soluble. Minimal reaction expected with PF3 forming but slowly hydrolyzes to 2HF and POF.	
1	Hydrofluorosilicic Acid	4930026	10	Potassium Hydroxide, Liq. or solution	4935230	Heat/Neutralization	Eruption of acid when added to KOH forms KF and SiO2.	2
1	Hydrofluorosilicic Acid	4930026	34	Propylene Oxide	4906620	Heat/Polymerization	Potentially violent polymerization with heat liberation.	
1	Hydrofluorosilicic Acid	4930026	101	Pulp Mill Liquid (F.L., n.o.s.)	4910320	Heat	Minimal heat generated.	
1	Hydrofluorosilicic Acid	4930026	10	Sodium Hydroxide, Liq. or solution	4935240	Heat/Neutralization	Violent neutralization reaction forms NaF and SiO2.	
1	Hydrofluorosilicic Acid	4930026	10	Sodium Hydroxide, liq. or solution	4935243	Heat/Neutralization	Violent neutralization reaction forms NaF and SiO2.	
1	Hydrofluorosilicic Acid	4930026	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Forms NaF + Na2SiF6 + hydrogen gas - enflames.	
1	Hydrofluorosilicic Acid	4930026	16	Styrene Monomer, Inhibited	4907265	Heat/Polymerization	Potentially violent polymerization and addition reaction forms alpha-fluoroethyl benzene.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrofluorosilicic Acid	4930026	2	Sulfuric Acid	4930040	Heat/Toxic Gas	Liberates HF and SiF4 gas.	
1	Hydrofluorosilicic Acid	4930026	2	Sulfuric Acid, spent	4930042	Heat/Toxic Gas	Forms SiO2 precipitate and liberates HF gas.	
1	Hydrofluorosilicic Acid	4930026	18	Toluene Diisocyanate	4921575	Heat/Polymerization	Potentially vigorous/violent reaction forming ArNHCOF. Possible polymerization if water present.	9
1	Hydrofluorosilicic Acid	4930026	13	Vinyl Acetate	4907270	Heat/Polymerization	Potential violent polymerization or addition of HF forms alpha-fluorovinyl acetate.	
1	Hydrofluorosilicic Acid	4930026	17	Vinyl Chloride	4905792	Heat/Polymerization	Potentially violent polymerization mitigated by volatility of vinyl chloride.	
1	Hydrogen Fluoride	4930024	5	Acetaldehyde	4907210	Heat/Polymerization	Violent polymerization in presence of acids and aldol condensation to 2-butenal.	2
1	Hydrogen Fluoride	4930024	3	Acetic Acid, Glacial	4931303	Heat/Toxic Gas	Can react violently - hydrogen bonding to acetic acid. Possible formation of volatile CH3COF.	5
1	Hydrogen Fluoride	4930024	107	Acetic Anhydride	4931304	Heat	Potentially violent reaction if water added. Hydrogen bonding. Forms acetyl fluoride.	5
1	Hydrogen Fluoride	4930024	19	Acetone	4908105	Heat	Slow acid catalyzed aldol condensation forms 4-methyl-3-penten-2-one.	8
1	Hydrogen Fluoride	4930024	3	Acrylic Acid	4931405	Heat/Polymerization	Can react violently with possible formation of acryl fluoride.	
1	Hydrogen Fluoride	4930024	26	Acrylonitrile	4906420	Heat/Polymerization	Potentially vigorous polymerization.	
1	Hydrogen Fluoride	4930024	4	Alcoholic Beverage	4910102	Heat/Gas	Violent dissolution of anhydrous HF and formation of ethyl fluoride (b.p.=-37.7 C, low toxicity).	8

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrogen Fluoride	4930024	10	Alkaline Liquid, n.o.s.	4935220	Heat/Neutralization	Violent neutralization reaction forms fluoride salts.	
1	Hydrogen Fluoride	4930024	106	Ammonium Nitrate Solution	4918774	Heat	No reaction expected. Heat from solubilization of HF.	
1	Hydrogen Fluoride	4930024	10	Anhydrous Ammonia	4904210	Heat/Neutralization	Violent neutralization reaction forming NH4F and NH4HF2 salts, possibly as aerosols.	
1	Hydrogen Fluoride	4930024	7	Aniline Oil, Liquid	4921410	Heat/Neutralization	Vigorous acid/base neutralization reaction generates aniline hydrofluoride.	8
1	Hydrogen Fluoride	4930024	28	Butadiene	4905704	Heat/Polymerization	Acid catalyzed cationic polymerization mitigated by low boiling point of butadiene (-5 C).	
1	Hydrogen Fluoride	4930024	28	Butadiene, Inhibited	4905703	Heat/Polymerization	Acid catalyzed cationic polymerization mitigated by low boiling point of butadiene (-5 C).	
1	Hydrogen Fluoride	4930024	13	Butyl Acrylate (Corr. L., n.o.s.)	4912215	Heat/Polymerization	Potential violent polymerization.	
1	Hydrogen Fluoride	4930024	4	Butyl Alcohol	4909129	Heat	Vigorous displacement reaction forms butyl fluoride.	8
1	Hydrogen Fluoride	4930024	5	Butyraldehyde	4908119	Heat/Polymerization	Violent polymerization in presence of acids and aldol condensation to 2-ethyl-2-hexenal.	
1	Hydrogen Fluoride	4930024	20	Carbon Disulfide	4908125	Compatible	No reaction expected - both reducing agents and immiscible at ambient temperatures.	
1	Hydrogen Fluoride	4930024	17	Carbon Tetrachloride	4940320	Heat/Toxic Gas	Potentially vigorous reaction forming Cl3CF (b.p.=23.7 C).	
1	Hydrogen Fluoride	4930024	104	Chlorine	4904120	Compatible	No reaction expected.	
1	Hydrogen Fluoride	4930024	17	Chloroprene, Inhibited	4907223	Heat/Polymerization	Potentially violent polymerization.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrogen Fluoride	4930024	101	Coal Tar Distillate	4915363	Heat	Minimal heat generated.	
1	Hydrogen Fluoride	4930024	101	Combustible Liquid, n.o.s.	4915185	Heat	Minimal heat generated.	
1	Hydrogen Fluoride	4930024	101	Compound, Cleaning, Liquid	4915147	Heat	Minimal heat generated.	
1	Hydrogen Fluoride	4930024	101	Crude Oil Petroleum	4910165	Heat	Minimal heat generated.	
1	Hydrogen Fluoride	4930024	4	Denatured Alcohol	4909141	Heat/Gas	Vigorous displacement reaction generates heat and ethyl fluoride (b.p.=-37.7 C, low toxicity).	8
1	Hydrogen Fluoride	4930024	4	Denatured Alcohol	4909151	Heat/Gas	Vigorous displacement reaction generates heat and ethyl fluoride (b.p.=-37.7 C, low toxicity).	8
1	Hydrogen Fluoride	4930024	101	Distillate Fuel Oil	2911315	Heat	Minimal heat generated.	
1	Hydrogen Fluoride	4930024	13	Ethyl Acetate	4909160	Heat	Potential vigorous hydrogen bonding.	
1	Hydrogen Fluoride	4930024	13	Ethyl Acrylate, inhibited	4907215	Heat/Polymerization	Potential vigorous/violent polymerization.	
1	Hydrogen Fluoride	4930024	4	Ethyl Alcohol	4909159	Heat/Gas	Vigorous displacement reaction generates heat and ethyl fluoride (b.p.=-37.7 C, low toxicity).	8
1	Hydrogen Fluoride	4930024	34	Ethylene Oxide	4906610	Heat/Polymerization	Potentially violent polymerization with heat liberation in contact with HF.	1
1	Hydrogen Fluoride	4930024	101	Flammable Liquid, n.o.s.	4910185	Heat	Minimal heat generated.	
1	Hydrogen Fluoride	4930024	5	Formaldehyde Solution	4913168	Heat/Polymerization	Potentially vigorous polymerization mitigated by water content.	
1	Hydrogen Fluoride	4930024	5	Formaldehyde Solution	4913144	Heat/Polymerization	Potentially vigorous polymerization mitigated by water content.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrogen Fluoride	4930024	101	Fuel Oil	4915111	Heat	Minimal heat generated.	
1	Hydrogen Fluoride	4930024	101	Fuel Oil	4915112	Heat	Minimal heat generated.	
1	Hydrogen Fluoride	4930024	101	Fuel Oil	4915113	Heat	Minimal heat generated.	
1	Hydrogen Fluoride	4930024	101	Fuel, Aviation, Turbine Engine	4915167	Heat	Minimal heat generated.	
1	Hydrogen Fluoride	4930024	101	Fuel, Aviation, Turbine Engine	4909215	Heat	Minimal heat generated.	
1	Hydrogen Fluoride	4930024	101	Gasoline	4908178	Heat	Minimal heat generated.	
1	Hydrogen Fluoride	4930024	101	Gasoline, nec	2911190	Heat	Minimal heat generated.	
1	Hydrogen Fluoride	4930024	14	Glycol Ethers, nec (C.L., n.o.s.)	4913194	Heat/Toxic Gas	Potential Zeisel type ether cleavages forming 1,2-difluoroethane (b.p. = 30.7 C).	
1	Hydrogen Fluoride	4930024	7	Hexamethylene Diamine Solution	4935645	Heat/Neutralization	Vigorous acid/base neutralization reaction generates hexamethylene diamine dihydrofluoride.	8
1	Hydrogen Fluoride	4930024	104	Hydrogen Peroxide Solution	4918335	Heat/Toxic Gas	Vigorous reaction forms fluorine.	6
1	Hydrogen Fluoride	4930024	4	Isopropanol	4909205	Heat	Vigorous displacement reaction generates heat and isopropyl fluoride.	8
1	Hydrogen Fluoride	4930024	107	Maleic Anhydride	4941161	Heat/Polymerization	Potential violent/explosive ring opening of anhydride or polymerization (less violent than H2SiF6).	
1	Hydrogen Fluoride	4930024	4	Methyl Alcohol	4909230	Heat/Gas	Vigorous displacement reaction generates heat and methyl fluoride (b.p.=-78.2 C, low toxicity).	8
1	Hydrogen Fluoride	4930024	4	Methyl Alcohol	4909237	Heat/Gas	Vigorous displacement reaction generates heat and methyl fluoride (b.p.=-78.2 C, low toxicity).	8

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrogen Fluoride	4930024	17	Methyl Chloride	4905761	Heat/Toxic Gas	Potentially vigorous reaction forming gaseous CH3F and HCL. Mitigated by volatility of CH3CL.	
1	Hydrogen Fluoride	4930024	19	Methyl Ethyl Ketone	4909243	Heat	Slow acid catalyzed aldol condensation.	8
1	Hydrogen Fluoride	4930024	13	Methyl Methacrylate Monomer, inhib.	4907250	Heat/Polymerization	Potential vigorous/violent polymerization.	
1	Hydrogen Fluoride	4930024	24	Motor Fuel Antiknock Compound	4921445	Heat/Gas	Potential formation of ethane gas.	
1	Hydrogen Fluoride	4930024	2	Nitric Acid, Fuming	4918529	Compatible	Possible oxidation of HF to fluorine.	
1	Hydrogen Fluoride	4930024	4	Octyl Alcohol (C.L., n.o.s.)	4913158	Heat	Vigorous displacement reaction generates octyl fluoride and heat.	8
1	Hydrogen Fluoride	4930024	101	Oil	4915245	Heat	Minimal heat generated.	
1	Hydrogen Fluoride	4930024	2	Oleum	4930030	Heat	SO3 and HF react to form fluosulfonic acid (SO2(OH)F) which hydrolyzes to H2SO4 and HF in water.	
1	Hydrogen Fluoride	4930024	101	Petroleum Naphtha	4910259	Heat	Minimal heat generated.	
1	Hydrogen Fluoride	4930024	101	Petroleum Naphtha	4915257	Heat	Minimal heat generated.	
1	Hydrogen Fluoride	4930024	101	Petroleum Naphtha	4915259	Heat	Minimal heat generated.	
1	Hydrogen Fluoride	4930024	101	Petroleum Residual Fuel Oil	2911715	Heat	Minimal heat generated.	
1	Hydrogen Fluoride	4930024	101	Petroleum, Partially Refined	2911735	Heat	Minimal heat generated.	
1	Hydrogen Fluoride	4930024	31	Phenol	4921220	Heat	Complexation reaction.	
1	Hydrogen Fluoride	4930024	105	Phosphorus, White or Yellow	4916141	Heat/Toxic Gas	Phosphine (PH3) and PF3 may form from mixing.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydrogen Fluoride	4930024	10	Potassium Hydroxide, Liq. or solution	4935230	Heat/Neutralization	Violent eruption of acid when added to KOH forms KF salt.	2
1	Hydrogen Fluoride	4930024	34	Propylene Oxide	4906620	Heat/Polymerization	Potentially violent polymerization with heat liberation.	5
1	Hydrogen Fluoride	4930024	101	Pulp Mill Liquid (F.L., n.o.s.)	4910320	Heat	Potentially vigorous formation of heat.	
1	Hydrogen Fluoride	4930024	10	Sodium Hydroxide, liq. or solution	4935243	Heat/Neutralization	Violent neutralization reaction forms NaF salt.	5
1	Hydrogen Fluoride	4930024	10	Sodium Hydroxide, Liq. or solution	4935240	Heat/Neutralization	Violent neutralization reaction forms NaF salt.	5
1	Hydrogen Fluoride	4930024	21	Sodium Metal	4916456	Heat/Gas	Aqueous solution of HF reacts explosively with sodium, slowly if anhydrous. Hydrogen generated.	2
1	Hydrogen Fluoride	4930024	16	Styrene Monomer, Inhibited	4907265	Heat/Polymerization	Potentially violent/explosive polymerization and addition reaction forms alpha-fluoroethyl benzene.	
1	Hydrogen Fluoride	4930024	2	Sulfuric Acid	4930040	Compatible	No reaction expected with anhydrous HF. Release of HF vapor if aqueous HF.	
1	Hydrogen Fluoride	4930024	2	Sulfuric Acid, spent	4930042	Compatible	Some dissolution of hydrogen fluoride with generation of heat with rest of HF volatilized.	
1	Hydrogen Fluoride	4930024	18	Toluene Diisocyanate	4921575	Heat	Potentially vigorous/violent reaction forming ArNHCOF. Possible polymerization if water present.	9
1	Hydrogen Fluoride	4930024	13	Vinyl Acetate	4907270	Heat/Polymerization	Potential vigorous/violent polymerization and addition of HF forms alpha-fluorovinyl acetate.	5
1	Hydrogen Fluoride	4930024	17	Vinyl Chloride	4905792	Heat/Polymerization	Potentially vigorous reaction mitigated by low boiling point of vinyl chloride - flash off.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
104	Hydrogen Peroxide Solution	4918335	107	Acetic Anhydride	4931304	Heat/Explosion	Presence of an excess of acetic anhydride forms diacetyl peroxide which explodes readily.	1
104	Hydrogen Peroxide Solution	4918335	106	Ammonium Nitrate Solution	4918774	Explosive Mixture	Added oxidizer could make combination more sensitive to sudden decomposition of NH4NO3.	
104	Hydrogen Peroxide Solution	4918335	107	Maleic Anhydride	4941161	Heat/Explosion	Potential epoxidation of maleic anhydride causing exotherm and forming maleic peroxide.	
104	Hydrogen Peroxide Solution	4918335	105	Phosphorus, White or Yellow	4916141	Heat/Fire/Explosion	Ignition of phosphorus can occur at the air-solution interface leading to a violent reaction.	2
1	Hydroiodic Acid	4930226	5	Acetaldehyde	4907210	Heat/Polymerization	Violent polymerization and aldol condensation to 2-butenal and 3-hydroxybutanal.	2
1	Hydroiodic Acid	4930226	3	Acetic Acid, Glacial	4931303	Heat	Heat generated from hydration of glacial acetic acid.	
1	Hydroiodic Acid	4930226	107	Acetic Anhydride	4931304	Heat/Fire	Mixing acetic anhydride with water can be explosive in aqueous mineral acids. Forms acetyl iodide.	1
1	Hydroiodic Acid	4930226	19	Acetone	4908105	Heat	Slow acid catalyzed aldol condensation forms diacetone alcohol.	8
1	Hydroiodic Acid	4930226	3	Acrylic Acid	4931405	Heat/Polymerization	Heat could initiate slow polymerization but primarily a hydration reaction.	
1	Hydroiodic Acid	4930226	26	Acrylonitrile	4906420	Heat/Polymerization	Potentially vigorous reaction by analogy to hydrochloric acid/acrylonitrile reactions.	
1	Hydroiodic Acid	4930226	4	Alcoholic Beverage	4910102	Heat	Displacement reaction generates ethyl iodide (b.p.=72.4 C) and some heat.	8
1	Hydroiodic Acid	4930226	10	Alkaline Liquid, n.o.s.	4935220	Heat/Neutralization	Violent neutralization reaction forms iodide salts.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydroiodic Acid	4930226	106	Ammonium Nitrate Solution	4918774	Heat	HI may be oxidized by nitrate forming I2 which reacts with NH4 ion to form NI3 (may explode if dry).	
1	Hydroiodic Acid	4930226	10	Anhydrous Ammonia	4904210	Heat/Neutralization	Violent neutralization reaction forms NH4I.	
1	Hydroiodic Acid	4930226	7	Aniline Oil, Liquid	4921410	Heat/Neutralization	Violent acid/base neutralization reaction generates aniline hydroiodide.	8
1	Hydroiodic Acid	4930226	28	Butadiene	4905704	Heat/Polymerization	Potential violent polymerization. Reaction mitigated by low solubility of butadiene in water.	
1	Hydroiodic Acid	4930226	28	Butadiene, Inhibited	4905703	Heat/Polymerization	Potential violent polymerization. Reaction mitigated by low solubility of butadiene in water.	
1	Hydroiodic Acid	4930226	13	Butyl Acrylate (Corr. L., n.o.s.)	4912215	Heat/Polymerization	Potentially vigorous acid catalyzed hydrolysis and polymerization forms acrylic acid and butanol.	
1	Hydroiodic Acid	4930226	4	Butyl Alcohol	4909129	Heat	Displacement reaction generates butyl iodide (b.p.=130 C) and some heat.	8
1	Hydroiodic Acid	4930226	5	Butyraldehyde	4908119	Heat/Polymerization	Violent polymerization and aldol condensation to 2-ethyl-2-hexenal and 3-hydroxy-2-ethylhexanal.	
1	Hydroiodic Acid	4930226	20	Carbon Disulfide	4908125	Compatible	No reaction expected because both are reducing agents.	
1	Hydroiodic Acid	4930226	17	Carbon Tetrachloride	4940320	Heat	May form Cl3CI (b.p. = 142 C).	
1	Hydroiodic Acid	4930226	104	Chlorine	4904120	Heat/Toxic Gas	Potentially vigorous reaction forms HCl and iodine.	6
1	Hydroiodic Acid	4930226	17	Chloroprene, Inhibited	4907223	Heat/Polymerization	Potentially vigorous/violent polymerization mitigated by low solubility of chloroprene in water.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydroiodic Acid	4930226	101	Coal Tar Distillate	4915363	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	101	Combustible Liquid, n.o.s.	4915185	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	101	Compound, Cleaning, Liquid	4915147	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	101	Crude Oil Petroleum	4910185	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	4	Denatured Alcohol	4909151	Heat	Displacement reaction generates ethyl iodide (b.p.=72.4 C) and some heat.	8
1	Hydroiodic Acid	4930226	4	Denatured Alcohol	4909141	Heat	Displacement reaction generates ethyl iodide (b.p.=72.4 C) and some heat.	8
1	Hydroiodic Acid	4930226	101	Distillate Fuel Oil	2911315	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	13	Ethyl Acetate	4909160	Heat	Potentially vigorous acid catalyzed hydrolysis forms acetic acid and ethanol.	
1	Hydroiodic Acid	4930226	13	Ethyl Acrylate, inhibited	4907215	Heat/Polymerization	Potentially vigorous/violent polymerization and hydrolysis reaction forms acrylic acid and ethanol.	
1	Hydroiodic Acid	4930226	4	Ethyl Alcohol	4909159	Heat	Displacement reaction generates ethyl iodide (b.p.=72.4 C) and some heat.	8
1	Hydroiodic Acid	4930226	34	Ethylene Oxide	4906610	Heat/Polymerization	Polymerization with heat liberation may occur in contact with acids - potentially violent.	1
1	Hydroiodic Acid	4930226	101	Flammable Liquid, n.o.s.	4910185	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	5	Formaldehyde Solution	4913144	Heat/Polymerization	Potentially vigorous polymerization mitigated by water content.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydroiodic Acid	4930226	5	Formaldehyde Solution	4913168	Heat/Polymerization	Potentially vigorous polymerization mitigated by water content.	
1	Hydroiodic Acid	4930226	101	Fuel Oil	4915111	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	101	Fuel Oil	4915112	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	101	Fuel Oil	4915113	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	101	Fuel, Aviation, Turbine Engine	4909215	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	101	Fuel, Aviation, Turbine Engine	4915167	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	101	Gasoline	4908178	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	101	Gasoline, nec	2911190	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	14	Glycol Ethers, nec (C.L., n.o.s.)	4913194	Heat	Cleavage to 1,2-diiodoethane (b.p. = 200 C).	
1	Hydroiodic Acid	4930226	7	Hexamethylene Diamine Solution	4935645	Heat/Neutralization	Violent acid/base neutralization reaction generates hexamethylene diamine dihydroiodide.	8
1	Hydroiodic Acid	4930226	104	Hydrogen Peroxide Solution	4918335	Heat/Toxic Gas	Vigorous reaction forms iodine, possibly as a vapor.	6
1	Hydroiodic Acid	4930226	4	Isopropanol	4909205	Heat	Displacement reaction generates isopropyl iodide and some heat.	8
1	Hydroiodic Acid	4930226	107	Maleic Anhydride	4941161	Heat/Polymerization	Potential explosive acid catalyzed hydrolysis of anhydride plus polymerization. Forms maleic acid.	
1	Hydroiodic Acid	4930226	4	Methyl Alcohol	4909230	Heat/Toxic Gas	Vigorous displacement reaction generates heat and methyl iodide (b.p. = 42.4 C - not flammable).	8
1	Hydroiodic Acid	4930226	4	Methyl Alcohol	4909237	Heat/Toxic Gas	Vigorous displacement reaction generates heat and methyl iodide (b.p. = 42.4 C - not flammable).	8

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydroiodic Acid	4930226	17	Methyl Chloride	4905761	Heat	Minimal displacement reaction forming CH3I moderated by immiscibility of methyl chloride/water.	
1	Hydroiodic Acid	4930226	19	Methyl Ethyl Ketone	4909243	Heat	Slow acid catalyzed aldol condensation.	8
1	Hydroiodic Acid	4930226	13	Methyl Methacrylate Monomer, inhib.	4907250	Heat/Polymerization	Potentially vigorous/violent polymerization and hydrolysis forms methacrylic acid and methanol.	
1	Hydroiodic Acid	4930226	24	Motor Fuel Antiknock Compound	4921445	Heat/Flammable Gas/Fire	Potential formation of ethane gas.	
1	Hydroiodic Acid	4930026	2	Nitric Acid, Fuming	4918529	Heat	Dilute solution of hydrogen iodide reduces nitric acid to nitrous acid and iodine.	6
1	Hydroiodic Acid	4930226	4	Octyl Alcohol (C.L., n.o.s.)	4913158	Heat	Displacement reaction generates octyl iodide and some heat.	8
1	Hydroiodic Acid	4930226	101	Oil	4915245	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	2	Oleum	4930030	Heat/Toxic Gas	Forms SO2, I2 in slight excess of HI; S, I2 in greater excess of HI; H2S, I2 in large excess of HI.	6
1	Hydroiodic Acid	4930226	101	Petroleum Naphtha	4910259	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	101	Petroleum Naphtha	4915257	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	101	Petroleum Naphtha	4915259	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	101	Petroleum Residual Fuel Oil	2911715	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	101	Petroleum, Partially Refined	2911735	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	31	Phenol	4921220	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	105	Phosphorus, White or Yellow	4916141	Heat/Flammable Gas/Toxic Gas	Phosphine formed from mixing may explode. Phosphonium iodide may form - reacts violently with water.	2

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Hydroiodic Acid	4930226	10	Potassium Hydroxide, Liq. or solution	4935230	Heat/Neutralization	Eruption of acid when added to KOH forms KI salt.	2
1	Hydroiodic Acid	4930226	34	Propylene Oxide	4906620	Heat/Polymerization	Potentially violent polymerization by analogy to HCL/propylene oxide reaction.	
1	Hydroiodic Acid	4930226	101	Pulp Mill Liquid (F.L., n.o.s.)	4910320	Heat	Minimal heat generated.	
1	Hydroiodic Acid	4930226	10	Sodium Hydroxide, Liq. or solution	4935240	Heat/Neutralization	Violent neutralization reaction forms NaI salt.	5
1	Hydroiodic Acid	4930226	10	Sodium Hydroxide, liq. or solution	4935243	Heat/Neutralization	Violent neutralization reaction forms NaI salt.	5
1	Hydroiodic Acid	4930226	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Potentially explosive reaction forms hydrogen gas, sodium iodide, and heat.	
1	Hydroiodic Acid	4930226	16	Styrene Monomer, Inhibited	4907265	Heat/Polymerization	Violent polymerization and addition forms alpha-iodomethyl benzene. Mitigated by insolubility.	
1	Hydroiodic Acid	4930226	2	Sulfuric Acid	4930040	Heat/Toxic Gas	Forms SO2, I2 in slight excess of HI; S, I2 in greater excess of HI; H2S, I2 in large excess of HI.	6
1	Hydroiodic Acid	4930226	2	Sulfuric Acid, spent	4930042	Heat/Toxic Gas	Forms SO2, I2 in slight excess of HI; S, I2 in greater excess of HI; H2S, I2 in large excess of HI.	6
1	Hydroiodic Acid	4930226	18	Toluene Diisocyanate	4921575	Heat/Polymerization/ Gas	Potentially vigorous/violent hydrolysis and subsequent polymerization.	9
1	Hydroiodic Acid	4930226	13	Vinyl Acetate	4907270	Heat/Polymerization	Potentially violent polymerization and hydrolysis reaction forms acetic acid and acetaldehyde.	
1	Hydroiodic Acid	4930226	17	Vinyl Chloride	4905792	Heat/Polymerization	Potentially vigorous/violent reaction mitigated by low boiling point of vinyl chloride.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
4	Isopropanol	4909205	5	Acetaldehyde	4907210	Heat	Reacts vigorously forming di(isopropoxy) ethane.	5
4	Isopropanol	4909205	5	Butyraldehyde	4908119	Heat	Potential vigorous reaction forming di(isopropoxy) butane.	
4	Isopropanol	4909205	104	Chlorine	4904120	Heat/Fire/Explosion	Forms 2-propyl hypochlorite which can violently explode on exposure to heat or sunlight.	1
4	Isopropanol	4909205	34	Ethylene Oxide	4906610	Heat/Polymerization	Slow reaction at room temperature in absence of acidic or basic catalysts.	1
4	Isopropanol	4909205	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Addition of alcohols to conc. H2O2 forms hydroperoxides that can be detonated by shock or heat.	2
4	Isopropanol	4909205	34	Propylene Oxide	4906620	Heat/Polymerization	Slow reaction at room temperature in absence of acidic or basic catalysts.	
4	Isopropanol	4909205	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Hydrogen evolution.	
4	Isopropanol	4909205	18	Toluene Diisocyanate	4921575	Heat/Fire	Potentially violent urethane formation (ArNHCO2C8H17).	
28	Liquefied Petroleum Gas	4905752	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
28	Liquefied Petroleum Gas	4905752	104	Hydrogen Peroxide Solution	4918335	Compatible	No reaction anticipated in absence of alkene functionality.	
28	Liquefied Petroleum Gas (Butene)	4905707	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
28	Liquefied Petroleum Gas (Butene)	4905707	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	May form combinations sensitive to heat or shock. Exotherm from epoxidation of alkene.	10
28	Liquefied Petroleum Gas (Butylene)	4905711	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
28	Liquefied Petroleum Gas (Butylene)	4905711	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	May form combinations sensitive to heat or shock. Exotherm from epoxidation of alkene.	10
29	Liquefied Petroleum Gas (Isobutane)	4905750	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
29	Liquefied Petroleum Gas (Isobutane)	4905747	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
29	Liquefied Petroleum Gas (Isobutane)	4905750	104	Hydrogen Peroxide Solution	4918335	Compatible	No reaction anticipated in absence of alkene functionality.	
29	Liquefied Petroleum Gas (Isobutane)	4905747	104	Hydrogen Peroxide Solution	4918335	Compatible	No reaction anticipated in absence of alkene functionality.	
28	Liquefied Petroleum Gas (Isobutylene)	4905748	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
28	Liquefied Petroleum Gas (Isobutylene)	4905748	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	May form combinations sensitive to heat or shock. Exotherm from epoxidation of alkene.	10
29	Liquefied Petroleum Gas (Propane)	4905781	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
29	Liquefied Petroleum Gas (Propane)	4905781	104	Hydrogen Peroxide Solution	4918335	Compatible	No reaction anticipated in absence of alkene functionality.	
28	Liquefied Petroleum Gas (Propylene)	4905782	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
28	Liquefied Petroleum Gas (Propylene)	4905782	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	May form combinations sensitive to heat or shock. Exotherm from epoxidation of alkene.	10
4	Methyl Alcohol	4909237	5	Acetaldehyde	4907210	Heat	Reacts vigorously forming 1,1-dimethoxyethane. Methanol will be the most reactive of all alcohols.	5

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
4	Methyl Alcohol	4909230	5	Acetaldehyde	4907210	Heat	Reacts vigorously forming 1,1-dimethoxyethane. Methanol will be the most reactive of all alcohols.	5
4	Methyl Alcohol	4909230	5	Butyraldehyde	4908119	Heat	Methanol will be the most reactive of all alcohols with butyraldehyde. Forms 1,1-dimethoxybutane.	
4	Methyl Alcohol	4909237	5	Butyraldehyde	4908119	Heat	Methanol will be the most reactive of all alcohols with butyraldehyde. Forms 1,1-dimethoxybutane.	
4	Methyl Alcohol	4909230	104	Chlorine	4904120	Heat/Fire/Explosion	Forms methyl hypochlorite which can violently explode on exposure to heat or sunlight.	1
4	Methyl Alcohol	4909237	104	Chlorine	4904120	Heat/Fire/Explosion	Forms methyl hypochlorite which can violently explode on exposure to heat or sunlight.	1
4	Methyl Alcohol	4909237	34	Ethylene Oxide	4906610	Heat/Polymerization	Slow reaction at room temperature in absence of acidic or basic catalysts.	1
4	Methyl Alcohol	4909230	34	Ethylene Oxide	4906610	Heat/Polymerization	Slow reaction at room temperature in absence of acidic or basic catalysts.	1
4	Methyl Alcohol	4909237	104	Ferric Chloride Solution	4932342	Heat	Forms formaldehyde after mixing when exposed to light.	6
4	Methyl Alcohol	4909230	104	Ferric Chloride Solution	4932342	Heat	Forms formaldehyde after mixing when exposed to light.	6
4	Methyl Alcohol	4909237	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Addition of alcohols to concentrated H2O2 forms explosives that can be detonated by shock or heat.	2
4	Methyl Alcohol	4909230	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Addition of alcohols to concentrated H2O2 forms explosives that can be detonated by shock or heat.	2

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
4	Methyl Alcohol	4909237	34	Propylene Oxide	4906620	Heat/Polymerization	Slow reaction at room temperature in absence of acidic or basic catalysts.	
4	Methyl Alcohol	4909230	34	Propylene Oxide	4906620	Heat/Polymerization	Slow reaction at room temperature in absence of acidic or basic catalysts.	
4	Methyl Alcohol	4909237	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Violent hydrogen evolution.	
4	Methyl Alcohol	4909230	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Violent hydrogen evolution.	
4	Methyl Alcohol	4909237	18	Toluene Diisocyanate	4921575	Heat/Fire	Potentially violent urethane formation. Methanol is most reactive alcohol with the diisocyanate.	
4	Methyl Alcohol	4909230	18	Toluene Diisocyanate	4921575	Heat/Fire	Potentially violent urethane formation. Methanol is most reactive alcohol with the diisocyanate.	
17	Methyl Chloride	4905761	107	Acetic Anhydride	4931304	Compatible	No reaction expected.	
17	Methyl Chloride	4905761	20	Carbon Disulfide	4908125	Compatible	Minimal reaction.	
17	Methyl Chloride	4905761	104	Chlorine	4904120	Heat/Fire	Potential fire.	
17	Methyl Chloride	4905761	104	Ferric Chloride Solution	4932342	Heat	Potentially vigorous hydrolysis reaction mitigated by water content and methyl chloride volatility.	
17	Methyl Chloride	4905761	104	Hydrogen Peroxide Solution	4918335	Heat/Explosion	Alkyl chlorides are very slowly attacked by H2O2 (under basic conditions). Potential explosion.	6
17	Methyl Chloride	4905761	105	Phosphorus, White or Yellow	4916141	Compatible	No reaction expected.	
17	Methyl Chloride	4905761	21	Sodium Metal	4916456	Heat	Sodium reacts explosively with methyl chloride.	1

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
19	Methyl Ethyl Ketone	4909243	20	Carbon Disulfide	4908125	Compatible	No reaction expected.	
19	Methyl Ethyl Ketone	4909243	104	Chlorine	4904120	Heat/Fire	Potentially vigorous/violent oxidation reaction with possible ignition.	
19	Methyl Ethyl Ketone	4909243	104	Ferric Chloride Solution	4932342	Heat/Polymerization	Slow polymerization possible.	
19	Methyl Ethyl Ketone	4909243	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Forms polymeric as well as dimeric and trimeric peroxides.	
19	Methyl Ethyl Ketone	4909243	105	Phosphorus, White or Yellow	4916141	Compatible	No reaction expected.	
19	Methyl Ethyl Ketone	4909243	21	Sodium Metal	4916456	Heat	Potentially violent reaction forms pinacolate dianion.	
13	Methyl Methacrylate Monomer, inhib.	4907250	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
13	Methyl Methacrylate Monomer, inhib.	4907250	104	Chlorine	4904120	Heat/Fire	Chlorine can react explosively with all hydrocarbons, especially those which are unsaturated.	
13	Methyl Methacrylate Monomer, inhib.	4907250	104	Ferric Chloride Solution	4932342	Heat/Polymerization	Possible polymerization.	
13	Methyl Methacrylate Monomer, inhib.	4907250	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Epoxidation (or polymerization) can lead to exotherm which could lead to detonation of H2O2.	
13	Methyl Methacrylate Monomer, inhib.	4907250	105	Phosphorus, White or Yellow	4916141	Compatible	No reaction expected.	
13	Methyl Methacrylate Monomer, inhib.	4907250	21	Sodium Metal	4916456	Heat/Polymerization/Fire	Violent polymerization and acyloin condensation forms 4-hydroxy-2,5-dimethyl-1,5-hexadien-3-one.	
24	Motor Fuel Antiknock Compound	4921445	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
24	Motor Fuel Antiknock Compound	4921445	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion		
2	Nitric Acid, Fuming	4918529	5	Acetaldehyde	4907210	Heat/Toxic Gas/Explosion	Potential formation of enol nitrate (CH2=CHONO2) and oxidation to acetic acid evolving NO gas.	
2	Nitric Acid, Fuming	4918529	3	Acetic Acid, Glacial	4931303	Heat/Explosion	Acetic acid/HNO3 can explode if not kept cold. Forms acetyl nitrate. May be used as a nitrating mix.	1
2	Nitric Acid, Fuming	4918529	107	Acetic Anhydride	4931304	Heat/Explosion	Mixtures containing more than 50 wt.% HNO3 may detonate. Forms acetyl nitrate or C(NO2)4.	2
2	Nitric Acid, Fuming	4918529	19	Acetone	4908105	Heat/Explosion	Acetone decomposes violently in HNO3/H2SO4 mixtures. May form enol nitrate ester.	1
2	Nitric Acid, Fuming	4918529	3	Acrylic Acid	4931405	Heat	Minimal temperature/pressure rise observed when mixed. May form acryl nitrate.	12
2	Nitric Acid, Fuming	4918529	26	Acrylonitrile	4906420	Heat/Explosion	Acrylonitrile and 70% nitric acid detonates at 70 C.	1
2	Nitric Acid, Fuming	4918529	4	Alcoholic Beverage	4910102	Heat/Explosion	Stirring concentrated HNO3 and ethanol results in a reaction that accelerates to an explosion.	1
2	Nitric Acid, Fuming	4918529	10	Alkaline Liquid, n.o.s.	4935220	Heat/Neutralization	Violent neutralization reaction.	8
2	Nitric Acid, Fuming	4918529	106	Ammonium Nitrate Solution	4918774	Heat	Heat generated from dissolution of nitric acid in aqueous ammonium nitrate solution.	
2	Nitric Acid, Fuming	4918529	10	Anhydrous Ammonia	4904210	Heat/Fire	Ammonia gas burns in an atmosphere of nitric acid.	1
2	Nitric Acid, Fuming	4918529	7	Aniline Oil, Liquid	4921410	Heat/Fire	Aniline ignites spontaneously in the presence of red fuming HNO3. Nitramine and amineoxide formation	1

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Nitric Acid, Fuming	4918529	16	Benzene	4908110	Heat/Explosion	High sensitivity to detonation by mixtures close to stoichiometric of about 84% acid.	2
2	Nitric Acid, Fuming	4918529	28	Butadiene	4905704	Heat/Fire	Dienes are hypergolic in contact with concentrated nitric acid. Ignition delay of 1 ms.	2
2	Nitric Acid, Fuming	4918529	28	Butadiene, Inhibited	4905703	Heat/Fire	Dienes are hypergolic in contact with concentrated nitric acid. Ignition delay of 1 ms.	2
2	Nitric Acid, Fuming	4918529	29	Butane	4905706	Compatible	Forms nitromethane and nitroethane at elevated temperatures (> 400 C).	14
2	Nitric Acid, Fuming	4918529	29	Butane	4905702	Compatible	Forms nitromethane and nitroethane at elevated temperatures (> 400 C).	14
2	Nitric Acid, Fuming	4918529	13	Butyl Acrylate (Corr. L., n.o.s.)	4912215	Heat/Fire	Possible vigorous polymerization.	
2	Nitric Acid, Fuming	4918529	4	Butyl Alcohol	4909129	Heat/Explosion	May form the explosive butyl nitrate.	
2	Nitric Acid, Fuming	4918529	5	Butyraldehyde	4908119	Heat/Toxic Gas/Explosion	Excessive temperature and pressure rise observed when mixed. May form enol nitrate ester.	12
2	Nitric Acid, Fuming	4918529	20	Carbon Disulfide	4908125	Heat	Reactive when heated between 100 and 200 C.	12
2	Nitric Acid, Fuming	4918529	17	Carbon Tetrachloride	4940320	Heat/Toxic Gas		
2	Nitric Acid, Fuming	4918529	104	Chlorine	4904120	Compatible	Forms chloric acid and nitrogen peroxide when maintained in contact for one month.	6
2	Nitric Acid, Fuming	4918529	17	Chloroprene, Inhibited	4907223	Heat/Polymerization/Fire	Dienes are hypergolic in contact with concentrated nitric acid. Possible polymerization.	2

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Nitric Acid, Fuming	4918529	101	Coal Tar Distillate	4915363	Heat/Fire		
2	Nitric Acid, Fuming	4918529	101	Combustible Liquid, n.o.s.	4915185	Heat/Fire		
2	Nitric Acid, Fuming	4918529	101	Compound, Cleaning, Liquid	4915147	Heat/Fire		
2	Nitric Acid, Fuming	4918529	101	Crude Oil Petroleum	4910165	Heat/Fire		
2	Nitric Acid, Fuming	4918529	29	Cyclohexane	4908132	Compatible		
2	Nitric Acid, Fuming	4918529	4	Denatured Alcohol	4909151	Heat/Explosion	Stirring concentrated HNO3 and ethanol results in a reaction that accelerates to an explosion.	1
2	Nitric Acid, Fuming	4918529	4	Denatured Alcohol	4909141	Heat/Explosion	Stirring concentrated HNO3 and ethanol results in a reaction that accelerates to an explosion.	1
2	Nitric Acid, Fuming	4918529	27	Dinitrotoluene, Liquid	4963120	Heat	Minimal reaction forming small amounts of TNT in absence of concentrated H2SO4.	
2	Nitric Acid, Fuming	4918529	101	Distillate Fuel Oil	2911315	Heat/Fire		
2	Nitric Acid, Fuming	4918529	13	Ethyl Acetate	4909160	Heat	Minimal temperature/pressure rise observed when mixed.	12
2	Nitric Acid, Fuming	4918529	13	Ethyl Acrylate, inhibited	4907215	Heat/Polymerization/ Fire	Possible vigorous polymerization.	
2	Nitric Acid, Fuming	4918529	4	Ethyl Alcohol	4909159	Heat/Explosion	Stirring concentrated HNO3 and ethanol results in a reaction that accelerates to an explosion.	1
2	Nitric Acid, Fuming	4918529	34	Ethylene Oxide	4906610	Heat/Polymerization/ Fire	Violent polymerization mitigated by volatility of ethylene oxide.	
2	Nitric Acid, Fuming	4918529	104	Ferric Chloride Solution	4932342	Compatible	Potential oxidation to chlorine gas.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Nitric Acid, Fuming	4918529	101	Flammable Liquid, n.o.s.	4910185	Heat/Fire		
2	Nitric Acid, Fuming	4918529	5	Formaldehyde Solution	4913168	Heat/Toxic Gas	Oxidation to formic acid evolves NO gas. Reacts even when cold.	6
2	Nitric Acid, Fuming	4918529	5	Formaldehyde Solution	4913144	Heat/Toxic Gas	Oxidation to formic acid evolves NO gas. Reacts even when cold.	6
2	Nitric Acid, Fuming	4918529	101	Fuel Oil	4915111	Heat/Fire		
2	Nitric Acid, Fuming	4918529	101	Fuel Oil	4915113	Heat/Fire		
2	Nitric Acid, Fuming	4918529	101	Fuel Oil	4915112	Heat/Fire		
2	Nitric Acid, Fuming	4918529	101	Fuel, Aviation, Turbine Engine	4915167	Heat/Fire		
2	Nitric Acid, Fuming	4918529	101	Fuel, Aviation, Turbine Engine	4909215	Heat/Fire		
2	Nitric Acid, Fuming	4918529	101	Gasoline	4908178	Heat/Fire		
2	Nitric Acid, Fuming	4918529	101	Gasoline, nec	2911190	Heat/Fire		
2	Nitric Acid, Fuming	4918529	14	Glycol Ethers, nec (C.L., n.o.s.)	4913194	Heat/Explosion	Mixtures of HNO3 with ethylene glycol are easily detonated by heat, impact or friction.	2
2	Nitric Acid, Fuming	4918529	7	Hexamethylene Diamine Solution	4935645	Heat/Fire/Explosion	Formation of hexamethylene dinitramine, an explosive with a low ignition temperature.	
2	Nitric Acid, Fuming	4918529	29	Hexane	4908183	Compatible		
2	Nitric Acid, Fuming	4918529	104	Hydrogen Peroxide Solution	4918335	Heat/Explosion	Mix is unstable when > 50% HNO3 is present due to supercritical amounts of peracids and peroxides.	6
2	Nitric Acid, Fuming	4918529	4	Isopropanol	4909205	Heat/Explosion	May form the explosive isopropyl nitrate.	
2	Nitric Acid, Fuming	4918529	28	Liquefied Petroleum Gas	4905752	Heat/Fire		

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Nitric Acid, Fuming	4918529	28	Liquefied Petroleum Gas (Butene)	4905707	Heat/Polymerization	Formation of 2-nitrobutane and possible polymerization.	
2	Nitric Acid, Fuming	4918529	28	Liquefied Petroleum Gas (Butylene)	4905711	Heat/Polymerization	Formation of 2-nitrobutane and possible polymerization.	
2	Nitric Acid, Fuming	4918529	29	Liquefied Petroleum Gas (Isobutane)	4905747	Compatible	Reacts rapidly in vapor phase (> 400 C) forming a complex mix of nitro derivatives.	14
2	Nitric Acid, Fuming	4918529	29	Liquefied Petroleum Gas (Isobutane)	4905750	Compatible	Reacts rapidly in vapor phase (> 400 C) forming a complex mix of nitro derivatives.	14
2	Nitric Acid, Fuming	4918529	28	Liquefied Petroleum Gas (Isobutylene)	4905748	Heat/Polymerization	Nitration reaction forms a small amount of C4H7NO2 (nitroisobutylene). Possible polymerization.	14
2	Nitric Acid, Fuming	4918529	29	Liquefied Petroleum Gas (Propane)	4905781	Compatible	Reacts rapidly in vapor phase (> 400 C) forming a complex mix of nitro derivatives.	14
2	Nitric Acid, Fuming	4918529	28	Liquefied Petroleum Gas (Propylene)	4905782	Heat/Polymerization	Polymerization and nitration.	
2	Nitric Acid, Fuming	4918529	107	Maleic Anhydride	4941161	Heat/Explosion	Probable formation of maleyl dinitrate.	
2	Nitric Acid, Fuming	4918529	4	Methyl Alcohol	4909230	Heat/Explosion	Readily forms the explosive methyl nitrate.	2
2	Nitric Acid, Fuming	4918529	4	Methyl Alcohol	4909237	Heat/Explosion	Readily forms the explosive methyl nitrate.	2
2	Nitric Acid, Fuming	4918529	17	Methyl Chloride	4905761	Heat/Fire/Toxic Gas		
2	Nitric Acid, Fuming	4918529	19	Methyl Ethyl Ketone	4909243	Heat	Minimal temperature/pressure rise observed when mixed. May form enol nitrate ester.	12
2	Nitric Acid, Fuming	4918529	13	Methyl Methacrylate Monomer, inhib.	4907250	Heat/Polymerization/ Fire	Possible vigorous polymerization.	
2	Nitric Acid, Fuming	4918529	24	Motor Fuel Antiknock Compound	4921445	Heat/Flammable Gas	Formation of ethane gas.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Nitric Acid, Fuming	4918529	4	Octyl Alcohol (C.L., n.o.s.)	4913158	Heat/Explosion	May form the explosive octyl nitrate.	
2	Nitric Acid, Fuming	4918529	101	Oil	4915245	Heat/Fire		
2	Nitric Acid, Fuming	4918529	2	Oleum	4930030	Heat	Forms addition compounds such as 2H2N03-HS207.	6
2	Nitric Acid, Fuming	4918529	101	Petroleum Naphtha	4915257	Heat/Fire		
2	Nitric Acid, Fuming	4918529	101	Petroleum Naphtha	4915259	Heat/Fire		
2	Nitric Acid, Fuming	4918529	101	Petroleum Naphtha	4910259	Heat/Fire		
2	Nitric Acid, Fuming	4918529	101	Petroleum Residual Fuel Oil	2911715	Heat/Fire		
2	Nitric Acid, Fuming	4918529	101	Petroleum, Partially Refined	2911735	Heat/Fire		
2	Nitric Acid, Fuming	4918529	31	Phenol	4921220	Heat	Forms mono-nitrophenol accompanied by considerable oxidation.	14
2	Nitric Acid, Fuming	4918529	105	Phosphorus, White or Yellow	4916141	Heat/Fire	Phosphorus ignites in a vapor of nitric acid and burns with an intense light forming NOx and H3P04.	1
2	Nitric Acid, Fuming	4918529	10	Potassium Hydroxide, Liq. or solution	4935230	Heat/Neutralization	Violent neutralization reaction.	8
2	Nitric Acid, Fuming	4918529	34	Propylene Oxide	4906620	Heat/Polymerization/Fire	Temperature and pressure increased when mixed.	1
2	Nitric Acid, Fuming	4918529	101	Pulp Mill Liquid (F.L., n.o.s.)	4910320	Heat/Fire		
2	Nitric Acid, Fuming	4918529	10	Sodium Hydroxide, liq. or solution	4935243	Heat/Neutralization	Excessive temperature and pressure increases observed when mixed.	12
2	Nitric Acid, Fuming	4918529	10	Sodium Hydroxide, Liq. or solution	4935240	Heat/Neutralization	Excessive temperature and pressure increases observed when mixed.	12

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Nitric Acid, Fuming	4918529	21	Sodium Metal	4916456	Heat/Fire	Sodium ignites spontaneously in contact with nitric acid having a specific gravity > 1.056.	1
2	Nitric Acid, Fuming	4918529	16	Styrene Monomer, Inhibited	4907265	Heat/Fire	High temperature and pressure increases when mixed. Violent polymerization and ring nitration.	9
2	Nitric Acid, Fuming	4918529	105	Sulfur Dioxide	4904290	Heat/Toxic Gas	Initially slow followed by explosive reaction forms nitrosylsulfuric acid or NO and SO3 gas.	6
2	Nitric Acid, Fuming	4918529	16	Toluene	4909305	Heat/Fire	Oxidation and some nitration may cause uncontrolled reaction causing a "fume-off" - not explosive.	13
2	Nitric Acid, Fuming	4918529	18	Toluene Diisocyanate	4921575	Heat/Toxic Gas	Violent acid-catalyzed hydrolysis (if water present) with evolution of CO2, and NOx.	
2	Nitric Acid, Fuming	4918529	13	Vinyl Acetate	4907270	Heat/Polymerization/ Fire	Temperature and pressure increased when mixed. Ester hydrolysis and probable violent polymerization.	1
2	Nitric Acid, Fuming	4918529	17	Vinyl Chloride	4905792	Heat/Polymerization/ Fire	Possible polymerization or ignition of vinyl chloride.	
2	Nitric Acid, Fuming	4918529	16	Xylene	4909350	Heat/Fire	Violent nitration reaction.	
2	Nitric Acid, Fuming	4918529	16	Xylene	4909351	Heat/Fire	Violent nitration reaction.	
4	Octyl Alcohol (C.L., n.o.s.)	4913158	5	Acetaldehyde	4907210	Heat	Probably reacts only moderately fast as a result of steric hindrance. Forms 1,1-di(octoxy) ethane.	
4	Octyl Alcohol (C.L., n.o.s.)	4913158	5	Butyraldehyde	4908119	Heat	Probably reacts only moderately fast as a result of steric hindrance. Forms 1,1-di(octoxy) butane.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
4	Octyl Alcohol (C.L., n.o.s.)	4913158	104	Chlorine	4904120	Heat/Fire/Explosion	Forms 1-octyl hypochlorite which can violently explode on exposure to heat or sunlight.	1
4	Octyl Alcohol (C.L., n.o.s.)	4913158	34	Ethylene Oxide	4906610	Heat/Polymerization	Slow reaction at room temperature in absence of acidic or basic catalysts.	1
4	Octyl Alcohol (C.L., n.o.s.)	4913158	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Addition of alcohols to concentrated H2O2 forms explosives that can be detonated by shock or heat.	2
4	Octyl Alcohol (C.L., n.o.s.)	4913158	34	Propylene Oxide	4906620	Heat/Polymerization	Slow reaction at room temperature in absence of acidic or basic catalysts.	
4	Octyl Alcohol (C.L., n.o.s.)	4913158	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Exothermic reaction forms hydrogen and alkoxide.	4
4	Octyl Alcohol (C.L., n.o.s.)	4913158	18	Toluene Diisocyanate	4921575	Heat	Potentially violent urethane formation (ArNHCO2C8H17).	
101	Oil	4915245	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
101	Oil	4915245	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
101	Oil	4915245	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	May form combinations sensitive to heat or shock.	10
2	Oleum	4930030	5	Acetaldehyde	4907210	Heat/Polymerization/Fire	Violent polymerization (oxidation) of acetaldehyde in presence of concentrated acid.	2
2	Oleum	4930030	3	Acetic Acid, Glacial	4931303	Heat/Fire	Violent chemical reaction with fire because H2SO4/acetic acid is reported to ignite.	5
2	Oleum	4930030	107	Acetic Anhydride	4931304	Heat/Fire	Violent chemical reaction. Explosion if any water is present (i.e. rain).	5

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Oleum	4930030	19	Acetone	4908105	Heat/Fire	Potentially violent/explosive reaction.	2
2	Oleum	4930030	3	Acrylic Acid	4931405	Heat/Polymerization/Fire	Potentially violent polymerization.	5
2	Oleum	4930030	26	Acrylonitrile	4906420	Heat/Polymerization/Fire/Toxic Gas	Violent reaction may form NOx and SO2 gas. Acetonitrile/oleum has been shown to readily explode.	5
2	Oleum	4930030	4	Alcoholic Beverage	4910102	Heat/Flammable Gas/Fire	Vigorous reaction forms ethylene, diethyl ether, acetaldehyde. Reaction moderated by water content.	
2	Oleum	4930030	10	Alkaline Liquid, n.o.s.	4935220	Heat/Neutralization	Violent neutralization reaction.	5
2	Oleum	4930030	106	Ammonium Nitrate Solution	4918774	Heat/Explosion	Forms HNO3 and heat. Solid (NH4)2SO4-2NH4NO3 is known to explode.	
2	Oleum	4930030	10	Anhydrous Ammonia	4904210	Heat/Fire	Violent neutralization reaction forms amine sulfates.	
2	Oleum	4930030	7	Aniline Oil, Liquid	4921410	Heat/Fire/Toxic Gas	Ignites or explodes on contact. May form NOx gas from exhaustive oxidation.	5
2	Oleum	4930030	16	Benzene	4908110	Heat/Fire	Sulfonation of benzene may occur instantaneously and violently forming benzenesulfonic acid.	
2	Oleum	4930030	28	Butadiene	4905704	Heat/Polymerization/Fire	Cyclopentadiene (contains a 1,3-diene) explodes in H2SO4 - polymerization/oxidation.	
2	Oleum	4930030	28	Butadiene, Inhibited	4905703	Heat/Polymerization/Fire	Cyclopentadiene (contains a 1,3-diene) explodes in sulfuric acid - polymerization/oxidation.	
2	Oleum	4930030	29	Butane	4905702	Heat	Minimal heat generated.	
2	Oleum	4930030	29	Butane	4905706	Heat	Minimal heat generated.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Oleum	4930030	13	Butyl Acrylate (Corr. L., n.o.s.)	4912215	Heat/Polymerization/Fire	Potentially violent/explosive because oleum/ethyl acetate is a violent reaction.	
2	Oleum	4930030	4	Butyl Alcohol	4909129	Heat/Flammable Gas/Fire	Potentially violent/explosive reaction forms butene, dibutyl ether, and butyraldehyde.	
2	Oleum	4930030	5	Butyraldehyde	4908119	Heat/Polymerization/Fire	Violent chemical reaction.	5
2	Oleum	4930030	17	Carbon Tetrachloride	4940320	Heat/Toxic Gas	At 150 C, forms HCl and phosgene. Probably moderate or slow reaction at ambient temperature.	6
2	Oleum	4930030	17	Chloroprene, Inhibited	4907223	Heat/Polymerization/Toxic Gas/Fire	Potential explosive polymerization and oxidation forms SO2 gas.	
2	Oleum	4930030	101	Coal Tar Distillate	4915363	Heat	Minimal heat generated.	
2	Oleum	4930030	101	Combustible Liquid, n.o.s.	4915185	Heat	Minimal heat generated.	
2	Oleum	4930030	101	Compound, Cleaning, Liquid	4915147	Heat	Minimal heat generated.	
2	Oleum	4930030	101	Crude Oil Petroleum	4910165	Heat	Minimal heat generated.	
2	Oleum	4930030	29	Cyclohexane	4908132	Heat	Minimal heat generated.	
2	Oleum	4930030	4	Denatured Alcohol	4909151	Heat/Flammable Gas/Fire	Potentially violent/explosive reaction forms ethylene, diethyl ether, and acetaldehyde.	
2	Oleum	4930030	4	Denatured Alcohol	4909141	Heat/Flammable Gas/Fire	Potentially violent/explosive reaction forms ethylene, diethyl ether, and acetaldehyde.	
2	Oleum	4930030	27	Dinitrotoluene, Liquid	4963120	Heat/Fire/Explosion	Sulfonation of p-Chloronitrotoluene with oleum led to an explosion.	2
2	Oleum	4930030	101	Distillate Fuel Oil	2911315	Heat	Minimal heat generated.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Oleum	4930030	13	Ethyl Acetate	4909160	Heat/Fire	Violent chemical reaction.	5
2	Oleum	4930030	13	Ethyl Acrylate, inhibited	4907215	Heat/Polymerization/Fire	Potentially violent/explosive because oleum/ethyl acetate is a violent reaction.	
2	Oleum	4930030	4	Ethyl Alcohol	4909159	Heat/Flammable Gas/Fire	Potentially violent/explosive reaction forms ethylene, diethyl ether, and acetaldehyde.	
2	Oleum	4930030	34	Ethylene Oxide	4906610	Heat/Polymerization/Fire	Polymerization with heat liberation may occur in contact with acids. Explodes on contact.	1
2	Oleum	4930030	101	Flammable Liquid, n.o.s.	4910185	Heat	Minimal heat generated.	
2	Oleum	4930030	5	Formaldehyde Solution	4913144	Heat/Polymerization	Potentially vigorous/violent reaction moderated by water.	
2	Oleum	4930030	5	Formaldehyde Solution	4913168	Heat/Polymerization	Potentially vigorous/violent reaction moderated by water.	
2	Oleum	4930030	101	Fuel Oil	4915112	Heat	Minimal heat generated.	
2	Oleum	4930030	101	Fuel Oil	4915111	Heat	Minimal heat generated.	
2	Oleum	4930030	101	Fuel Oil	4915113	Heat	Minimal heat generated.	
2	Oleum	4930030	101	Fuel, Aviation, Turbine Engine	4915167	Heat	Minimal heat generated.	
2	Oleum	4930030	101	Fuel, Aviation, Turbine Engine	4909215	Heat	Minimal heat generated.	
2	Oleum	4930030	101	Gasoline	4908178	Heat	Minimal heat generated.	
2	Oleum	4930030	101	Gasoline, nec	2911190	Heat	Minimal heat generated.	
2	Oleum	4930030	14	Glycol Ethers, nec (C.L., n.o.s.)	4913194	Heat/Fire	Heat could detonate hydroperoxides formed from prior air oxidation, otherwise possible fire.	
2	Oleum	4930030	7	Hexamethylene Diamine Solution	4935645	Heat/Neutralization	Violent acid/base neutralization reaction. May form NOx gas from exhaustive oxidation.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Oleum	4930030	29	Hexane	4908183	Heat	Minimal heat generated.	
2	Oleum	4930030	104	Hydrogen Peroxide Solution	4918335	Heat/Explosion	Heat of dissolution of oleum in hydrogen peroxide solution.	
2	Oleum	4930030	4	Isopropanol	4909205	Heat/Flammable Gas/Fire	Potentially violent/explosive reaction forms propene, diisopropyl ether, and acetone.	5
2	Oleum	4930030	28	Liquefied Petroleum Gas	4905752	Heat	Minimal heat generated.	
2	Oleum	4930030	28	Liquefied Petroleum Gas (Butene)	4905707	Heat/Fire/Gas	Moderate heat and CO2 generated but mitigated by volatility of butene.	
2	Oleum	4930030	28	Liquefied Petroleum Gas (Butylene)	4905711	Heat/Fire/Gas	Moderate heat and CO2 generated but mitigated by volatility of butylene.	
2	Oleum	4930030	29	Liquefied Petroleum Gas (Isobutane)	4905750	Heat	Minimal heat generated.	
2	Oleum	4930030	29	Liquefied Petroleum Gas (Isobutane)	4905747	Heat	Minimal heat generated.	
2	Oleum	4930030	28	Liquefied Petroleum Gas (Isobutylene)	4905748	Heat/Fire/Gas	Moderate heat and CO2 generated but mitigated by volatility of isobutylene.	
2	Oleum	4930030	29	Liquefied Petroleum Gas (Propane)	4905781	Heat	Minimal heat generated.	
2	Oleum	4930030	28	Liquefied Petroleum Gas (Propylene)	4905782	Heat/Fire/Gas	Moderate heat and CO2 generated but mitigated by volatility of propylene.	
2	Oleum	4930030	107	Maleic Anhydride	4941161	Heat/Polymerization	Potential violent/explosive polymerization and sulfonation forms sulfonatomaleic acid.	
2	Oleum	4930030	4	Methyl Alcohol	4909230	Heat/Flammable Gas/Fire/Toxic Gas	Potentially violent/explosive reaction forms dimethyl ether, and formaldehyde.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Oleum	4930030	4	Methyl Alcohol	4909237	Heat/Flammable Gas/Fire/Toxic Gas	Potentially violent/explosive reaction forms dimethyl ether, and formaldehyde.	
2	Oleum	4930030	17	Methyl Chloride	4905761	Heat/Fire/Toxic Gas	Potential oxidation forms SO2 and HCl gas.	8
2	Oleum	4930030	19	Methyl Ethyl Ketone	4909243	Heat/Fire	Potentially violent/explosive reaction.	5
2	Oleum	4930030	13	Methyl Methacrylate Monomer, inhib.	4907250	Heat/Polymerization/Fire	Potentially violent/explosive because oleum/ethyl acetate is a violent reaction.	
2	Oleum	4930030	24	Motor Fuel Antiknock Compound	4921445	Heat/Flammable Gas	Potential formation of ethane.	
2	Oleum	4930030	4	Octyl Alcohol (C.L., n.o.s.)	4913158	Heat/Fire	Potentially violent/explosive reaction forms octene, dioctyl ether, and octanal.	
2	Oleum	4930030	101	Oil	4915245	Heat	Minimal heat generated.	
2	Oleum	4930030	101	Petroleum Naphtha	4915257	Heat	Minimal heat generated.	
2	Oleum	4930030	101	Petroleum Naphtha	4910259	Heat	Minimal heat generated.	
2	Oleum	4930030	101	Petroleum Naphtha	4915259	Heat	Minimal heat generated.	
2	Oleum	4930030	101	Petroleum Residual Fuel Oil	2911715	Heat	Minimal heat generated.	
2	Oleum	4930030	101	Petroleum, Partially Refined	2911735	Heat	Minimal heat generated.	
2	Oleum	4930030	31	Phenol	4921220	Heat	Sulfonation of phenol should be extremely rapid and violent.	
2	Oleum	4930030	105	Phosphorus, White or Yellow	4916141	Heat/Fire/Toxic Gas	Yellow phosphorus ignites when placed in boiling sulfuric acid.	1
2	Oleum	4930030	10	Potassium Hydroxide, Liq. or solution	4935230	Heat/Neutralization	Extremely violent eruption of acid when added to KOH.	2
2	Oleum	4930030	34	Propylene Oxide	4906620	Heat/Polymerization/Fire	Violent/explosive chemical reaction - since sulfuric acid spent/propylene oxide explodes.	5

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Oleum	4930030	101	Pulp Mill Liquid (F.L., n.o.s.)	4910320	Heat	Minimal heat generated.	
2	Oleum	4930030	10	Sodium Hydroxide, liq. or solution	4935243	Heat/Neutralization	Violent neutralization reaction.	5
2	Oleum	4930030	10	Sodium Hydroxide, Liq. or solution	4935240	Heat/Neutralization	Violent neutralization reaction.	5
2	Oleum	4930030	21	Sodium Metal	4916456	Heat	Mild reaction if anhydrous, otherwise reacts explosively. Hydrogen generated.	2
2	Oleum	4930030	16	Styrene Monomer, Inhibited	4907265	Heat/Polymerization/Fire	Ignites or explodes on contact.	5
2	Oleum	4930030	16	Toluene	4909305	Heat/Fire	Violent sulfonation of ring and oxidation of methyl group - more readily than with benzene.	
2	Oleum	4930030	18	Toluene Diisocyanate	4921575	Heat/Toxic Gas	Violent oxidation with evolution of CO2, NOx and acid catalyzed hydrolysis if water is present.	
2	Oleum	4930030	13	Vinyl Acetate	4907270	Heat/Polymerization/Fire	Potentially violent/explosive reaction. Sulfuric acid/vinyl acetate ignites or explodes on contact.	5
2	Oleum	4930030	17	Vinyl Chloride	4905792	Heat/Polymerization/Toxic Gas/Fire	Potentially violent polymerization forms SO2 gas.	
2	Oleum	4930030	16	Xylene	4909350	Heat/Fire	Violent sulfonation of ring and oxidation of methyl groups forming xylenesulfonic acid.	
2	Oleum	4930030	16	Xylene	4909351	Heat/Fire	Violent sulfonation of ring and oxidation of methyl groups forming xylenesulfonic acid.	
101	Petroleum Naphtha	4915259	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
101	Petroleum Naphtha	4915257	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
101	Petroleum Naphtha	4910259	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
101	Petroleum Naphtha	4915259	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
101	Petroleum Naphtha	4910259	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
101	Petroleum Naphtha	4915257	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
101	Petroleum Naphtha	4915259	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	May form combinations sensitive to heat or shock.	10
101	Petroleum Naphtha	4910259	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	May form combinations sensitive to heat or shock.	10
101	Petroleum Naphtha	4915257	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	May form combinations sensitive to heat or shock.	10
101	Petroleum Residual Fuel Oil	2911715	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
101	Petroleum Residual Fuel Oil	2911715	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
101	Petroleum Residual Fuel Oil	2911715	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Reaction expected only if material contains alkenes, aldehydes, ketones, or alcohols.	10
101	Petroleum, Partially Refined	2911735	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
101	Petroleum, Partially Refined	2911735	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
101	Petroleum, Partially Refined	2911735	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Reaction expected only if material contains alkenes, aldehydes, ketones, or alcohols.	
31	Phenol	4921220	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
31	Phenol	4921220	104	Chlorine	4904120	Heat/Fire	Potentially violent/explosive due to exothermic chlorination of phenol.	
31	Phenol	4921220	34	Ethylene Oxide	4906610	Heat/Polymerization/Fire	Potentially violent reaction due to phenol catalyzed ring opening polymerization.	1
31	Phenol	4921220	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Possible oxidation if trace of Fe+2 is present, potential explosion of H2O2 due to exotherm.	
31	Phenol	4921220	105	Phosphorus, White or Yellow	4916141	Heat/Flammable Gas		
31	Phenol	4921220	34	Propylene Oxide	4906620	Heat/Polymerization/Fire	Potentially violent reaction due to phenol catalyzed ring opening polymerization.	
1	Phosphoric Acid	4930247	5	Acetaldehyde	4907210	Heat/Polymerization	Vigorous polymerization and aldol condensation to 2-butenal and 3-hydroxybutanal.	2
1	Phosphoric Acid	4930247	3	Acetic Acid, Glacial	4931303	Heat	Generation of heat.	
1	Phosphoric Acid	4930247	107	Acetic Anhydride	4931304	Heat/Fire	Mixing acetic anhydride with water can be explosive in aqueous mineral acids.	1
1	Phosphoric Acid	4930247	19	Acetone	4908105	Heat	Slow acid catalyzed aldol condensation forms diacetone alcohol.	8
1	Phosphoric Acid	4930247	3	Acrylic Acid	4931405	Heat/Polymerization	Vigorous reaction may occur as in the hydrochloric acid/acrylic acid reaction.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Phosphoric Acid	4930247	26	Acrylonitrile	4906420	Heat/Polymerization	Probably only a moderate reaction because phosphoric acid is a weak acid - pKa = 2.	
1	Phosphoric Acid	4930247	4	Alcoholic Beverage	4910102	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	10	Alkaline Liquid, n.o.s.	4935220	Heat/Neutralization	Violent neutralization reaction forms phosphate salts.	
1	Phosphoric Acid	4930247	106	Ammonium Nitrate Solution	4918774	Heat	Forms HNO3, heat and (NH4)2PO4 which is a fire retardant.	
1	Phosphoric Acid	4930247	10	Anhydrous Ammonia	4904210	Heat/Neutralization	Violent neutralization reaction releases heat which vaporizes any excess NH3 and forms phosphate.	
1	Phosphoric Acid	4930247	7	Aniline Oil, Liquid	4921410	Heat/Neutralization	Vigorous acid/base neutralization reaction generates aniline phosphate.	8
1	Phosphoric acid	4930247	28	Butadiene	4905704	Heat/Polymerization	Minimal acid catalyzed cationic polymerization mitigated by low solubility of butadiene in water.	
1	Phosphoric Acid	4930247	28	Butadiene, Inhibited	4905703	Heat/Polymerization	Minimal acid catalyzed cationic polymerization mitigated by low solubility of butadiene in water.	
1	Phosphoric acid	4930247	13	Butyl Acrylate (Corr. L., n.o.s.)	4912215	Heat	Slow hydrolysis reaction forms acrylic acid and butanol.	
1	Phosphoric Acid	4930247	4	Butyl Alcohol	4909129	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	5	Butyraldehyde	4908119	Heat/Polymerization	Vigorous polymerization and aldol condensation to 2-ethyl-2-hexenal and 3-hydroxy-2-ethylhexanal.	
1	Phosphoric Acid	4930247	20	Carbon Disulfide	4908125	Compatible	Immiscible at ambient temperature. At elevated temperatures CS2 can be oxidized/H3PO4 reduced.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Phosphoric Acid	4930247	17	Carbon Tetrachloride	4940320	Compatible	No reaction anticipated.	
1	Phosphoric Acid	4930247	104	Chlorine	4904120	Heat	Chlorine may dissolve in H3PO4 but reaction is not anticipated.	
1	Phosphoric Acid	4930247	17	Chloroprene, Inhibited	4907223	Heat/Polymerization	Potentially vigorous/violent polymerization mitigated by low solubility of chloroprene in water.	
1	Phosphoric Acid	4930247	101	Coal Tar Distillate	4915363	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	101	Combustible Liquid, n.o.s.	4915185	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	101	Compound, Cleaning, Liquid	4915147	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	101	Crude Oil Petroleum	4910165	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	4	Denatured Alcohol	4909141	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	4	Denatured Alcohol	4909151	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	101	Distillate Fuel Oil	2911315	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	13	Ethyl Acetate	4909160	Heat	Slow hydrolysis reaction forms acetic acid and ethanol.	
1	Phosphoric Acid	4930247	13	Ethyl Acrylate, inhibited	4907215	Heat	Slow hydrolysis reaction forms acrylic acid and ethanol.	
1	Phosphoric Acid	4930247	4	Ethyl Alcohol	4909159	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	34	Ethylene Oxide	4906610	Heat/Polymerization	Polymerization with heat liberation may occur in contact with acids.	1
1	Phosphoric Acid	4930247	101	Flammable Liquid, n.o.s.	4910185	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	5	Formaldehyde Solution	4913168	Heat/Polymerization	Potentially vigorous polymerization moderated by presence of water.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Phosphoric Acid	4930247	5	Formaldehyde Solution	4913144	Heat/Polymerization	Potentially vigorous polymerization moderated by presence of water.	
1	Phosphoric Acid	4930247	101	Fuel Oil	4915112	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	101	Fuel Oil	4915111	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	101	Fuel Oil	4915113	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	101	Fuel, Aviation, Turbine Engine	4909215	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	101	Fuel, Aviation, Turbine Engine	4915167	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	101	Gasoline	4908178	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	101	Gasoline, nec	2911190	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	14	Glycol Ethers, nec (C.L., n.o.s.)	4913194	Heat	Minimal cleavage and heat. However, hydroperoxides formed from prior air oxidation are explosive.	
1	Phosphoric Acid	4930247	7	Hexamethylene Diamine Solution	4935645	Heat/Neutralization	Vigorous acid/base neutralization reaction generates hexamethylene diamine phosphate.	8
1	Phosphoric Acid	4930247	104	Hydrogen Peroxide Solution	4918335	Heat/Gas	Heat of solution and formation of peroxyphosphoric acid. Trace metals could catalyze 02 release.	
1	Phosphoric Acid	4930247	4	Isopropanol	4909205	Heat	Minimal heat generated	
1	Phosphoric Acid	4930247	107	Maleic Anhydride	4941161	Heat	Potential vigorous acid catalyzed hydrolysis (less violent than with HCl) forms maleic acid.	
1	Phosphoric Acid	4930247	4	Methyl Alcohol	4909237	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	4	Methyl Alcohol	4909230	Heat	Minimal heat generated	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Phosphoric Acid	4930247	17	Methyl Chloride	4905761	Compatible	No reaction anticipated.	
1	Phosphoric Acid	4930247	19	Methyl Ethyl Ketone	4909243	Heat	Slow acid catalyzed aldol condensation.	8
1	Phosphoric Acid	4930247	13	Methyl Methacrylate Monomer, inhib.	4907250	Heat	Slow hydrolysis reaction forms methacrylic acid and methanol.	
1	Phosphoric Acid	4930247	24	Motor Fuel Antiknock Compound	4921445	Heat/Flammable Gas/Fire	Potential formation of ethane gas.	
1	Phosphoric Acid	4930247	2	Nitric Acid, Fuming	4918529	Compatible		
1	Phosphoric Acid	4930247	4	Octyl Alcohol (C.L., n.o.s.)	4913158	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	101	Oil	4915245	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	101	Petroleum Naphtha	4915259	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	101	Petroleum Naphtha	4915257	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	101	Petroleum Naphtha	4910259	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	101	Petroleum Residual Fuel Oil	2911715	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	101	Petroleum, Partially Refined	2911735	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	31	Phenol	4921220	Heat	Minimal heat generated.	
1	Phosphoric Acid	4930247	105	Phosphorus, White or Yellow	4916141	Compatible		
1	Phosphoric Acid	4930247	10	Potassium Hydroxide, Liq. or solution	4935230	Heat/Neutralization	Violent eruption of acid when added to KOH forms phosphate salt.	2
1	Phosphoric Acid	4930247	34	Propylene Oxide	4906620	Heat/Polymerization	Potentially vigorous/violent polymerization.	
1	Phosphoric Acid	4930247	101	Pulp Mill Liquid (F.L., n.o.s.)	4910320	Heat	Minimal heat generated.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
1	Phosphoric Acid	4930247	10	Sodium Hydroxide, liq. or solution	4935243	Heat/Neutralization	Violent neutralization reaction forms phosphate salt.	5
1	Phosphoric Acid	4930247	10	Sodium Hydroxide, Liq. or solution	4935240	Heat/Neutralization	Violent neutralization reaction forms phosphate salt.	5
1	Phosphoric Acid	4930247	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Sodium ignites in phosphoric acid. Hydrogen evolution.	4
1	Phosphoric Acid	4930247	16	Styrene Monomer, Inhibited	4907265	Heat/Polymerization	Potentially vigorous polymerization.	
1	Phosphoric Acid	4930247	18	Toluene Diisocyanate	4921575	Heat/Polymerization/Gas	Potentially vigorous/violent hydrolysis followed by polymerization.	9
1	Phosphoric Acid	4930247	13	Vinyl Acetate	4907270	Heat/Polymerization	Potentially vigorous/violent hydrolysis reaction forms acetic acid and acetaldehyde.	
1	Phosphoric Acid	4930247	17	Vinyl Chloride	4905792	Heat/Polymerization	Potentially vigorous/violent reaction mitigated by low boiling point of vinyl chloride.	
105	Phosphorus, White or Yellow	4916141	107	Acetic Anhydride	4931304	Unknown		
105	Phosphorus, White or Yellow	4916141	106	Ammonium Nitrate Solution	4918774	Heat/Explosion	The mixture can explode by percussion.	1
105	Phosphorus, White or Yellow	4916141	107	Maleic Anhydride	4941161	Unknown		
105	Phosphorus, White or Yellow	4916141	105	Sulfur Dioxide	4904290	Compatible	Liquid SO2 dissolves white phosphorus. If heated it will react to form phosphorus and sulfur oxides.	
10	Potassium Hydroxide, Liq. or solution	4935230	107	Acetic Anhydride	4931304	Heat	Violent hydrolysis reaction with potential explosive boiling. Forms potassium acetate.	
10	Potassium Hydroxide, Liq. or solution	4935230	19	Acetone	4908105	Heat	Slow aldol condensation forms 4-hydroxy-4-methyl-2-pentanone.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
10	Potassium Hydroxide, Liq. or solution	4935230	26	Acrylonitrile	4906420	Heat/Polymerization	Violent polymerization occurs if alkaline is concentrated.	1
10	Potassium Hydroxide, Liq. or solution	4935230	106	Ammonium Nitrate Solution	4918774	Heat	Will form heat.	
10	Potassium Hydroxide, Liq. or solution	4935230	17	Carbon Tetrachloride	4940320	Heat/Toxic Gas	Moderate heat generated from displacement reaction forming CCL3OH which converts to phosgene and HCL	
10	Potassium Hydroxide, Liq. or solution	4935230	17	Chloroprene, Inhibited	4907223	Heat/Polymerization	Potential vigorous polymerization mitigated by low solubility of chloroprene in water.	
10	Potassium Hydroxide, Liq. or solution	4935230	27	Dinitrotoluene, Liquid	4963120	Heat/Explosion	o-Nitrotoluene in the presence of NaOH exploded - DNT is expected to be more explosive.	2
10	Potassium Hydroxide, Liq. or solution	4935230	13	Ethyl Acetate	4909160	Heat	Potentially violent base initiated hydrolysis forming acetic acid and ethanol.	
10	Potassium Hydroxide, Liq. or solution	4935230	34	Ethylene Oxide	4906610	Heat/Polymerization/Fire	Polymerization will occur in contact with bases. Propylene oxide/NaOH known to explode.	1
10	Potassium Hydroxide, Liq. or solution	4935230	107	Maleic Anhydride	4941161	Heat	Decomposes explosively in presence of alkalis forming maleic acid potassium salt.	1
10	Potassium Hydroxide, Liq. or solution	4935230	17	Methyl Chloride	4905761	Heat	Very rapid displacement reaction forms methanol.	
10	Potassium Hydroxide, Liq. or solution	4935230	19	Methyl Ethyl Ketone	4909243	Heat	Slow aldol condensation.	
10	Potassium Hydroxide, Liq. or solution	4935230	105	Phosphorus, White or Yellow	4916141	Heat/Flammable Gas/Toxic Gas	Yields phosphine gas when the mixture is boiled.	1
10	Potassium Hydroxide, Liq. or solution	4935230	34	Propylene Oxide	4906620	Heat/Polymerization/Fire	Violent base catalyzed polymerization. Propylene oxide/sodium hydroxide is known to explode.	2

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
10	Potassium Hydroxide, Liq. or solution	4935230	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Hydrogen evolution.	
10	Potassium Hydroxide, Liq. or solution	4935230	16	Styrene Monomer, Inhibited	4907265	Heat/Polymerization	Potential polymerization mitigated by low solubility of styrene in water.	
10	Potassium Hydroxide, Liq. or solution	4935230	105	Sulfur Dioxide	4904290	Heat/Neutralization	Reacts to form alkali sulfites in solution or bisulfites if excess SO2 present.	
10	Potassium Hydroxide, Liq. or solution	4935230	18	Toluene Diisocyanate	4921575	Heat/Polymerization/ Gas	Potentially vigorous exothermic hydrolysis/polymerization will occur in contact with bases.	2
10	Potassium Hydroxide, Liq. or solution	4935230	13	Vinyl Acetate	4907270	Heat	Potentially violent base initiated hydrolysis forming acetic acid and acetaldehyde.	
10	Potassium Hydroxide, Liq. or solution	4935230	17	Vinyl Chloride	4905792	Heat/Polymerization/ Flammable Gas	Potential vigorous polymerization with possible acetylene formation. Mitigated by low solubility.	
34	Propylene Oxide	4906620	106	Ammonium Nitrate Solution	4918774	Compatible	Minimal reaction anticipated.	
34	Propylene Oxide	4906620	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	
34	Propylene Oxide	4906620	104	Ferric Chloride Solution	4932342	Heat/Polymerization	Potential violent polymerization (FeCl3 is used for propylene oxide polymerization).	
34	Propylene Oxide	4906620	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Alpha positions are activated to attack by hydroxyl radicals generating hydroperoxides - explosive.	
34	Propylene Oxide	4906620	105	Phosphorus, White or Yellow	4916141	Heat/Polymerization		
101	Pulp Mill Liquid (F.L., n.o.s.)	4910320	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
101	Pulp Mill Liquid (F.L., n.o.s.)	4910320	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
101	Pulp Mill Liquid (F.L., n.o.s.)	4910320	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	May form combinations that are sensitive to heat or shock.	10
10	Sodium Hydroxide, liq. or solution	4935243	107	Acetic Anhydride	4931304	Heat	Violent hydrolysis reaction with potential explosive boiling. Forms sodium acetate.	12
10	Sodium Hydroxide, Liq. or solution	4935240	107	Acetic Anhydride	4931304	Heat	Violent hydrolysis reaction with potential explosive boiling. Forms sodium acetate.	12
10	Sodium Hydroxide, Liq. or solution	4935240	19	Acetone	4908105	Heat	Slow aldol condensation forms 4-hydroxy-4-methyl-2-pentanone.	
10	Sodium Hydroxide, liq. or solution	4935243	19	Acetone	4908105	Heat	Slow aldol condensation forms 4-hydroxy-4-methyl-2-pentanone.	
10	Sodium Hydroxide, Liq. or solution	4935240	26	Acrylonitrile	4906420	Heat/Polymerization	Violent polymerization occurs if alkaline is concentrated.	1
10	Sodium Hydroxide, liq. or solution	4935243	26	Acrylonitrile	4906420	Heat/Polymerization	Violent polymerization occurs if alkaline is concentrated.	1
10	Sodium Hydroxide, Liq. or solution	4935240	106	Ammonium Nitrate Solution	4918774	Heat	Will form heat.	
10	Sodium Hydroxide, liq. or solution	4935243	106	Ammonium Nitrate Solution	4918774	Heat	Will form heat.	
10	Sodium Hydroxide, liq. or solution	4935243	17	Carbon Tetrachloride	4940320	Heat/Toxic Gas	Moderate heat from displacement reaction forming CCl3OH which converts to phosgene and HCL.	
10	Sodium Hydroxide, Liq. or solution	4935240	17	Carbon Tetrachloride	4940320	Heat/Toxic Gas	Moderate heat from displacement reaction forming CCl3OH which converts to phosgene and HCL.	
10	Sodium Hydroxide, liq. or solution	4935243	17	Chloroprene, Inhibited	4907223	Heat/Polymerization	Potential vigorous polymerization mitigated by low solubility of chloroprene in water.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
10	Sodium Hydroxide, Liq. or solution	4935240	17	Chloroprene, Inhibited	4907223	Heat/Polymerization	Potential vigorous polymerization mitigated by low solubility of chloroprene in water.	
10	Sodium Hydroxide, liq. or solution	4935243	27	Dinitrotoluene, Liquid	4963120	Heat/Explosion	o-Nitrotoluene in the presence of NaOH exploded - DNT is expected to be more explosive.	2
10	Sodium Hydroxide, Liq. or solution	4935240	27	Dinitrotoluene, Liquid	4963120	Heat/Explosion	o-Nitrotoluene in the presence of NaOH exploded - DNT is expected to be more explosive.	2
10	Sodium Hydroxide, liq. or solution	4935243	13	Ethyl Acetate	4909160	Heat	Potential base initiated hydrolysis. Exotherm observed when mixture heated between 100 and 200 C.	12
10	Sodium Hydroxide, Liq. or solution	4935240	13	Ethyl Acetate	4909160	Heat	Potential base initiated hydrolysis. Exotherm observed when mixture heated between 100 and 200 C.	12
10	Sodium Hydroxide, liq. or solution	4935243	34	Ethylene Oxide	4906610	Heat/Polymerization/ Fire	Violent polymerization with heat liberation will occur. Propylene oxide/NaOH known to explode.	1
10	Sodium Hydroxide, Liq. or solution	4935240	34	Ethylene Oxide	4906610	Heat/Polymerization/ Fire	Violent polymerization with heat liberation will occur. Propylene oxide/NaOH known to explode.	1
10	Sodium Hydroxide, Liq. or solution	4935240	107	Maleic Anhydride	4941161	Heat	Decomposes explosively in presence of NaOH forming maleic acid sodium salt.	1
10	Sodium Hydroxide, liq. or solution	4935243	107	Maleic Anhydride	4941161	Heat	Decomposes explosively in presence of NaOH forming maleic acid sodium salt.	1
10	Sodium Hydroxide, Liq. or solution	4935240	17	Methyl Chloride	4905761	Heat	Very rapid displacement forming methanol.	
10	Sodium Hydroxide, liq. or solution	4935243	17	Methyl Chloride	4905761	Heat	Very rapid displacement forming methanol.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
10	Sodium Hydroxide, Liq. or solution	4935240	19	Methyl Ethyl Ketone	4909243	Heat	Slow aldol condensation with minimal heat generation.	12
10	Sodium Hydroxide, liq. or solution	4935243	19	Methyl Ethyl Ketone	4909243	Heat	Slow aldol condensation with minimal heat generation.	12
10	Sodium Hydroxide, Liq. or solution	4935240	105	Phosphorus, White or Yellow	4916141	Heat/Flammable Gas/Toxic Gas	Yields phosphine gas when the mixture is boiled.	1
10	Sodium Hydroxide, liq. or solution	4935243	105	Phosphorus, White or Yellow	4916141	Heat/Flammable Gas/Toxic Gas	Yields phosphine gas when the mixture is boiled.	1
10	Sodium Hydroxide, Liq. or solution	4935240	34	Propylene Oxide	4906620	Heat/Polymerization/ Fire	Violent base catalyzed polymerization. Propylene oxide/NaOH is known to explode.	2
10	Sodium Hydroxide, liq. or solution	4935243	34	Propylene Oxide	4906620	Heat/Polymerization/ Fire	Violent base catalyzed polymerization. Propylene oxide/NaOH is known to explode.	2
10	Sodium Hydroxide, liq. or solution	4935243	16	Styrene Monomer, Inhibited	4907265	Heat/Polymerization	Potential polymerization mitigated by low solubility of styrene in water.	
10	Sodium Hydroxide, Liq. or solution	4935240	16	Styrene Monomer, Inhibited	4907265	Heat/Polymerization	Potential polymerization mitigated by low solubility of styrene in water.	
10	Sodium Hydroxide, Liq. or solution	4935240	105	Sulfur Dioxide	4904290	Heat/Neutralization	Reacts to form alkali sulfites in solution or bisulfites if excess SO2 present.	
10	Sodium Hydroxide, liq. or solution	4935243	105	Sulfur Dioxide	4904290	Heat/Neutralization	Reacts to form alkali sulfites in solution or bisulfites if excess SO2 present.	
10	Sodium Hydroxide, Liq. or solution	4935240	18	Toluene Diisocyanate	4921575	Heat/Polymerization/ Gas	Exothermic hydrolysis to carbamate followed by polymerization will occur in contact with bases.	2
10	Sodium Hydroxide, liq. or solution	4935243	18	Toluene Diisocyanate	4921575	Heat/Polymerization/ Gas	Exothermic hydrolysis to carbamate followed by polymerization will occur in contact with bases.	2

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
10	Sodium Hydroxide, liq. or solution	4935243	13	Vinyl Acetate	4907270	Heat	Potentially violent base initiated hydrolysis forming acetic acid and acetaldehyde.	
10	Sodium Hydroxide, Liq. or solution	4935240	13	Vinyl Acetate	4907270	Heat	Potentially violent base initiated hydrolysis forming acetic acid and acetaldehyde.	
10	Sodium Hydroxide, liq. or solution	4935243	17	Vinyl Chloride	4905792	Heat/Polymerization/ Flammable Gas	Potential vigorous polymerization with possible acetylene formation mitigated by low solubility.	
10	Sodium Hydroxide, Liq. or solution	4935240	17	Vinyl Chloride	4905792	Heat/Polymerization/ Flammable Gas	Potential vigorous polymerization with possible acetylene formation mitigated by low solubility.	
21	Sodium Metal	4916456	107	Acetic Anhydride	4931304	Heat	May be extremely reactive since acetic anhydride is more reactive than esters which react violently.	
21	Sodium Metal	4916456	26	Acrylonitrile	4906420	Heat/Polymerization/ Flammable Gas/Fire	Sodium could initiate violent or explosive polymerization.	
21	Sodium Metal	4916456	106	Ammonium Nitrate Solution	4918774	Heat/Flammable Gas/Fire/Explosion	React through a series of reductions to form an explosive substance believed to be disodium nitrite.	1
21	Sodium Metal	4916456	28	Butadiene	4905704	Heat/Polymerization	Sodium catalyzes polymerization of butadiene (potentially violent without solvent).	4
21	Sodium Metal	4916456	28	Butadiene, Inhibited	4905703	Heat/Polymerization	Sodium catalyzes polymerization of butadiene (potentially violent without solvent).	4
21	Sodium Metal	4916456	104	Chlorine	4904120	Heat/Fire	Sodium and chlorine vapors react with a luminous flame.	1
21	Sodium Metal	4916456	27	Dinitrotoluene, Liquid	4963120	Heat/Explosion	DNT is prone to accept an electron in making a stable radical anion - may form explosive compounds.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
21	Sodium Metal	4916456	34	Ethylene Oxide	4906610	Heat/Polymerization	Potentially explosive by analogy to ethylene oxide/potassium.	
21	Sodium Metal	4916456	104	Ferric Chloride Solution	4932342	Heat/Flammable Gas/Fire	Violent reaction occurs if a mixture of sodium and ferric chloride is shocked. H2 formation.	1
21	Sodium Metal	4916456	104	Hydrogen Peroxide Solution	4918335	Heat/Flammable Gas/Fire/Explosion	Reacts violently. Hydrogen evolution.	1
21	Sodium Metal	4916456	107	Maleic Anhydride	4941161	Heat/Polymerization	Decomposes explosively in presence of alkali metals. Anionic Polymerization.	1
21	Sodium Metal	4916456	105	Phosphorus, White or Yellow	4916141	Heat/Fire	Reacts vigorously with sodium forming phosphide, or in air, phosphate with ignition.	4
21	Sodium Metal	4916456	34	Propylene Oxide	4906620	Heat/Polymerization	Potentially explosive by analogy to ethylene oxide/potassium.	
21	Sodium Metal	4916456	101	Pulp Mill Liquid (F.L., n.o.s.)	4910320	Heat/Flammable Gas/Fire	Hydrogen evolution possible (if water present).	
21	Sodium Metal	4916456	105	Sulfur Dioxide	4904290	Heat/Fire	SO2 reacts violently with sodium at its melting point. Heated potassium is known to burn in SO2.	
16	Styrene Monomer, Inhibited	4907265	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
16	Styrene Monomer, Inhibited	4907265	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with most hydrocarbons causing ignition of some.	1
16	Styrene Monomer, Inhibited	4907265	104	Ferric Chloride Solution	4932342	Heat/Polymerization	Typically anionic or radical initiators are used for styrene polymerization	
16	Styrene Monomer, Inhibited	4907265	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Epoxidation exotherm may initiate explosion of H2O2.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
16	Styrene Monomer, Inhibited	4907265	105	Phosphorus, White or Yellow	4916141	Compatible	No reaction expected.	
16	Styrene Monomer, Inhibited	4907265	21	Sodium Metal	4916456	Heat/Polymerization	Efficient anionic polymerization. Probable explosion.	
105	Sulfur Dioxide	4904290	107	Acetic Anhydride	4931304	Unknown		
2	Sulfuric Acid	4930040	5	Acetaldehyde	4907210	Heat/Polymerization/Fire	Violent polymerization of acetaldehyde in presence of concentrated acid.	2
2	Sulfuric Acid	4930040	3	Acetic Acid, Glacial	4931303	Heat/Fire	Ignites or explodes on contact.	5
2	Sulfuric Acid	4930040	107	Acetic Anhydride	4931304	Heat/Fire	Violent chemical reaction. Explosion if any water is present (i.e. rain).	5
2	Sulfuric Acid	4930040	19	Acetone	4908105	Heat/Polymerization	Potentially violent polymerization of enol plus aldol condensation followed by elimination.	
2	Sulfuric Acid	4930040	3	Acrylic Acid	4931405	Heat/Polymerization	Potentially violent polymerization but minimal heat generation reported.	12
2	Sulfuric Acid	4930040	26	Acrylonitrile	4906420	Heat/Polymerization/Fire/Toxic Gas	Vigorous exothermic reaction may form NOx gas. Methacrylonitrile/H2SO4 has been shown to explode.	2
2	Sulfuric Acid	4930040	4	Alcoholic Beverage	4910102	Heat/Flammable Gas/Fire	Potentially violent reaction forms ethylene and diethyl ether. Reaction moderated by water content.	
2	Sulfuric Acid	4930040	10	Alkaline Liquid, n.o.s.	4935220	Heat/Neutralization	Violent neutralization reaction.	5
2	Sulfuric Acid	4930040	106	Ammonium Nitrate Solution	4918774	Heat/Explosion	Forms HNO3 and heat. Solid (NH4)2SO4-2NH4NO3 is known to explode.	
2	Sulfuric Acid	4930040	10	Anhydrous Ammonia	4904210	Heat/Fire	Violent neutralization reaction.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Sulfuric Acid	4930040	7	Aniline Oil, Liquid	4921410	Heat/Fire/Toxic Gas	Ignites or explodes on contact. May form NOx gas from exhaustive oxidation.	5
2	Sulfuric Acid	4930040	16	Benzene	4908110	Heat/Fire	Sulfonation of benzene will proceed vigorously or violently forming benzenesulfonic acid.	
2	Sulfuric Acid	4930040	28	Butadiene	4905704	Heat/Polymerization/Fire	Potential violent/explosive polymerization with excessive heat generation.	12
2	Sulfuric Acid	4930040	28	Butadiene, Inhibited	4905703	Heat/Polymerization/Fire	Potential violent/explosive polymerization with excessive heat generation.	12
2	Sulfuric Acid	4930040	13	Butyl Acrylate (Corr. L., n.o.s.)	4912215	Heat/Polymerization/Fire	Potentially violent/explosive reaction.	
2	Sulfuric Acid	4930040	4	Butyl Alcohol	4909129	Heat/Flammable Gas/Fire	Potentially violent reaction forms butene, dibutyl ether and heat.	
2	Sulfuric Acid	4930040	5	Butyraldehyde	4908119	Heat/Polymerization/Fire	Violent chemical reaction.	5
2	Sulfuric Acid	4930040	17	Carbon Tetrachloride	4940320	Heat/Toxic Gas	Forms HCl and phosgene at 150 C.	6
2	Sulfuric Acid	4930040	17	Chloroprene, Inhibited	4907223	Heat/Polymerization/Toxic Gas/Fire	Potentially explosive polymerization reaction forms SO2 gas.	
2	Sulfuric Acid	4930040	101	Coal Tar Distillate	4915363	Heat	Minimal heat generated.	
2	Sulfuric Acid	4930040	101	Combustible Liquid, n.o.s.	4915185	Heat	Minimal heat generated.	
2	Sulfuric Acid	4930040	101	Compound, Cleaning, Liquid	4915147	Heat	Minimal heat generated.	
2	Sulfuric Acid	4930040	101	Crude Oil Petroleum	4910165	Heat	Minimal heat generated.	
2	Sulfuric Acid	4930040	4	Denatured Alcohol	4909151	Heat/Flammable Gas/Fire	Potentially violent reaction forms ethylene and diethyl ether.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Sulfuric Acid	4930040	4	Denatured Alcohol	4909141	Heat/Flammable Gas/Fire	Potentially violent reaction forms ethylene and diethyl ether.	
2	Sulfuric Acid	4930040	27	Dinitrotoluene, Liquid	4963120	Heat/Fire/Explosion	Since sulfuric acid/p-nitrotoluene mixtures detonate at 160 C, 2,4-DNT may explode at lower temps.	
2	Sulfuric Acid	4930040	101	Distillate Fuel Oil	2911315	Heat	Minimal heat generated.	
2	Sulfuric Acid	4930040	13	Ethyl Acetate	4909160	Heat	Minimal heat generated.	12
2	Sulfuric Acid	4930040	13	Ethyl Acrylate, inhibited	4907215	Heat/Polymerization	Some heat generation with potential polymerization.	9
2	Sulfuric Acid	4930040	4	Ethyl Alcohol	4909159	Heat/Flammable Gas/Fire	Potentially violent reaction forms ethylene, diethyl ether and excessive heat.	9
2	Sulfuric Acid	4930040	34	Ethylene Oxide	4906610	Heat/Polymerization/Fire	Polymerization/explosion with heat liberation may occur. Analagous to sulfuric acid/propylene oxide.	1
2	Sulfuric Acid	4930040	101	Flammable Liquid, n.o.s.	4910185	Heat	Minimal heat generated.	
2	Sulfuric Acid	4930040	5	Formaldehyde Solution	4913168	Heat/Polymerization	Potentially vigorous/violent moderated by water.	
2	Sulfuric Acid	4930040	5	Formaldehyde Solution	4913144	Heat/Polymerization	Potentially vigorous/violent moderated by water.	
2	Sulfuric Acid	4930040	101	Fuel Oil	4915111	Heat	Minimal heat generated.	
2	Sulfuric Acid	4930040	101	Fuel Oil	4915113	Heat	Minimal heat generated.	
2	Sulfuric Acid	4930040	101	Fuel Oil	4915112	Heat	Minimal heat generated.	
2	Sulfuric Acid	4930040	101	Fuel, Aviation, Turbine Engine	4915167	Heat	Minimal heat generated.	
2	Sulfuric Acid	4930040	101	Fuel, Aviation, Turbine Engine	4909215	Heat	Minimal heat generated.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Sulfuric Acid	4930040	101	Gasoline	4908178	Heat	Minimal heat generated.	
2	Sulfuric Acid	4930040	101	Gasoline, nec	2911190	Heat	Minimal heat generated.	
2	Sulfuric Acid	4930040	14	Glycol Ethers, nec (C.L., n.o.s.)	4913194	Heat/Fire	Heat could detonate hydroperoxides formed from prior air oxidation, otherwise possible fire.	
2	Sulfuric Acid	4930040	7	Hexamethylene Diamine Solution	4935845	Heat/Neutralization	Vigorous/violent acid/base neutralization reaction. May form NOx gas from exhaustive oxidation.	
2	Sulfuric Acid	4930040	104	Hydrogen Peroxide Solution	4918335	Heat	Heat of dissolution of concentrated sulfuric acid in hydrogen peroxide solution.	
2	Sulfuric Acid	4930040	4	Isopropanol	4909205	Heat/Flammable Gas/Fire	Potentially violent reaction forms propene and diisopropyl ether.	
2	Sulfuric Acid	4930040	107	Maleic Anhydride	4941161	Heat/Polymerization	Potential violent/explosive acid catalyzed hydrolysis and polymerization.	
2	Sulfuric Acid	4930040	4	Methyl Alcohol	4909230	Heat/Flammable Gas/Fire	Potentially violent reaction forms dimethyl ether.	
2	Sulfuric Acid	4930040	4	Methyl Alcohol	4909237	Heat/Flammable Gas/Fire	Potentially violent reaction forms dimethyl ether.	
2	Sulfuric Acid	4930040	17	Methyl Chloride	4905761	Heat/Fire/Toxic Gas	Potential oxidation forms SO2 and HCl gas.	8
2	Sulfuric Acid	4930040	19	Methyl Ethyl Ketone	4909243	Heat/Polymerization	Potential polymerization of enol plus aldol condensation followed by elimination.	12
2	Sulfuric Acid	4930040	13	Methyl Methacrylate Monomer, inhib.	4907250	Heat/Polymerization/Fire	Potentially vigorous polymerization.	
2	Sulfuric Acid	4930040	24	Motor Fuel Antiknock Compound	4921445	Heat/Flammable Gas	Potential formation of ethane.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Sulfuric Acid	4930040	4	Octyl Alcohol (C.L., n.o.s.)	4913158	Heat/Fire	Potentially violent reaction forms octene and dioctyl ether.	
2	Sulfuric Acid	4930040	101	Oil	4915245	Heat	Minimal heat generated.	
2	Sulfuric Acid	4930040	101	Petroleum Naphtha	4915259	Heat	Minimal heat generated.	
2	Sulfuric Acid	4930040	101	Petroleum Naphtha	4915257	Heat	Minimal heat generated.	
2	Sulfuric Acid	4930040	101	Petroleum Naphtha	4910259	Heat	Minimal heat generated.	
2	Sulfuric Acid	4930040	101	Petroleum Residual Fuel Oil	2911715	Heat	Minimal heat generated.	
2	Sulfuric Acid	4930040	101	Petroleum, Partially Refined	2911735	Heat	Minimal heat generated.	
2	Sulfuric Acid	4930040	31	Phenol	4921220	Heat	Sulfonation of phenol should be extremely rapid and violent.	
2	Sulfuric Acid	4930040	105	Phosphorus, White or Yellow	4916141	Heat/Fire/Toxic Gas	Potential explosion by analogy to chlorosulfuric acid/phosphorus which explodes.	2
2	Sulfuric Acid	4930040	10	Potassium Hydroxide, Liq. or solution	4935230	Heat/Neutralization	Violent eruption of acid when added to KOH.	2
2	Sulfuric Acid	4930040	34	Propylene Oxide	4906620	Heat/Polymerization/Fire	Ignites or explodes on contact.	5
2	Sulfuric Acid	4930040	101	Pulp Mill Liquid (F.L., n.o.s.)	4910320	Heat	Minimal heat generated.	
2	Sulfuric Acid	4930040	10	Sodium Hydroxide, liq. or solution	4935243	Heat/Neutralization	Violent neutralization reaction.	5
2	Sulfuric Acid	4930040	10	Sodium Hydroxide, Liq. or solution	4935240	Heat/Neutralization	Violent neutralization reaction.	5
2	Sulfuric Acid	4930040	21	Sodium Metal	4916456	Heat	Mild reaction if anhydrous, otherwise reacts explosively. Hydrogen generated.	2
2	Sulfuric Acid	4930040	16	Styrene Monomer, Inhibited	4907265	Heat/Polymerization/Fire	Ignites or explodes on contact.	5

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Sulfuric Acid	4930040	16	Toluene	4909305	Heat/Fire	Toluene should be sulfonated very rapidly forming p-toluenesulfonic acid.	
2	Sulfuric Acid	4930040	18	Toluene Diisocyanate	4921575	Heat/Gas	Violent oxidation with evolution of CO2 and acid catalyzed hydrolysis if water present.	9
2	Sulfuric Acid	4930040	13	Vinyl Acetate	4907270	Heat/Polymerization/Fire	Ignites or explodes on contact.	5
2	Sulfuric Acid	4930040	17	Vinyl Chloride	4905792	Heat/Polymerization/Toxic Gas/Fire	Potentially violent polymerization.	
2	Sulfuric Acid	4930040	16	Xylene	4909351	Heat/Fire	Sulfonation and oxidation forming xylenesulfonic acid.	
2	Sulfuric Acid	4930040	16	Xylene	4909350	Heat/Fire	Sulfonation and oxidation forming xylenesulfonic acid.	
2	Sulfuric Acid, spent	4930042	5	Acetaldehyde	4907210	Heat/Polymerization	Vigorous polymerization of acetaldehyde moderated by water content.	2
2	Sulfuric Acid, spent	4930042	3	Acetic Acid, Glacial	4931303	Heat	Potentially vigorous reaction moderated by water content.	
2	Sulfuric Acid, spent	4930042	107	Acetic Anhydride	4931304	Heat	Mixing acetic anhydride with water can be explosive especially when mineral acids are present.	1
2	Sulfuric Acid, spent	4930042	19	Acetone	4908105	Heat/Polymerization	Potential polymerization of enol plus aldol condensation followed by elimination.	
2	Sulfuric Acid, spent	4930042	3	Acrylic Acid	4931405	Heat/Polymerization	Potentially violent polymerization moderated by water content.	
2	Sulfuric Acid, spent	4930042	26	Acrylonitrile	4906420	Heat/Polymerization/Fire/Toxic Gas	Vigorous exothermic reaction, ignites or explodes on contact and may form NOx.	5
2	Sulfuric Acid, spent	4930042	4	Alcoholic Beverage	4910102	Heat/Flammable Gas	Potentially vigorous reaction forms ethylene, diethyl ether and heat. Reaction moderated by water.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Sulfuric Acid, spent	4930042	10	Alkaline Liquid, n.o.s.	4935220	Heat/Neutralization	Violent neutralization reaction.	5
2	Sulfuric Acid, spent	4930042	106	Ammonium Nitrate Solution	4918774	Heat	Forms HNO3 and heat. Presence of excess water moderates heat build-up.	
2	Sulfuric Acid, spent	4930042	10	Anhydrous Ammonia	4904210	Heat/Neutralization	Vigorous neutralization reaction forming ammonium sulfate salts. Reaction moderated by water.	
2	Sulfuric Acid, spent	4930042	7	Aniline Oil, Liquid	4921410	Heat/Neutralization	Violent acid/base neutralization reaction moderated by water content.	
2	Sulfuric Acid, spent	4930042	16	Benzene	4908110	Heat	Potentially violent sulfonation reaction forming benzenesulfonic acid. Moderated by water content.	
2	Sulfuric Acid, spent	4930042	28	Butadiene	4905704	Heat/Polymerization	Potentially vigorous polymerization mitigated by volatility of butadiene and presence of water.	
2	Sulfuric Acid, spent	4930042	28	Butadiene, Inhibited	4905703	Heat/Polymerization	Potentially vigorous polymerization mitigated by volatility of butadiene and presence of water.	
2	Sulfuric Acid, spent	4930042	13	Butyl Acrylate (Corr. L., n.o.s.)	4912215	Heat/Polymerization	Potentially vigorous/violent reaction mitigated by water content.	
2	Sulfuric Acid, spent	4930042	4	Butyl Alcohol	4909129	Heat/Flammable Gas/Fire	Potentially vigorous reaction forms butene, dibutyl ether, and heat. Reaction moderated by water.	
2	Sulfuric Acid, spent	4930042	5	Butyraldehyde	4908119	Heat/Polymerization	Violent polymerization of butyraldehyde moderated by water content.	5
2	Sulfuric Acid, spent	4930042	17	Carbon Tetrachloride	4940320	Heat/Toxic Gas	Forms HCl and phosgene at 150 C. Probably moderate or slow reaction at ambient temperatures.	6

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Sulfuric Acid, spent	4930042	17	Chloroprene, Inhibited	4907223	Heat/Polymerization	Potentially violent polymerization reaction moderated by water content.	
2	Sulfuric Acid, spent	4930042	101	Coal Tar Distillate	4915363	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	101	Combustible Liquid, n.o.s.	4915185	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	101	Compound, Cleaning, Liquid	4915147	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	101	Crude Oil Petroleum	4910165	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	4	Denatured Alcohol	4909151	Heat/Flammable Gas/Fire	Potentially vigorous reaction forms ethylene, diethyl ether and heat. Reaction moderated by water.	
2	Sulfuric Acid, spent	4930042	4	Denatured Alcohol	4909141	Heat/Flammable Gas/Fire	Potentially vigorous reaction forms ethylene, diethyl ether and heat. Reaction moderated by water.	
2	Sulfuric Acid, spent	4930042	27	Dinitrotoluene, Liquid	4963120	Heat/Fire/Explosion	Since sulfuric acid/p-nitrotoluene mixtures detonate at 160 C, 2,4-DNT may explode at lower temps.	
2	Sulfuric Acid, spent	4930042	101	Distillate Fuel Oil	2911315	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	13	Ethyl Acetate	4909160	Heat	Potentially vigorous reaction mitigated by water content.	
2	Sulfuric Acid, spent	4930042	13	Ethyl Acrylate, inhibited	4907215	Heat/Polymerization	Potentially vigorous/violent reaction mitigated by water content.	
2	Sulfuric Acid, spent	4930042	4	Ethyl Alcohol	4909159	Heat/Flammable Gas/Fire	Potentially vigorous reaction forms ethylene, diethyl ether and heat. Reaction moderated by water.	
2	Sulfuric Acid, spent	4930042	34	Ethylene Oxide	4906610	Heat/Polymerization/Fire	Polymerization with heat liberation. Analogous to sulfuric acid/propylene oxide-explodes on contact.	1

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Sulfuric Acid, spent	4930042	101	Flammable Liquid, n.o.s.	4910185	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	5	Formaldehyde Solution	4913144	Heat/Polymerization	Potentially vigorous/violent moderated by water content.	
2	Sulfuric Acid, spent	4930042	5	Formaldehyde Solution	4913168	Heat/Polymerization	Potentially vigorous/violent moderated by water content.	
2	Sulfuric Acid, spent	4930042	101	Fuel Oil	4915111	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	101	Fuel Oil	4915113	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	101	Fuel Oil	4915112	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	101	Fuel, Aviation, Turbine Engine	4915167	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	101	Fuel, Aviation, Turbine Engine	4909215	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	101	Gasoline	4908178	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	101	Gasoline, nec	2911190	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	14	Glycol Ethers, nec (C.L., n.o.s.)	4913194	Heat	Potential cleavage of ether group in aqueous solution containing H_2SO_4 forming heat.	
2	Sulfuric Acid, spent	4930042	7	Hexamethylene Diamine Solution	4935645	Heat/Neutralization	Violent acid/base neutralization reaction moderated by water content.	
2	Sulfuric Acid, spent	4930042	4	Isopropanol	4909205	Heat/Flammable Gas/Fire	Potentially vigorous reaction forms propene, diisopropyl ether, and heat. Reaction moderated by water.	
2	Sulfuric Acid, spent	4930042	107	Maleic Anhydride	4941161	Heat/Polymerization	Potential violent/explosive acid catalyzed hydrolysis and polymerization.	
2	Sulfuric Acid, spent	4930042	4	Methyl Alcohol	4909230	Heat/Flammable Gas/Fire	Potentially vigorous reaction forms dimethyl ether and heat. Reaction moderated by water.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Sulfuric Acid, spent	4930042	4	Methyl Alcohol	4909237	Heat/Flammable Gas/Fire	Potentially vigorous reaction forms dimethyl ether and heat. Reaction moderated by water.	
2	Sulfuric Acid, spent	4930042	17	Methyl Chloride	4905761	Heat/Toxic Gas	Potential oxidation forms SO2 and HCL gas.	
2	Sulfuric Acid, spent	4930042	19	Methyl Ethyl Ketone	4909243	Heat/Polymerization	Potential polymerization of enol plus aldol condensation followed by elimination.	
2	Sulfuric Acid, spent	4930042	13	Methyl Methacrylate Monomer, inhib.	4907250	Heat/Polymerization	Potentially vigorous/violent polymerization reaction mitigated by water content.	
2	Sulfuric Acid, spent	4930042	24	Motor Fuel Antiknock Compound	4921445	Heat/Flammable Gas	Potential formation of ethane.	
2	Sulfuric Acid, spent	4930042	4	Octyl Alcohol (C.L., n.o.s.)	4913158	Heat	Potentially vigorous reaction forms octene, dioctyl ether, and heat. Reaction moderated by water.	
2	Sulfuric Acid, spent	4930042	101	Oil	4915245	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	101	Petroleum Naphtha	4910259	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	101	Petroleum Naphtha	4915257	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	101	Petroleum Naphtha	4915259	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	101	Petroleum Residual Fuel Oil	2911715	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	101	Petroleum, Partially Refined	2911735	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	31	Phenol	4921220	Heat	Potentially vigorous sulfonation of phenol.	
2	Sulfuric Acid, spent	4930042	105	Phosphorus, White or Yellow	4916141	Heat/Fire	Yellow phosphorus ignites when placed in boiling sulfuric acid.	1
2	Sulfuric Acid, spent	4930042	10	Potassium Hydroxide, Liq. or solution	4935230	Heat/Neutralization	Eruption of acid when added to KOH. Reaction moderated by water.	2

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
2	Sulfuric Acid, spent	4930042	34	Propylene Oxide	4906620	Heat/Polymerization/Fire	Ignites or explodes on contact.	5
2	Sulfuric Acid, spent	4930042	101	Pulp Mill Liquid (F.L., n.o.s.)	4910320	Heat	Minimal heat generated.	
2	Sulfuric Acid, spent	4930042	10	Sodium Hydroxide, liq. or solution	4935243	Heat/Neutralization	Vigorous neutralization reaction moderated by water content.	
2	Sulfuric Acid, spent	4930042	10	Sodium Hydroxide, Liq. or solution	4935240	Heat/Neutralization	Vigorous neutralization reaction moderated by water content.	
2	Sulfuric Acid, spent	4930042	21	Sodium Metal	4916456	Heat/Flammable Gas/Fire	Aqueous sulfuric acid reacts explosively with sodium. Hydrogen generated.	2
2	Sulfuric Acid, spent	4930042	16	Styrene Monomer, Inhibited	4907265	Heat/Polymerization	Reaction moderated by water content.	
2	Sulfuric Acid, spent	4930042	16	Toluene	4909305	Heat	Potentially violent sulfonation/oxidation forming p-toluenesulfonic acid. Moderated by water.	
2	Sulfuric Acid, spent	4930042	18	Toluene Diisocyanate	4921575	Heat/Gas	Violent hydrolysis with evolution of CO2 - reaction severity increased because of water content.	
2	Sulfuric Acid, spent	4930042	13	Vinyl Acetate	4907270	Heat/Polymerization	Potentially vigorous/violent polymerization reaction mitigated by water content.	
2	Sulfuric Acid, spent	4930042	17	Vinyl Chloride	4905792	Heat/Polymerization	Potentially violent polymerization.	
2	Sulfuric Acid, spent	4930042	16	Xylene	4909350	Heat	Potentially violent sulfonation/oxidation forming xylenesulfonic acid. Moderated by water content.	
2	Sulfuric Acid, spent	4930042	16	Xylene	4909351	Heat	Potentially violent sulfonation/oxidation forming xylenesulfonic acid. Moderated by water content.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
16	Toluene	4909305	104	Chlorine	4904120	Heat/Fire	Chlorine reacts vigorously with hydrocarbons. Toluene is susceptible to free radical chlorination.	1
16	Toluene	4909305	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Oxidation of methyl group could lead to exotherm and explosion or detonation.	2
18	Toluene Diisocyanate	4921575	106	Ammonium Nitrate Solution	4918774	Heat/Gas	Non-violent reaction with water forms CO2 gas and an organic base.	11
18	Toluene Diisocyanate	4921575	104	Chlorine	4904120	Heat/Fire	Potentially violent oxidation.	
18	Toluene Diisocyanate	4921575	34	Ethylene Oxide	4906810	Heat/Polymerization	Isocyanate moiety may be nucleophilic enough to initiate vigorous/violent ring opening.	
18	Toluene Diisocyanate	4921575	104	Ferric Chloride Solution	4932342	Compatible	No reaction self-evident.	
18	Toluene Diisocyanate	4921575	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Hydrolysis and polymerization of TDI will cause significant exotherm leading to H2O2 decomposition.	
18	Toluene Diisocyanate	4921575	105	Phosphorus, White or Yellow	4916141	Heat/Flammable Gas		
18	Toluene Diisocyanate	4921575	34	Propylene Oxide	4906620	Heat/Polymerization	Potential polymerization.	
18	Toluene Diisocyanate	4921575	21	Sodium Metal	4916456	Heat/Polymerization/ Flammable Gas/Fire	Potentially vigorous polymerization.	
18	Toluene Diisocyanate	4921575	105	Sulfur Dioxide	4904290	Unknown		
13	Vinyl Acetate	4907270	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
13	Vinyl Acetate	4907270	104	Chlorine	4904120	Heat/Fire	Potential explosion.	
13	Vinyl Acetate	4907270	104	Ferric Chloride Solution	4932342	Heat/Polymerization	Potential cationic polymerization.	

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
13	Vinyl Acetate	4907270	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Vinyl acetate in contact with peroxides may explode violently.	1
13	Vinyl Acetate	4907270	105	Phosphorus, White or Yellow	4916141	Compatible	No reaction expected.	
13	Vinyl Acetate	4907270	21	Sodium Metal	4916456	Heat/Polymerization/Fire	Potentially violent acyloin condensation forms 3-hydroxy-2-butanone and acetaldehyde.	
17	Vinyl Chloride	4905792	106	Ammonium Nitrate Solution	4918774	Compatible	Ammonium nitrate solutions containing significant water are essentially not flammable.	
17	Vinyl Chloride	4905792	20	Carbon Disulfide	4908125	Compatible	No reaction anticipated.	
17	Vinyl Chloride	4905792	104	Chlorine	4904120	Heat/Fire	Potential explosion because of very exothermic chlorine addition.	
17	Vinyl Chloride	4905792	104	Ferric Chloride Solution	4932342	Heat/Polymerization	Potentially vigorous/violent polymerization.	
17	Vinyl Chloride	4905792	104	Hydrogen Peroxide Solution	4918335	Heat/Polymerization/Fire/Explosion	Potential explosion due to exotherm from epoxidation and polymerization.	
17	Vinyl Chloride	4905792	24	Motor Fuel Antiknock Compound	4921445	Heat/Polymerization	Potential anionic polymerization.	
17	Vinyl Chloride	4905792	105	Phosphorus, White or Yellow	4916141	Compatible	No reaction expected.	
17	Vinyl Chloride	4905792	21	Sodium Metal	4916456	Heat	Sodium forms explosive mixtures with chlorinated hydrocarbons. Violent anionic polymerization.	1
16	Xylene	4909350	104	Chlorine	4904120	Heat/Fire	Potentially violent/explosive reaction because xylene has two activated methyl groups.	1
16	Xylene	4909351	104	Chlorine	4904120	Heat/Fire	Potentially violent/explosive reaction because xylene has two activated methyl groups.	1

ASTM GRP	Chemical Name	STC Number	ASTM GRP	Chemical Name	STC Number	Compatibility	General Comments	REF #
16	Xylene	4909350	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Oxidation of methyl groups could lead to exotherm which causes H2O2 to detonate.	2
16	Xylene	4909351	104	Hydrogen Peroxide Solution	4918335	Heat/Fire/Explosion	Oxidation of methyl groups could lead to exotherm which causes H2O2 to detonate.	2

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APPENDIX I

RESULTS FROM THE CONSEQUENCE CALCULATIONS

APPENDIX I

Results from the Consequence Calculations

The results from the consequence calculations are given on pages I-2 through I-62. The tables contain the following information:

- Table I1 - Distances to IDLH levels (pages I-2 to I-3),
- Table I2 - Toxic Emission Consequence Calculation Summary (pages I-4 to I-34),
- Table I3 - Fireball Consequence Calculation Summary (pages I-35 to I-43),
- Table I4 - Unconfined Vapor Cloud Explosion Consequence Calculation Summary (pages I-44 to I-56),
- Table I5 - Condensed Phase Explosion Consequence Calculation Summary (pages I-57 to I-60),
- Table I6 - Tank Car Explosion Consequence Calculation Summary (pages I-61 to I-62).

Given below are IDLH levels used for toxic products formed from incompatible binary reactions not already shown in Table I1:

Chemical Name	IDLH mg/m^3
Carbon Monoxide	1750
Cyanogen chloride	49
Ethyl chloride	53758
Fluorine	40
Fluorotrichloromethane	57083
Methyl amine	129
Methyl iodide	4733
Nitrogen dioxide	192
Phosgene	8.2
Phosphine	283
Phosphorus trichloride	286

TABLE I1. Distances to IDLH and TLV Values Following a Spill

Chemical Name	IDLH mg/m3	TLV mg/m3	Rel. Type	Total Release kg or kg/sec	Distance to (km) at 25C IDLH	TLV	Surface Area Covered sq.m.	Rel. Type	Total Release kg or kg/sec	Distance to (km) at 50C IDLH	TLV	Rel. Type	Total Release kg or kg/sec	Distance to (km) at 100C IDLH	TLV
Acetaldehyde	18354	184	I	90720	1.1	5.1	95033	I	45360	0.9	4.0	I	22680	0.7	3.2
Acetic Acid, Glacial	2502	25	C	2.0	0.1	1.2	785	C	9.0	0.3	2.6	I	22680	1.3	6.9
Acetic Anhydride	4254	21	C	1.1	<0.1	1.0	<785	C	5.6	0.2	2.2	C	44.1	0.4	7.7
Acetone	48400	1815	C	46.4	0.1	0.7	785	I	45360	0.6	1.9	I	22680	0.5	1.5
Acrylic Acid	?	10	C	1.1	-	0.8	-	C	4.0	-	1.6	I	22680	-	6.3
Acrylonitrile	8843	4	C	13.2	0.2	11.1	3142	C	41.9	0.3	26.5	I	22680	0.9	16.4
Alcoholic Beverage (1)	?	?	C	0.1	-	-	-	C	0.3	-	-	C	0.8	-	-
Anhydrous Ammonia	355	18	I	90720	4.1	16.3	1320254	I	45360	3.2	11.6	I	22680	2.6	8.2
Aniline Oil, Liquid	388	8	C	0.2	0.1	0.6	785	C	0.6	0.2	1.2	C	9.4	0.7	4.7
Benzene	6510	66	C	17.6	0.2	1.8	3142	C	56.3	0.4	3.3	I	22680	1.0	3.9
Butadiene	45075	2254	I	90720	0.8	2.2	50265	I	45360	0.6	1.7	I	22680	0.5	1.4
Butadiene, Inhibited	45075	2254	I	90720	0.8	2.2	50265	I	45360	0.6	1.7	I	22680	0.5	1.4
Butane	?	?	I	90720	-	-	-	I	45360	-	-	I	22680	-	-
Butyl Acrylate	?	53	C	1.3	-	0.7	-	C	6.1	-	1.5	C	26.4	-	3.0
Butyl Alcohol	24707	618	C	0.9	<0.1	0.2	<785	C	7.4	<0.1	0.5	I	22680	0.6	2.1
Butyraldehyde	?	?	C	31.8	-	-	-	I	45360	-	-	I	22680	-	-
Carbon Dioxide	91667	9167	I	90720	0.6	1.4	28274	I	45360	-	-	I	22680	-	-
Carbon Disulfide	1586	32	C	68.6	0.9	6.2	63617	I	45360	2.0	8.6	I	22680	1.6	6.1
Carbon Tetrachloride	1923	32	C	36.0	0.6	4.6	28274	C	116.9	1.1	3.5	I	22680	1.5	6.1
Chlorine	74	9	I	90720	8.0	40.0	5026548	I	45360	5.7	28.1	I	22680	4.3	19.8
Chloroprene, Inhibited	1276	32	C	47.6	0.8	5.5	50265	I	45360	2.1	8.6	I	22680	1.7	6.1
Coal Tar Distillate	32500	325	C	0.7	<0.1	0.2	<785	C	2.7	<0.1	0.4	C	13.1	0.1	0.9
Crude Oil Petroleum	?	?	C	0.7	-	-	-	C	2.3	-	-	C	13.4	-	-
Cyclohexane	35067	1052	C	24.0	0.1	0.7	785	C	61.8	0.2	1.0	I	22680	0.6	1.8
Denatured Alcohol	?	?	C	8.7	-	-	-	C	26.1	-	-	I	22680	-	-
Dinitrotoluene, Liquid	200	1.5	C	0.0	<0.1	<0.1	<785	C	0	<0.1	<0.1	C	0.03	0.1	0.6
Distillate Fuel Oil	?	?	C	12.9	-	-	-	C	32.3	-	-	C	28.0	-	-
Ethyl Acetate	36713	1469	C	20.1	0.1	0.5	785	C	67.1	0.2	0.9	I	22680	0.5	1.6
Ethyl Acrylate, inhibited	8343	21	C	7.7	0.1	2.6	785	C	28.5	0.3	5.1	I	22680	0.9	7.5
Ethyl Alcohol	?	?	C	8.7	-	-	-	C	26.1	-	-	I	22680	-	-
Ethylene Oxide	1468	92	I	90720	2.5	7.2	490874	I	45360	2.0	5.1	I	22680	1.6	4.0
Formaldehyde Solution (2)	125	25	C	0.04	0.1	0.5	785	C	0.2	0.2	1.2	C	1.5	0.5	3.3
Fuel Oil	?	?	C	0.9	-	-	-	C	2.7	-	-	C	17.1	-	-
Fuel, Aviation	?	?	C	0.7	-	-	-	C	2.1	-	-	C	13.2	-	-
Glycol Ethers (3)	6341	79	C	2.2	<0.1	0.7	<785	C	7.4	0.1	1.3	C	58.6	0.4	3.7
Hexamethylene Diamine (4)	?	?	C	0.01	-	-	-	I	0.05	-	-	C	0.6	-	-
Hexane	17954	180	C	32.1	0.2	1.8	3142	C	93.8	0.3	3.1	I	22680	0.7	3.2
Hydrochloric Acid (5)	152	8	C	0.02	<0.1	0.2	<785	C	0.12	0.1	0.5	C	2.4	0.5	2.4
Hydrocyanic acid	61	11	I	90720	8.8	20.5	6082123	I	45360	6.2	14.5	I	22680	4.6	10.2
Hydrofluorosilicic Acid (6)	65	10	C	0.004	<0.1	<0.1	<785	C	0.07	0.1	0.4	C	2.3	0.8	2.1
Hydrogen Fluoride	65	10	I	90720	8.5	22.0	5674502	I	45360	6.0	15.5	I	22680	4.5	11.0
Hydrogen Peroxide Solution	106	1	C	0.2	0.2	1.6	3142	C	0.9	0.4	3.5	C	9.9	1.3	26.2
Hydroiodic Acid (7)	?	?	C	0.01	-	-	-	C	0.2	-	-	C	10.7	-	-
Isopropanol	50083	1002	C	6.0	<0.1	0.3	<785	C	28.3	0.1	0.7	I	22680	0.5	1.8
Liquefied Petroleum Gas	33250	1750	I	90720	0.6	1.2	28274	I	45360	0.7	1.9	I	22680	0.6	1.5

TABLE I1. Distances to IDLH and TLV Values Following a Spill (Cont.)

Chemical Name	IDLH mg/m3	TLV mg/m3	Rel. Type	Total Release kg or kg/sec	Distance to (km) at 25C IDLH	TLV	Surface Area Covered sq.m.	Rel. Type	Total Release kg or kg/sec	Distance to (km) at 50C IDLH	TLV	Rel. Type	Total Release kg or kg/sec	Distance to (km) at 100C IDLH	TLV
LPG (Butene)	44413	2338	I	90720	0.8	2.2	50265	I	45360	0.6	1.7	I	22680	0.5	1.4
LPG (Butylene)	44413	2338	I	90720	0.8	2.2	50265	I	45360	0.6	1.7	I	22680	0.5	1.4
LPG (Isobutane)	?	?	I	90720	-	-	-	I	45360	-	-	I	22680	-	-
LPG (Isobutylene)	?	?	I	90720	-	-	-	I	45360	-	-	I	22680	-	-
LPG (Propane)	36742	1837	I	90720	0.9	2.3	63617	I	45360	0.7	1.9	I	22680	0.5	1.5
LPG (Propylene)	?	?	I	90720	-	-	-	I	45360	-	-	I	22680	-	-
Maleic Anhydride	?	1	C	0.05	-	0.9	-	C	0.5	-	3.0	C	5.6	-	20.7
Methyl Alcohol	33375	267	C	31.7	0.1	1.5	785	C	36.8	0.1	1.6	I	22680	0.6	2.8
Methyl Chloride	21038	105	I	90720	1.0	6.7	78540	I	45360	0.8	4.8	I	22680	0.7	3.8
Methyl Ethyl Ketone	9014	601	C	21.4	0.2	0.8	3142	C	51.9	0.3	1.3	I	22680	0.9	2.1
Methyl Methacrylate Monomer	16687	417	C	9.0	0.1	0.6	785	C	28.5	0.2	1.1	I	22680	0.7	2.4
Motor Fuel Antiknock (8)			C	2.0	-	-	-	C	5.1			C	32.9		
Tetraethyl Lead	40	0.1	C	0.006	<0.1	1.1	<785	C	0.04	0.1	2.7	C	0.6	0.5	22.2
Ethylene Dibromide	3131	157	C	0.2	<0.1	0.2	<785	C	0.7	0.1	0.3	C	5.3	0.2	0.8
Ethylene Dichlorid	4123	41	C	1.8	0.1	0.9	785	C	4.4	0.1	1.4	C	27.0	0.3	3.5
Nitric Acid, Fuming	263	5	C	11.7	0.9	8.2	63617	C	36.1	1.6	25.2	I	22680	2.8	14.9
Octyl Alcohol	?	?	C	0.03	-	-	-	C	0.2	-	-	C	5.6	-	-
Oleum (9)	80	1	C	10.5	1.6	39.8	201062	C	24.4	2.4	92.2	I	22680	3.2	24.6
Petroleum Naphtha	41667	2083	C	1.3	<0.1	0.1	<785	C	2.6	<0.1	0.2	C	16.7	0.1	0.4
Phenol	392	20	C	0.1	<0.1	0.3	<785	C	0.9	0.2	0.9	C	9.3	0.7	3.0
Phosphoric Acid	?	1	C	0.009	-	0.4	-	C	0.0	-	-	C	0.0	-	-
Propylene Oxide	4837	48	I	90720	1.7	9.9	226980	I	45360	1.3	7.0	I	22680	1.1	5.0
Styrene Monomer, Inhibited	21698	868	C	1.3	<0.1	0.1	<785	C	5.7	<0.1	0.3	C	39.6	0.2	0.9
Sulfur Dioxide	267	5	I	90720	4.5	29.9	1590431	I	45360	3.5	21.1	I	22680	2.8	14.9
Toluene	7678	384	C	6.1	0.1	0.5	785	C	23.0	0.2	1.1	I	22680	0.9	2.9
Toluene Diisocyanate	73	0.1	C	0.02	<0.1	1.5	<785	C	0.1	0.1	3.3	C	1.2	0.6	31.7
Vinyl Acetate	?	36	C	32.6	-	4.1	-	C	77.5	-	8.0	I	22680	-	5.7
Vinyl Chloride	?	13	I	90720	-	19.1	-	I	45360	-	13.5	I	22680	-	9.5
Xylene	44238	442	C	2.5	<0.1	0.3	<785	C	7.6	<0.1	0.6	C	49.8	0.1	1.4

1) Alcoholic beverage = 20% Ethanol/80% Water
2) Formaldehyde = 37% formaldehyde/50% water/13% Methanol
3) Glycol ethers = Methyl Cellosolve
4) Hexamethylene Diamine Solution = 70% in Water
5) Hydrochloric acid = 20% HCl/80% water
6) Hydrofluorosilicic acid = 25% 2HF-SiF4/75% water
7) Hydroiodic acid = 57% HI/43% water
8) Motor Fuel Antiknock Compound = 50% Tetraethyl Lead, 30% Ethylene Dibromide, 20% Ethylene Dichloride
9) Oleum = 50% SO3/50% H2SO4

Note: I = instantaneous release (kg), I = continuous release (kg/sec).

Temperature = 298 Degrees K (Ambient)
Spill diameter = 100 meters (7853.982 sq. meters)
Wind speed = 5 m/sec

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Acetaldehyde	5	Acetic Anhydride	107	Release of vinyl acetate	1100	< 100	900	200				Mitigated
Acetaldehyde	5	Alkaline Liquid	10	Evaporation of residuals at 100 C	1100	0	700	0				Mitigated
Acetaldehyde	5	Anhydrous Ammonia	10	Mitigate NH3 release	1100	4100	900	3900				Mitigated
Acetaldehyde	5	Aniline Oil	7	Evaporation of residuals at 100 C	1100	100	700	700				Mitigated
Acetaldehyde	5	Chlorine	104	Evaporation of residuals at 50 C **	1100	8000	900	7600				Mitigated
Acetaldehyde	5	Dinitrotoluene, Liquid	27	Evaporation at 100 C; Explosion	1100	< 100	700	< 100				Mitigated
Acetaldehyde	5	Ferric Chloride Solution	104	Evaporation of residuals at 50 C	1100	0	900	0				Mitigated
Acetaldehyde	5	Hexamethylene Diamine Soln	7	Evaporation of residuals at 50 C	1100	< 100	900	< 100				Mitigated
Acetaldehyde	5	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	1100	200	700	1300				Aggravated
Acetaldehyde	5	Phenol	31	Evaporation of residuals at 100 C **	1100	< 100	700	700				Mitigated
Acetaldehyde	5	Phosphorus	105	Evaporation of residuals at 50 C	1100	0	900	0				Mitigated
Acetaldehyde	5	Potassium Hydroxide, Liq	10	Evaporation of residuals at 100 C	1100	0	700	0				Mitigated
Acetaldehyde	5	Sodium Hydroxide, Liq.	10	Evaporation of residuals at 100 C	1100	0	700	0				Mitigated
Acetaldehyde	5	Sodium Metal	21	Evaporation of residuals at 50 C **	1100	0	900	0				Mitigated
Acetaldehyde	5	Sulfur Dioxide	105	Unknown	1100	4500	?	?				Unknown
Acetaldehyde	5	Toluene Diisocyanate	18	Evaporation of residuals at 100 C	1100	< 100	700	600				Mitigated
Acetic Acid, Glacial	3	Acetaldehyde	5	Evaporation of residuals at 100 C	100	1100	1300	700				Aggravated
Acetic Acid, Glacial	3	Acetic Anhydride	107	Evaporation of residuals at 100 C	100	< 100	1300	400				Aggravated
Acetic Acid, Glacial	3	Acrylonitrile	26	Evaporation of residuals at 50 C	100	200	300	300				Aggravated
Acetic Acid, Glacial	3	Alkaline Liquid	10	Evaporation of residuals at 100 C	100	0	1300	0				Aggravated
Acetic Acid, Glacial	3	Ammonium Nitrate Soln.	106	Evaporation of residuals at 50 C	100	0	300	0				Aggravated
Acetic Acid, Glacial	3	Anhydrous Ammonia	10	Mitigate release of NH3	100	4100	300	3900				Mitigated
Acetic Acid, Glacial	3	Aniline Oil	7	Evaporation of residuals at 50 C	100	100	900	200				Aggravated
Acetic Acid, Glacial	3	Butyraldehyde	5	Evaporation of residuals at 100 C	100	< 100	1300	< 100				Aggravated
Acetic Acid, Glacial	3	Chlorine	104	Evaporation of residuals at 100 C **	100	8000	1300	7600				Mitigated
Acetic Acid, Glacial	3	Chloroprene	17	Evaporation of residuals at 100 C	100	800	1300	1700				Aggravated
Acetic Acid, Glacial	3	Ethylene Oxide	34	Evaporation of residuals at 100 C	100	2500	1300	1600				Mitigated
Acetic Acid, Glacial	3	Formaldehyde Solution	5	Evaporation of residuals at 100 C	100	100	1300	500				Aggravated
Acetic Acid, Glacial	3	Hexamethylene Diamine Soln	7	Evaporation of residuals at 50 C	100	< 100	900	< 100				Aggravated
Acetic Acid, Glacial	3	Hydrogen Peroxide	104	Evaporation at 100 C; Explosion	100	200	1300	1300				Aggravated
Acetic Acid, Glacial	3	Potassium Hydroxide, Liq	10	Evaporation of residuals at 100 C	100	0	1300	0				Aggravated
Acetic Acid, Glacial	3	Propylene Oxide	34	Evaporation of residuals at 50 C	100	1700	300	1300				Mitigated
Acetic Acid, Glacial	3	Sodium Hydroxide, Liq.	10	Evaporation of residuals at 100 C	100	0	1300	0				Aggravated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Acetic Acid, Glacial	3	Sodium Metal	21	Evaporation at 100 C; release H2 gas **	100	0	1300	0				Aggravated
Acetic Acid, Glacial	3	Toluene Diisocyanate	18	Evaporation of residuals at 100 C	100	< 100	1300	600				Aggravated
Acetone	19	Chlorine	104	Mitigation of chlorine release **	100	8000	600	7600				Mitigated
Acetone	19	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	100	200	500	1300				Aggravated
Acetone	19	Sodium Metal	21	Releases H2 gas	100	0	500	0	< 100			Aggravated
Acrylic Acid	3	Acetaldehyde	5	Evaporation of residuals at 100 C	800*	1100	6300*	700				Mitigated
Acrylic Acid	3	Acetic Anhydride	107	Evaporation of residuals at 100 C	800*	< 100	6300*	400				Aggravated
Acrylic Acid	3	Alkaline Liquid	10	Evaporation of residuals at 100 C	800*	0	6300*	0				Aggravated
Acrylic Acid	3	Ammonium Nitrate Soln.	108	Evaporation of residuals at 50 C	800*	0	1600*	0				Aggravated
Acrylic Acid	3	Anhydrous Ammonia	10	Mitigate release of NH3	800*	4100	1600*	3900				Mitigated
Acrylic Acid	3	Aniline Oil	7	Evaporation of residuals at 100 C	800*	100	6300*	700				Aggravated
Acrylic Acid	3	Chlorine	104	Evaporation of residuals at 100 C **	800*	8000	6300*	7600				Mitigated
Acrylic Acid	3	Chloroprene	17	Evaporation of residuals at 100 C	800*	800	6300*	1700				Aggravated
Acrylic Acid	3	Ethylene Oxide	34	Evaporation of residuals at 100 C	800*	2500	6300*	1600				Mitigated
Acrylic Acid	3	Formaldehyde Solution	5	Evaporation of residuals at 100 C	800*	100	6300*	500				Aggravated
Acrylic Acid	3	Hexamethylene Diamine Soln	7	Evaporation of residuals at 100 C	800*	< 100	6300*	< 100				Aggravated
Acrylic Acid	3	Hydrogen Peroxide	104	Evaporation at 100 C; Explosion	800*	200	6300*	1300				Aggravated
Acrylic Acid	3	Potassium Hydroxide, Liq	10	Evaporation of residuals at 100 C	800*	0	6300*	0				Aggravated
Acrylic Acid	3	Sodium Hydroxide, Liq.	10	Evaporation of residuals at 100 C	800*	0	6300*	0				Aggravated
Acrylic Acid	3	Sodium Metal	21	Evaporation at 100 C; release H2 gas **	800*	0	6300*	0	< 100			Aggravated
Acrylic Acid	3	Toluene Diisocyanate	18	Evaporation of residuals at 100 C	800*	< 100	6300*	600				Aggravated
Acrylonitrile	26	Chlorine	104	Evaporation of residuals at 50 C **	200	8000	300	7600				Mitigated
Acrylonitrile	26	Ferric Chloride Solution	104	Evaporation of residuals at 50 C	200	0	300	0				Aggravated
Acrylonitrile	26	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	200	200	900	1300				Aggravated
Acrylonitrile	26	Phenol	31	Evaporation of residuals at 100 C	200	< 100	900	700				Aggravated
Acrylonitrile	26	Sulfur Dioxide	105	Unknown	200	4500	?	?				Unknown
Alcoholic Beverage	4	Acetaldehyde	5	Evaporation at 50 C; releases acetal	< 100	1100	< 100	900	?			Mitigated
Alcoholic Beverage	4	Butyraldehyde	5	Evaporation of residuals at 50 C	< 100	< 100	< 100	< 100				Same
Alcoholic Beverage	4	Chlorine	104	Evaporation at 50 C; explosion **	< 100	8000	< 100	7600				Mitigated
Alcoholic Beverage	4	Ethylene Oxide	34	Evaporation of residuals at 50 C	< 100	2500	< 100	2000				Mitigated
Alcoholic Beverage	4	Hydrogen Peroxide	104	Evaporation at 50 C; explosion **	< 100	200	< 100	400				Aggravated
Alcoholic Beverage	4	Propylene Oxide	34	Evaporation of residuals at 50 C	< 100	1700	< 100	1300				Mitigated
Alcoholic Beverage	4	Sodium Metal	21	Release of hydrogen gas **	< 100	0	< 100	0				Same

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Alcoholic Beverage	4	Toluene Diisocyanate	18	Evaporation of residuals at 100 C	< 100	< 100	< 100	600				Aggravated
Alkaline Liquid	10	Acetic Anhydride	107	Evaporation of residuals at 100 C	0	< 100	0	400				Aggravated
Alkaline Liquid	10	Acetone	19	Evaporation of residuals at 50 C	0	100	0	600				Aggravated
Alkaline Liquid	10	Acrylonitrile	26	Evaporation of residuals at 100 C	0	200	0	900				Aggravated
Alkaline Liquid	10	Ammonium Nitrate Soln.	106	Local consequences	0	0	0	0				Same
Alkaline Liquid	10	Carbon Tetrachloride	17	Releases HCL and phosgene	0	600	0	1500	900	2100		Aggravated
Alkaline Liquid	10	Chloroprene	17	Evaporation of residuals at 100 C	0	800	0	1700				Aggravated
Alkaline Liquid	10	Dinitrotoluene, Liquid	27	Evaporation at 100 C; Explosion	0	< 100	0	< 100				Same
Alkaline Liquid	10	Ethyl Acetate	13	Releases acetic acid and ethanol	0	100	0	500	300			Aggravated
Alkaline Liquid	10	Ethylene Oxide	34	Evaporation of residuals at 100 C **	0	2500	0	1600				Mitigated
Alkaline Liquid	10	Maleic Anhydride	107	Evaporation of residuals at 100 C	0	900*	0	20700*				Aggravated
Alkaline Liquid	10	Methyl Chloride	17	Mitigate CH3CL; release methanol	0	1000	0	1000	100			Same
Alkaline Liquid	10	Methyl Ethyl Ketone	19	Evaporation of residuals at 50 C	0	200	0	300				Aggravated
Alkaline Liquid	10	Phosphorus	105	Releases PH3 gas	0	0	0	0	800			Aggravated
Alkaline Liquid	10	Propylene Oxide	34	Evaporation of residuals at 100 C **	0	1700	0	1100				Mitigated
Alkaline Liquid	10	Sodium Metal	21	Releases H2 gas	0	0	0	0				Same
Alkaline Liquid	10	Styrene Monomer	16	Evaporation of residuals at 100 C	0	< 100	0	200				Aggravated
Alkaline Liquid	10	Sulfur Dioxide	105	Mitigate release of SO2	0	4500	0	4100				Mitigated
Alkaline Liquid	10	Toluene Diisocyanate	18	Evaporation of residuals at 100 C	0	< 100	0	600				Aggravated
Alkaline Liquid	10	Vinyl Acetate	13	Releases acetic acid and acetaldehyde	0	4100*	0	5700*	300	900		Aggravated
Alkaline Liquid	10	Vinyl Chloride	17	Release acetylene gas	0	19100*	0	18100*				Mitigated
Ammonium Nitrate Soln.	106	Acetic Anhydride	107	Evaporation of residuals at 50 C **	0	< 100	0	200				Aggravated
Ammonium Nitrate Soln.	106	Maleic Anhydride	107	Local consequences	0	900*	0	900*				Same
Anhydrous Ammonia	10	Acetic Anhydride	107	Mitigate release of NH3	4100	< 100	3900	200				Mitigated
Anhydrous Ammonia	10	Acetone	19	Mitigate release of NH3	4100	100	3900	600				Mitigated
Anhydrous Ammonia	10	Acrylonitrile	26	Mitigate release of NH3	4100	200	3900	300				Mitigated
Anhydrous Ammonia	10	Carbon Tetrachloride	17	Mitigate release of NH3	4100	600	3900	1100				Mitigated
Anhydrous Ammonia	10	Chlorine	104	Releases NCL3 and HCL gas	4100	8000	4000	6900	?	2700		Mitigated
Anhydrous Ammonia	10	Chloroprene	17	Mitigate release of NH3	4100	800	3900	2100				Mitigated
Anhydrous Ammonia	10	Dinitrotoluene, Liquid	27	Mitigate release of NH3	4100	< 100	3900	< 100				Mitigated
Anhydrous Ammonia	10	Ethyl Acetate	13	Mitigate release of NH3	4100	100	3900	200				Mitigated
Anhydrous Ammonia	10	Ethylene Oxide	34	Mitigate release of NH3 **	4100	2500	3700	1600				Mitigated
Anhydrous Ammonia	10	Maleic Anhydride	107	Mitigate release of NH3	4100	900*	3900	3000*				Mitigated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	Distances for Gas Releases IDLH Gas 2	Distances for Gas Releases IDLH Gas 3	Conclusions
Anhydrous Ammonia	10	Methyl Chloride	17	Releases HCL and methyl amine gas	4100	1000	3500	0	4800	4800		Aggravated
Anhydrous Ammonia	10	Methyl Ethyl Ketone	19	Mitigate release of NH3	4100	200	3900	300				Mitigated
Anhydrous Ammonia	10	Motor Fuel Antiknock Compo	24	Releases ethane gas	4100	100	3900	100	< 100			Mitigated
Anhydrous Ammonia	10	Propylene Oxide	34	Mitigate release of NH3 **	4100	1700	3700	1100				Mitigated
Anhydrous Ammonia	10	Sodium Metal	21	Releases H2 gas; mitigate NH3 release	4100	0	3900	0				Mitigated
Anhydrous Ammonia	10	Styrene Monomer	16	Mitigate release of NH3	4100	< 100	3900	< 100				Mitigated
Anhydrous Ammonia	10	Sulfur Dioxide	105	Mitigate release of SO2 and NH3	4100	4500	3700	3500				Mitigated
Anhydrous Ammonia	10	Toluene Diisocyanate	18	Mitigate release of NH3	4100	< 100	3900	100				Mitigated
Anhydrous Ammonia	10	Vinyl Acetate	13	Mitigate release of NH3	4100	4100*	3900	8000*				Mitigated
Anhydrous Ammonia	10	Vinyl Chloride	17	Release acetylene gas	4100	19100*	3700	18100*				Mitigated
Aniline Oil	7	Acetic Anhydride	107	Evaporation of residuals at 100 C	100	< 100	700	400				Aggravated
Aniline Oil	7	Acrylonitrile	26	Evaporation of residuals at 100 C	100	200	700	900				Aggravated
Aniline Oil	7	Carbon Tetrachloride	17	Evaporation of residuals at 100 C	100	600	700	1500				Aggravated
Aniline Oil	7	Chlorine	104	Evaporation of residuals at 50 C **	100	8000	200	7600				Mitigated
Aniline Oil	7	Chloroprene	17	Evaporation of residuals at 100 C	100	800	700	1700				Aggravated
Aniline Oil	7	Ethylene Oxide	34	Evaporation of residuals at 100 C	100	2500	700	1600				Mitigated
Aniline Oil	7	Ferric Chloride Solution	104	Evaporation of residuals at 50 C	100	0	200	0				Aggravated
Aniline Oil	7	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	100	200	700	1300				Aggravated
Aniline Oil	7	Maleic Anhydride	107	Evaporation of residuals at 100 C	100	900*	700	20700*				Aggravated
Aniline Oil	7	Methyl Chloride	17	Mitigate methyl chloride release	100	1000	200	1000				Same
Aniline Oil	7	Motor Fuel Antiknock Compo	24	Evaporation at 50 C; release ethane gas	100	100	200	100				Aggravated
Aniline Oil	7	Propylene Oxide	34	Evaporation of residuals at 100 C	100	1700	700	1100				Mitigated
Aniline Oil	7	Sodium Metal	21	Evaporation at 100 C; release H2 gas	100	0	700	0	< 100			Aggravated
Aniline Oil	7	Toluene Diisocyanate	18	Evaporation of residuals at 100 C	100	< 100	700	600				Aggravated
Aniline Oil	7	Vinyl Chloride	17	Mitigate release of vinyl chloride	100	19100*	200	18100*				Mitigated
Benzene	16	Chlorine	104	Mitigation of chlorine release **	200	8000	400	7600				Mitigated
Benzene	16	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	200	200	1000	1300				Aggravated
Butadiene	28	Chlorine	104	Fire	800	8000	800	8000				Same
Butadiene	28	Ferric Chloride Solution	104	Mitigation of butadiene release	800	0	800	0				Same
Butadiene	28	Hydrogen Peroxide	104	Evaporation of residuals at 100 C **	800	200	800	400				Same
Butadiene	28	Phenol	31	Mitigation of butadiene release	800	< 100	800	700				Same
Butane	29	Chlorine	104	Fire	< 100	8000	< 100	8000				Same
Butyl Acrylate	13	Chlorine	104	Mitigation of chlorine release **	700*	8000	1500*	7600				Mitigated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Butyl Acrylate	13	Ferric Chloride Solution	104	Evaporation of residuals at 50 C	700*	0	1500*	0				Aggravated
Butyl Acrylate	13	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	700*	200	3000*	1300				Aggravated
Butyl Acrylate	13	Sodium Metal	21	Evaporation of residuals at 100 C **	700*	0	3000*	0				Aggravated
Butyl Alcohol	4	Acetaldehyde	5	Evaporation of residuals at 100 C	< 100	1100	600	700				Mitigated
Butyl Alcohol	4	Butyraldehyde	5	Evaporation of residuals at 100 C	< 100	< 100	600	< 100				Same
Butyl Alcohol	4	Chlorine	104	Evaporation at 50 C; explosion **	< 100	8000	< 100	7600				Mitigated
Butyl Alcohol	4	Ethylene Oxide	34	Evaporation of residuals at 50 C	< 100	2500	< 100	2000				Mitigated
Butyl Alcohol	4	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	< 100	200	600	1300				Aggravated
Butyl Alcohol	4	Propylene Oxide	34	Evaporation of residuals at 50 C	< 100	1700	< 100	1300				Mitigated
Butyl Alcohol	4	Sodium Metal	21	Release of hydrogen gas **	< 100	0	500	0				Aggravated
Butyl Alcohol	4	Toluene Diisocyanate	18	Evaporation of residuals at 100 C	< 100	< 100	500	600				Aggravated
Butyraldehyde	5	Acetic Anhydride	107	Release of vinyl acetate	< 100	< 100	< 100	200				Aggravated
Butyraldehyde	5	Alkaline Liquid	10	Evaporation of residuals at 100 C	< 100	0	< 100	0				Same
Butyraldehyde	5	Anhydrous Ammonia	10	Mitigate NH3 release	< 100	4100	< 100	3900				Mitigated
Butyraldehyde	5	Aniline Oil	7	Evaporation of residuals at 50 C	< 100	100	< 100	200				Aggravated
Butyraldehyde	5	Chlorine	104	Evaporation of residuals at 50 C **	< 100	8000	< 100	7600				Mitigated
Butyraldehyde	5	Dinitrotoluene, Liquid	27	Evaporation at 100 C; Explosion	< 100	< 100	< 100	< 100				Same
Butyraldehyde	5	Ferric Chloride Solution	104	Evaporation of residuals at 50 C	< 100	0	< 100	0				Same
Butyraldehyde	5	Hexamethylene Diamine Soln	7	Evaporation of residuals at 50 C	< 100	< 100	< 100	< 100				Same
Butyraldehyde	5	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	< 100	200	< 100	1300				Aggravated
Butyraldehyde	5	Phenol	31	Evaporation of residuals at 100 C **	< 100	< 100	< 100	700				Aggravated
Butyraldehyde	5	Potassium Hydroxide, Liq	10	Evaporation of residuals at 100 C	< 100	0	< 100	0				Same
Butyraldehyde	5	Sodium Hydroxide, Liq.	10	Evaporation of residuals at 100 C	< 100	0	< 100	0				Same
Butyraldehyde	5	Sodium Metal	21	Evaporation of residuals at 50 C **	< 100	0	< 100	0				Same
Butyraldehyde	5	Toluene Diisocyanate	18	Evaporation of residuals at 100 C	< 100	< 100	< 100	600				Aggravated
Carbon Disulfide	20	Chlorine	104	Evaporation of residuals at 100 C	900	8000	900	8000				Mitigated
Carbon Disulfide	20	Ferric Chloride Solution	104	Mitigate release of CS2	900	0	2400	0				Aggravated
Carbon Disulfide	20	Hydrogen Peroxide	104	Releases SO2 gas; explosion **	900	200	2300	1300	3000			Aggravated
Carbon Disulfide	20	Propylene Oxide	34	Mitigate release of CS2	900	1700	2400	1300				Aggravated
Carbon Disulfide	20	Sodium Metal	21	Evaporation of residuals at 50 C	900	0	2000	0				Aggravated
Carbon Tetrachloride	17	Carbon Disulfide	20	Evaporation of residuals at 50 C	600	900	1100	2000				Aggravated
Carbon Tetrachloride	17	Sodium Metal	21	Evaporation at 100 C; Explosion	600	0	1500	0				Aggravated
Chlorine	104	Acetic Anhydride	107	Evaporation of residuals at 50 C **	8000	< 100	7600	200				Mitigated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	Distances for Gas Releases IDLH Gas 2	Distances for Gas Releases IDLH Gas 3	Conclusions
Chlorine	104	Ammonium Nitrate Soln.	106	Mitigation of chlorine release;explosion	8000	0	7600	0				Mitigated
Chlorine	104	Maleic Anhydride	107	Evaporation of residuals at 50 C **	8000	900*	7600	3000*				Mitigated
Chlorine	104	Phosphorus	105	Releases PCL3 gas	8000	0	7600	0	2200			Mitigated
Chloroprene	17	Chlorine	104	Mitigation of chlorine release **	800	8000	1700	7600				Mitigated
Chloroprene	17	Ferric Chloride Solution	104	Evaporation of residuals at 50 C	800	0	1700	0				Aggravated
Chloroprene	17	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	800	200	1700	1300				Aggravated
Chloroprene	17	Motor Fuel Antiknock Compo	24	Evaporation of residuals at 50 C	800	100	1700	100				Aggravated
Chloroprene	17	Sodium Metal	21	Evaporation at 100 C; explosion **	800	0	1700	0				Aggravated
Coal Tar Distillate	101	Chlorine	104	Evaporation of residuals at 50 C **	< 100	8000	100	7600				Mitigated
Coal Tar Distillate	101	Hydrogen Peroxide	104	Evaporation at 50 C; explosion **	< 100	200	100	400				Aggravated
Combustible Liquid	101	Chlorine	104	Evaporation of residuals at 50 C **	< 100	8000	?	7600				Mitigated
Combustible Liquid	101	Hydrogen Peroxide	104	Evaporation at 50 C; explosion **	< 100	200	?	400				Aggravated
Compound, Cleaning	101	Chlorine	104	Evaporation of residuals at 50 C **	< 100	8000	?	7600				Mitigated
Compound, Cleaning	101	Hydrogen Peroxide	104	Evaporation at 50 C; explosion **	< 100	200	?	400				Aggravated
Crude Oil Petroleum	101	Chlorine	104	Evaporation of residuals at 50 C **	< 100	8000	100	7600				Mitigated
Crude Oil Petroleum	101	Hydrogen Peroxide	104	Evaporation at 50 C; explosion **	< 100	200	100	400				Aggravated
Cyclohexane	29	Chlorine	104	Evaporation of residuals at 50 C **	100	8000	200	7600				Mitigated
Denatured Alcohol	4	Acetaldehyde	5	Evaporation at 100 C; releases acetal	< 100	1100	< 100	700	?			Mitigated
Denatured Alcohol	4	Butyraldehyde	5	Evaporation of residuals at 100 C	< 100	< 100	< 100	< 100				Same
Denatured Alcohol	4	Chlorine	104	Evaporation at 50 C; explosion **	< 100	8000	< 100	7600				Mitigated
Denatured Alcohol	4	Ethylene Oxide	34	Evaporation of residuals at 50 C	< 100	2500	< 100	2000				Mitigated
Denatured Alcohol	4	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	< 100	200	< 100	1300				Aggravated
Denatured Alcohol	4	Propylene Oxide	34	Evaporation of residuals at 50 C	< 100	1700	< 100	1300				Mitigated
Denatured Alcohol	4	Sodium Metal	21	Release of hydrogen gas **	< 100	0	< 100	0				Same
Denatured Alcohol	4	Toluene Diisocyanate	18	Evaporation of residuals at 100 C **	< 100	< 100	< 100	600				Aggravated
Dinitrotoluene, Liquid	27	Acetic Anhydride	107	Evaporation of residuals at 100 C	< 100	< 100	< 100	400				Aggravated
Dinitrotoluene, Liquid	27	Chlorine	104	Evaporation at 50 C; explosion	< 100	8000	< 100	7600				Mitigated
Dinitrotoluene, Liquid	27	Hydrogen Peroxide	104	Evaporation at 100 C; Explosion	< 100	200	< 100	1300				Aggravated
Dinitrotoluene, Liquid	27	Maleic Anhydride	107	Evaporation of residuals at 100 C	< 100	900*	< 100	20700*				Aggravated
Dinitrotoluene, Liquid	27	Phosphorus	105	Evaporation at 100 C; Explosion	< 100	0	< 100	0				Same
Distillate Fuel Oil	101	Chlorine	104	Evaporation of residuals at 50 C **	< 100	8000	100	7600				Mitigated
Distillate Fuel Oil	101	Hydrogen Peroxide	104	Evaporation at 50 C; explosion **	< 100	200	100	400				Aggravated
Ethyl Acetate	13	Chlorine	104	Mitigation of chlorine release **	100	8000	200	7600				Mitigated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Ethyl Acetate	13	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	100	200	500	1300				Aggravated
Ethyl Acetate	13	Sodium Metal	21	Evaporation of residuals at 100 C **	100	0	500	0				Aggravated
Ethyl Acrylate	13	Chlorine	104	Mitigation of chlorine release **	100	8000	300	7600				Mitigated
Ethyl Acrylate	13	Ferric Chloride Solution	104	Evaporation of residuals at 50 C	100	0	300	0				Aggravated
Ethyl Acrylate	13	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	100	200	900	1300				Aggravated
Ethyl Acrylate	13	Sodium Metal	21	Evaporation of residuals at 100 C **	100	0	900	0				Aggravated
Ethyl Alcohol	4	Acetaldehyde	5	Evaporation at 100 C; releases acetal	< 100	1100	< 100	700	?			Mitigated
Ethyl Alcohol	4	Butyraldehyde	5	Evaporation of residuals at 100 C	< 100	< 100	< 100	< 100				Same
Ethyl Alcohol	4	Chlorine	104	Evaporation at 50 C; explosion **	< 100	8000	< 100	7600				Mitigated
Ethyl Alcohol	4	Ethylene Oxide	34	Evaporation of residuals at 50 C	< 100	2500	< 100	2000				Mitigated
Ethyl Alcohol	4	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	< 100	200	< 100	1300				Aggravated
Ethyl Alcohol	4	Propylene Oxide	34	Evaporation of residuals at 50 C	< 100	1700	< 100	1300				Mitigated
Ethyl Alcohol	4	Sodium Metal	21	Release of hydrogen gas **	< 100	0	< 100	0				Same
Ethyl Alcohol	4	Toluene Diisocyanate	18	Evaporation of residuals at 100 C **	< 100	< 100	< 100	600				Aggravated
Ethylene Oxide	34	Chlorine	104	Evaporation of residuals at 50 C **	2500	8000	2000	7600				Mitigated
Ethylene Oxide	34	Ferric Chloride Solution	104	Evaporation of residuals at 50 C	2500	0	2000	0				Mitigated
Ethylene Oxide	34	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	2500	200	1600	1300				Mitigated
Ethylene Oxide	34	Phosphorus	105	Evaporation of residuals at 100 C	2500	0	1600	0				Mitigated
Ethylene Oxide	34	Sulfur Dioxide	105	Unknown	2500	4500	?	?				Unknown
Ferric Chloride Solution	104	Acetic Anhydride	107	Evaporation of residuals at 50 C	0	< 100	0	200				Aggravated
Ferric Chloride Solution	104	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	0	200	0	1300				Aggravated
Ferric Chloride Solution	104	Maleic Anhydride	107	Evaporation of residuals at 50 C	0	900*	0	3000*				Aggravated
Ferric Chloride Solution	104	Phosphorus	105	Local consequences	0	0	0	0				Same
Flammable Liquid	101	Chlorine	104	Evaporation of residuals at 50 C **	< 100	8000	?	7600				Mitigated
Flammable Liquid	101	Hydrogen Peroxide	104	Evaporation at 50 C; explosion **	< 100	200	?	400				Aggravated
Formaldehyde Solution	5	Acetic Anhydride	107	Release of acetic acid	100	< 100	200	200	300			Aggravated
Formaldehyde Solution	5	Alkaline Liquid	10	Evaporation of residuals at 50 C	100	0	200	0				Aggravated
Formaldehyde Solution	5	Anhydrous Ammonia	10	Mitigate NH3 release	100	4100	200	3700				Mitigated
Formaldehyde Solution	5	Aniline Oil	7	Evaporation of residuals at 100 C	100	100	500	700				Aggravated
Formaldehyde Solution	5	Chlorine	104	Evaporation of residuals at 50 C **	100	8000	200	7600				Mitigated
Formaldehyde Solution	5	Ethylene Oxide	34	Evaporation of residuals at 50 C	100	2500	200	2000				Mitigated
Formaldehyde Solution	5	Ferric Chloride Solution	104	Evaporation of residuals at 50 C	100	0	200	0				Aggravated
Formaldehyde Solution	5	Hexamethylene Diamine Soln	7	Evaporation of residuals at 100 C	100	< 100	500	< 100				Aggravated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Formaldehyde Solution	6	Hydrogen Peroxide	104	Evaporation at 50 C; explosion **	100	200	200	400				Aggravated
Formaldehyde Solution	6	Potassium Hydroxide, Liq	10	Evaporation of residuals at 50 C	100	0	200	0				Aggravated
Formaldehyde Solution	6	Sodium Hydroxide, Liq.	10	Evaporation of residuals at 50 C	100	0	200	0				Aggravated
Formaldehyde Solution	6	Sodium Metal	21	Release of hydrogen gas **	100	0	200	0				Aggravated
Formaldehyde Solution	6	Toluene Diisocyanate	18	Evaporation of residuals at 100 C	100	< 100	200	600				Aggravated
Fuel Oil	101	Chlorine	104	Evaporation of residuals at 50 C **	< 100	8000	100	7600				Mitigated
Fuel Oil	101	Hydrogen Peroxide	104	Evaporation at 50 C; explosion **	< 100	200	100	400				Aggravated
Fuel, Aviation	101	Chlorine	104	Evaporation of residuals at 50 C **	< 100	8000	100	7600				Mitigated
Fuel, Aviation	101	Hydrogen Peroxide	104	Evaporation at 50 C; explosion **	< 100	200	100	400				Aggravated
Gasoline	101	Chlorine	104	Evaporation of residuals at 50 C **	< 100	8000	100	7600				Mitigated
Gasoline	101	Hydrogen Peroxide	104	Evaporation at 50 C; explosion **	< 100	200	100	400				Aggravated
Gasoline, nec	101	Chlorine	104	Evaporation of residuals at 50 C **	< 100	8000	100	7600				Mitigated
Gasoline, nec	101	Hydrogen Peroxide	104	Evaporation at 50 C; explosion **	< 100	200	100	400				Aggravated
Glycol Ethers	14	Chlorine	104	Mitigation of chlorine release **	< 100	8000	100	7600				Mitigated
Glycol Ethers	14	Ferric Chloride Solution	104	Evaporation of residuals at 50 C	< 100	0	100	0				Aggravated
Hexamethylene Diamine Sol	7	Acetic Anhydride	107	Evaporation of residuals at 100 C	< 100	< 100	< 100	400				Aggravated
Hexamethylene Diamine Sol	7	Acrylonitrile	26	Evaporation of residuals at 100 C	< 100	200	< 100	900				Aggravated
Hexamethylene Diamine Sol	7	Carbon Tetrachloride	17	Evaporation of residuals at 100 C	< 100	600	< 100	1500				Aggravated
Hexamethylene Diamine Sol	7	Chlorine	104	Evaporation of residuals at 50 C **	< 100	8000	< 100	7600				Mitigated
Hexamethylene Diamine Sol	7	Chloroprene	17	Evaporation of residuals at 100 C	< 100	800	< 100	1700				Aggravated
Hexamethylene Diamine Sol	7	Ethylene Oxide	34	Evaporation of residuals at 100 C	< 100	2500	< 100	1600				Mitigated
Hexamethylene Diamine Sol	7	Ferric Chloride Solution	104	Evaporation of residuals at 50 C	< 100	0	< 100	0				Same
Hexamethylene Diamine Sol	7	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	< 100	200	< 100	1300				Aggravated
Hexamethylene Diamine Sol	7	Maleic Anhydride	107	Evaporation of residuals at 100 C	< 100	900*	< 100	20700*				Aggravated
Hexamethylene Diamine Sol	7	Methyl Chloride	17	Mitigate methyl chloride release	< 100	1000	< 100	1000				Same
Hexamethylene Diamine Sol	7	Motor Fuel Antiknock Compo	24	Evaporation of residuals at 50 C	< 100	100	< 100	100				Same
Hexamethylene Diamine Sol	7	Propylene Oxide	34	Evaporation of residuals at 100 C	< 100	1700	< 100	1100				Mitigated
Hexamethylene Diamine Sol	7	Sodium Metal	21	Evaporation at 100 C; release H2 gas	< 100	0	< 100	0				Same
Hexamethylene Diamine Sol	7	Toluene Diisocyanate	18	Evaporation of residuals at 100 C	< 100	< 100	< 100	600				Aggravated
Hexamethylene Diamine Sol	7	Vinyl Chloride	17	Mitigate release of vinyl chloride	< 100	19100*	< 100	18100*				Mitigated
Hexane	29	Chlorine	104	Evaporation of residuals at 50 C **	200	8000	300	7600				Mitigated
Hydrochloric Acid	1	Acetaldehyde	6	Evaporation of residuals at 100 C	< 100	1100	500	700				Mitigated
Hydrochloric Acid	1	Acetic Acid, Glacial	3	Evaporation of residuals at 50 C	< 100	100	100	300				Aggravated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Hydrochloric Acid	1	Acetic Anhydride	107	Evaporation of residuals at 100 C **	< 100	< 100	500	400				Aggravated
Hydrochloric Acid	1	Acetone	19	Evaporation of residuals at 50 C	< 100	100	100	600				Aggravated
Hydrochloric Acid	1	Acrylic Acid	3	Evaporation of residuals at 50 C	< 100	800*	100	1600*				Aggravated
Hydrochloric Acid	1	Acrylonitrile	26	Evaporation of residuals at 100 C	< 100	200	500	900				Aggravated
Hydrochloric Acid	1	Alcoholic Beverage	4	Releases ethyl chloride gas	< 100	< 100	100	< 100	400			Aggravated
Hydrochloric Acid	1	Alkaline Liquid	10	Evaporation of residual HCL at 100 C	< 100	0	500	0				Aggravated
Hydrochloric Acid	1	Anhydrous Ammonia	10	Mitigate NH3 release	< 100	4100	100	3700				Mitigated
Hydrochloric Acid	1	Aniline Oil	7	Evaporation of residuals at 50 C	< 100	100	100	200				Aggravated
Hydrochloric Acid	1	Butadiene	28	Evaporation of residual HCL at 50 C	< 100	800	100	800				Same
Hydrochloric Acid	1	Butyl Acrylate	13	Release acrylic acid and butanol	< 100	700*	500	3000*	6300*	< 100		Aggravated
Hydrochloric Acid	1	Butyl Alcohol	4	Evaporation of butyl chloride, alcohol	< 100	< 100	100	< 100	?			Aggravated
Hydrochloric Acid	1	Butyraldehyde	5	Evaporation of residuals at 50 C	< 100	< 100	100	< 100				Aggravated
Hydrochloric Acid	1	Chlorine	104	Evaporation of residual HCL at 100 C	< 100	8000	500	8000	< 100			Same
Hydrochloric Acid	1	Chloroprene	17	Evaporation of residuals at 100 C **	< 100	800	500	1700				Aggravated
Hydrochloric Acid	1	Coal Tar Distillate	101	Evaporation of residuals at 50 C	< 100	< 100	100	< 100				Same
Hydrochloric Acid	1	Combustible Liquid	101	Evaporation of residuals at 50 C	< 100	?	100	?				Same
Hydrochloric Acid	1	Compound, Cleaning	101	Evaporation of residuals at 50 C	< 100	?	100	?				Same
Hydrochloric Acid	1	Crude Oil Petroleum	101	Evaporation of residuals at 50 C	< 100	< 100	100	< 100				Same
Hydrochloric Acid	1	Denatured Alcohol	4	Releases ethyl chloride gas	< 100	< 100	100	< 100	400			Aggravated
Hydrochloric Acid	1	Distillate Fuel Oil	101	Evaporation of residuals at 50 C	< 100	< 100	100	< 100				Same
Hydrochloric Acid	1	Ethyl Acetate	13	Release acetic acid and ethanol	< 100	100	100	200	300	< 100		Aggravated
Hydrochloric Acid	1	Ethyl Acrylate	13	Release acrylic acid and ethanol	< 100	100	500	900	6300*	< 100		Aggravated
Hydrochloric Acid	1	Ethyl Alcohol	4	Releases ethyl chloride gas	< 100	< 100	100	< 100	400			Aggravated
Hydrochloric Acid	1	Ethylene Oxide	34	Mitigate ethylene oxide release	< 100	2500	500	2300				Mitigated
Hydrochloric Acid	1	Flammable Liquid	101	Evaporation of residuals at 50 C	< 100	?	100	?				Same
Hydrochloric Acid	1	Formaldehyde Solution	5	Evaporation of residuals at 50 C	< 100	100	100	200				Aggravated
Hydrochloric Acid	1	Fuel Oil	101	Evaporation of residuals at 50 C	< 100	< 100	100	< 100				Same
Hydrochloric Acid	1	Fuel, Aviation	101	Evaporation of residuals at 50 C	< 100	< 100	100	< 100				Same
Hydrochloric Acid	1	Gasoline	101	Evaporation of residuals at 50 C	< 100	< 100	100	< 100				Same
Hydrochloric Acid	1	Gasoline, nec	101	Evaporation of residuals at 50 C	< 100	< 100	100	< 100				Same
Hydrochloric Acid	1	Glycol Ethers	14	Releases 1,2 dichloroethane	< 100	< 100	100	100	300			Aggravated
Hydrochloric Acid	1	Hexamethylene Diamine Soln	7	Evaporation of residuals at 50 C	< 100	< 100	100	< 100				Aggravated
Hydrochloric Acid	1	Hydrogen Peroxide	104	Releases chlorine gas; explosion	< 100	200	0	1300	3100			Aggravated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Hydrochloric Acid	1	Isopropanol	4	Releases isopropyl chloride gas	< 100	< 100	100	100	?			Aggravated
Hydrochloric Acid	1	Maleic Anhydride	107	Evaporation of residuals at 100 C	< 100	900*	500	20700*				Aggravated
Hydrochloric Acid	1	Methyl Alcohol	4	Releases methyl chloride gas	< 100	100	100	100	500			Aggravated
Hydrochloric Acid	1	Methyl Ethyl Ketone	19	Evaporation of residuals at 50 C	< 100	200	100	300				Aggravated
Hydrochloric Acid	1	Methyl Methacrylate	13	Release methacrylic acid and methanol	< 100	100	500	700	?	600		Aggravated
Hydrochloric Acid	1	Motor Fuel Antiknock Compo	24	Boil-off HCL, release ethane gas **	< 100	100	100	100				Same
Hydrochloric Acid	1	Nitric Acid, Fuming	2	Release of chlorine gas	< 100	900	100	1600	2700			Aggravated
Hydrochloric Acid	1	Octyl Alcohol	4	Local consequences	< 100	< 100	< 100	< 100				Same
Hydrochloric Acid	1	Oil	101	Evaporation of residuals at 50 C	< 100	< 100	100	< 100				Same
Hydrochloric Acid	1	Oleum	2	Releases HCL gas, H2SO4 mist (from SO3)	< 100	1600	2500	2400				Aggravated
Hydrochloric Acid	1	Petroleum Naphtha	101	Evaporation of residuals at 50 C	< 100	< 100	100	< 100				Same
Hydrochloric Acid	1	Petroleum Residual Fuel	101	Evaporation of residuals at 50 C	< 100	< 100	100	< 100				Same
Hydrochloric Acid	1	Petroleum, Refined	101	Evaporation of residuals at 50 C	< 100	< 100	100	< 100				Same
Hydrochloric Acid	1	Phenol	31	Same as individual chemicals	< 100	< 100	< 100	< 100				Same
Hydrochloric Acid	1	Phosphorus	105	Releases PH3 gas	< 100	0	100	0	800			Aggravated
Hydrochloric Acid	1	Potassium Hydroxide, Liq	10	Evaporation of residual HCL at 100 C	< 100	0	500	0				Aggravated
Hydrochloric Acid	1	Propylene Oxide	34	Mitigate propylene oxide release	< 100	1700	500	1500				Mitigated
Hydrochloric Acid	1	Pulp Mill Liquid	101	Evaporation of residuals at 50 C	< 100	?	100	?				Same
Hydrochloric Acid	1	Sodium Hydroxide, Liq.	10	Evaporation of residual HCL at 100 C	< 100	0	500	0				Aggravated
Hydrochloric Acid	1	Sodium Metal	21	Boil-off HCL, release H2 **	< 100	0	500	0	< 100			Aggravated
Hydrochloric Acid	1	Styrene Monomer	16	Evaporation of residuals at 100 C	< 100	< 100	500	200				Aggravated
Hydrochloric Acid	1	Sulfuric Acid	2	Displaces HCL from solution	< 100	0	2500	0				Aggravated
Hydrochloric Acid	1	Sulfuric Acid, Spent	2	Displaces HCL from solution	< 100	0	2500	0				Aggravated
Hydrochloric Acid	1	Toluene Diisocyanate	18	Evaporation of residuals at 100 C	< 100	< 100	100	600				Aggravated
Hydrochloric Acid	1	Vinyl Acetate	13	Release acetic acid and acetaldehyde	< 100	4100*	500	5700*	300	900		Aggravated
Hydrochloric Acid	1	Vinyl Chloride	17	Mitigate release of vinyl chloride	< 100	19100*	500	18100*				Aggravated
Hydrocyanic Acid	1	Acetaldehyde	5	Mitigate release of HCN	8800	1100	8400	700				Mitigated
Hydrocyanic Acid	1	Acetic Anhydride	107	Release acetonitrile **	8800	< 100	8400	200	100			Mitigated
Hydrocyanic Acid	1	Acetone	19	Mitigate HCN release	8800	100	8400	600				Mitigated
Hydrocyanic Acid	1	Acrylonitrile	26	Mitigate HCN release	8800	200	8400	900				Mitigated
Hydrocyanic Acid	1	Alcoholic Beverage	4	Evaporation of propionitrile	8800	< 100	7600	< 100	?			Mitigated
Hydrocyanic Acid	1	Alkaline Liquid	10	Mitigate HCN release	8800	0	7600	0				Mitigated
Hydrocyanic Acid	1	Ammonium Nitrate Soln.	106	Mitigate HCN release	8800	0	8400	0				Mitigated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Hydrocyanic Acid	1	Anhydrous Ammonia	10	Mitigate HCN and NH3 releases	8800	4100	6200	3400				Mitigated
Hydrocyanic Acid	1	Butadiene	28	Mitigate HCN release	8800	800	8400	800				Mitigated
Hydrocyanic Acid	1	Butyl Acrylate	13	Release acrylonitrile and butanol	8800	700*	8400	1500*	300	< 100		Mitigated
Hydrocyanic Acid	1	Butyl Alcohol	4	Evaporation of pentanenitrile	8800	< 100	8400	< 100	?			Mitigated
Hydrocyanic Acid	1	Butyraldehyde	5	Mitigate release of HCN	8800	< 100	8400	< 100				Mitigated
Hydrocyanic Acid	1	Carbon Tetrachloride	17	Mitigate HCN release	8800	600	8400	1100				Mitigated
Hydrocyanic Acid	1	Chlorine	104	Releases CNCL and HCL gas	8800	8000	6900	0	9200	4300		Aggravated
Hydrocyanic Acid	1	Chloroprene	17	Mitigate HCN release	8800	800	8400	2100				Mitigated
Hydrocyanic Acid	1	Denatured Alcohol	4	Evaporation of propionitrile	8800	< 100	8400	< 100	?			Mitigated
Hydrocyanic Acid	1	Ethyl Acetate	13	Release acetonitrile and ethanol	8800	100	8400	200	100	< 100		Mitigated
Hydrocyanic Acid	1	Ethyl Acrylate	13	Release acryonitrile and ethanol	8800	100	8400	300	300	< 100		Mitigated
Hydrocyanic Acid	1	Ethyl Alcohol	4	Evaporation of propionitrile	8800	< 100	8400	< 100	?			Mitigated
Hydrocyanic Acid	1	Ethylene Oxide	34	Mitigate ethylene oxide and HCN releases	8800	2500	7600	2300				Mitigated
Hydrocyanic Acid	1	Ferric Chloride Solution	104	Mitigate release of HCN	8800	0	7600	0				Mitigated
Hydrocyanic Acid	1	Formaldehyde Solution	5	Mitigate release of HCN	8800	100	7600	500				Mitigated
Hydrocyanic Acid	1	Glycol Ethers	14	Mitigate HCN release	8800	< 100	8400	100				Mitigated
Hydrocyanic Acid	1	Hydrogen Peroxide	104	Releases NOx gas; explosion	8800	200	6200	1300	3700			Mitigated
Hydrocyanic Acid	1	Isopropanol	4	Evaporation of isopropyl cyanide	8800	< 100	8400	100	?			Mitigated
Hydrocyanic Acid	1	Maleic Anhydride	107	Mitigate HCN release	8800	900*	8400	3000*				Mitigated
Hydrocyanic Acid	1	Methyl Alcohol	4	Evaporation of acetonitrile	8800	100	8400	100	800			Mitigated
Hydrocyanic Acid	1	Methyl Chloride	17	Mitigate HCN, CH3CL; form CH3CN and HCL	8800	1000	7600	800	1100	3800		Mitigated
Hydrocyanic Acid	1	Methyl Ethyl Ketone	19	Mitigate HCN release	8800	200	8400	300				Mitigated
Hydrocyanic Acid	1	Methyl Methacrylate	13	Release methacrylonitrile and methanol	8800	100	8400	200	?	< 100		Mitigated
Hydrocyanic Acid	1	Motor Fuel Antiknock Compo	24	Mitigate HCN release **	8800	100	8400	100	< 100			Mitigated
Hydrocyanic Acid	1	Nitric Acid, Fuming	2	Mitigate release of HCN	8800	900	6200	1600				Mitigated
Hydrocyanic Acid	1	Octyl Alcohol	4	Mitigate release of HCN	8800	< 100	8400	< 100				Mitigated
Hydrocyanic Acid	1	Oleum	2	Releases NO2, CO, and SO2 gas	8800	1600	8600	0	2400	900	2600	Mitigated
Hydrocyanic Acid	1	Potassium Hydroxide, Liq	10	Mitigate HCN release	8800	0	7600	0				Mitigated
Hydrocyanic Acid	1	Propylene Oxide	34	Mitigate propylene oxide and HCN release	8800	1700	7600	1500				Mitigated
Hydrocyanic Acid	1	Sodium Hydroxide, Liq.	10	Mitigate HCN release	8800	0	7600	0				Mitigated
Hydrocyanic Acid	1	Sodium Metal	21	Mitigate HCN release **	8800	0	8400	0	< 100			Mitigated
Hydrocyanic Acid	1	Styrene Monomer	16	Evaporation of residuals at 100 C	8800	< 100	8400	200				Mitigated
Hydrocyanic Acid	1	Sulfuric Acid	2	Releases NO2, CO, and SO2 gas	8800	0	8700	0	1100	500	1900	Mitigated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	Distances for Gas Releases IDLH Gas 2	Distances for Gas Releases IDLH Gas 3	Conclusions
Hydrocyanic Acid	1	Sulfuric Acid, Spent	2	Releases CO gas	8800	0	7600	0	1100			Mitigated
Hydrocyanic Acid	1	Toluene Diisocyanate	18	Mitigate HCN release	8800	< 100	8400	600				Mitigated
Hydrocyanic Acid	1	Vinyl Acetate	13	Release acetonitrile and acetaldehyde	8800	4100*	8400	8000*	100	900		Mitigated
Hydrocyanic Acid	1	Vinyl Chloride	17	Mitigate HCN, vinyl chloride releases	8800	19100*	7600	16500*				Mitigated
Hydrofluorosilicic Acid	1	Acetaldehyde	5	Evaporation of residuals at 100 C	< 100	1100	800	700				Mitigated
Hydrofluorosilicic Acid	1	Acetic Acid, Glacial	3	Evaporation of residuals at 50 C	< 100	100	100	300				Aggravated
Hydrofluorosilicic Acid	1	Acetic Anhydride	107	Release acetyl fluoride **	< 100	< 100	800	400	?			Aggravated
Hydrofluorosilicic Acid	1	Acetone	19	Evaporation of residuals at 50 C	< 100	100	100	600				Aggravated
Hydrofluorosilicic Acid	1	Acrylic Acid	3	Evaporation of residuals at 50 C	< 100	800*	100	1600*				Aggravated
Hydrofluorosilicic Acid	1	Acrylonitrile	26	Evaporation of residuals at 100 C	< 100	200	800	900				Aggravated
Hydrofluorosilicic Acid	1	Alcoholic Beverage	4	Releases ethyl fluoride gas	< 100	< 100	100	< 100	?			Aggravated
Hydrofluorosilicic Acid	1	Alkaline Liquid	10	Evaporation of residuals at 100 C	< 100	0	800	0				Aggravated
Hydrofluorosilicic Acid	1	Ammonium Nitrate Soln.	106	Evaporation of residuals at 50 C	< 100	0	100	0				Aggravated
Hydrofluorosilicic Acid	1	Anhydrous Ammonia	10	Mitigate NH3 release	< 100	4100	100	3700	< 100			Mitigated
Hydrofluorosilicic Acid	1	Aniline Oil	7	Evaporation of residuals at 50 C	< 100	100	100	200				Aggravated
Hydrofluorosilicic Acid	1	Butadiene	28	Evaporation of residual 2HF-SiF4 at 50 C	< 100	800	100	800				Same
Hydrofluorosilicic Acid	1	Butyl Acrylate	13	Evaporation of residuals at 100 C	< 100	700*	800	3000*				Aggravated
Hydrofluorosilicic Acid	1	Butyl Alcohol	4	Evaporate butyl fluoride	< 100	< 100	100	< 100	?			Aggravated
Hydrofluorosilicic Acid	1	Butyraldehyde	5	Evaporation of residuals at 100 C	< 100	< 100	800	< 100				Aggravated
Hydrofluorosilicic Acid	1	Carbon Tetrachloride	17	Releases CL3CF gas	< 100	600	100	1100	500			Aggravated
Hydrofluorosilicic Acid	1	Chloroprene	17	Evaporation of residuals at 100 C	< 100	800	800	1700				Aggravated
Hydrofluorosilicic Acid	1	Coal Tar Distillate	101	Evaporation of residuals at 50 C	< 100	< 100	< 100	< 100				Same
Hydrofluorosilicic Acid	1	Combustible Liquid	101	Evaporation of residuals at 50 C	< 100	?	< 100	?				Same
Hydrofluorosilicic Acid	1	Compound, Cleaning	101	Evaporation of residuals at 50 C	< 100	?	< 100	?				Same
Hydrofluorosilicic Acid	1	Crude Oil Petroleum	101	Evaporation of residuals at 50 C	< 100	< 100	< 100	< 100				Same
Hydrofluorosilicic Acid	1	Denatured Alcohol	4	Releases ethyl fluoride gas	< 100	< 100	100	< 100	?			Aggravated
Hydrofluorosilicic Acid	1	Distillate Fuel Oil	101	Evaporation of residuals at 50 C	< 100	< 100	< 100	< 100				Same
Hydrofluorosilicic Acid	1	Ethyl Acetate	13	Evaporation of residuals at 50 C	< 100	100	100	200				Aggravated
Hydrofluorosilicic Acid	1	Ethyl Acrylate	13	Evaporation of residuals at 100 C	< 100	100	800	900				Aggravated
Hydrofluorosilicic Acid	1	Ethyl Alcohol	4	Releases ethyl fluoride gas	< 100	< 100	100	< 100	?			Aggravated
Hydrofluorosilicic Acid	1	Ethylene Oxide	34	Mitigate ethylene oxide release	< 100	2500	800	2300				Mitigated
Hydrofluorosilicic Acid	1	Flammable Liquid	101	Evaporation of residuals at 50 C	< 100	?	< 100	?				Same
Hydrofluorosilicic Acid	1	Formaldehyde Solution	5	Evaporation of residuals at 50 C	< 100	100	100	200				Aggravated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Hydrofluorosilicic Acid	1	Fuel Oil	101	Evaporation of residuals at 50 C	< 100	< 100	< 100	< 100				Same
Hydrofluorosilicic Acid	1	Fuel, Aviation	101	Evaporation of residuals at 50 C	< 100	< 100	< 100	< 100				Same
Hydrofluorosilicic Acid	1	Gasoline	101	Evaporation of residuals at 50 C	< 100	< 100	< 100	< 100				Same
Hydrofluorosilicic Acid	1	Gasoline, nec	101	Evaporation of residuals at 50 C	< 100	< 100	< 100	< 100				Same
Hydrofluorosilicic Acid	1	Glycol Ethers	14	Releases 1,2 difluoroethane	< 100	< 100	100	100	?			Aggravated
Hydrofluorosilicic Acid	1	Hexamethylene Diamine Soln	7	Evaporation of residuals at 50 C	< 100	< 100	100	< 100				Aggravated
Hydrofluorosilicic Acid	1	Hydrogen Peroxide	104	Releases HF from solution	< 100	200	100	400	< 100			Aggravated
Hydrofluorosilicic Acid	1	Isopropanol	4	Evaporate isopropyl fluoride	< 100	< 100	100	100	?			Aggravated
Hydrofluorosilicic Acid	1	Maleic Anhydride	107	Evaporation of residuals at 100 C	< 100	900*	800	20700*				Aggravated
Hydrofluorosilicic Acid	1	Methyl Alcohol	4	Releases methyl fluoride gas	< 100	100	100	100	?			Same
Hydrofluorosilicic Acid	1	Methyl Chloride	17	Releases HCL, methyl fluoride gases	< 100	1000	100	1000	2200	?		Aggravated
Hydrofluorosilicic Acid	1	Methyl Ethyl Ketone	19	Evaporation of residuals at 50 C	< 100	200	100	300				Aggravated
Hydrofluorosilicic Acid	1	Methyl Methacrylate	13	Evaporation of residuals at 100 C	< 100	100	800	700				Aggravated
Hydrofluorosilicic Acid	1	Motor Fuel Antiknock Compo	24	Boil-off HF, release ethane gas **	< 100	100	100	100	< 100			Same
Hydrofluorosilicic Acid	1	Nitric Acid, Fuming	2	Displaces HF from solution	< 100	900	3400	2800				Aggravated
Hydrofluorosilicic Acid	1	Octyl Alcohol	4	Local consequences	< 100	< 100	< 100	< 100				Same
Hydrofluorosilicic Acid	1	Oil	101	Evaporation of residuals at 50 C	< 100	< 100	< 100	< 100				Same
Hydrofluorosilicic Acid	1	Oleum	2	Releases HF gas, H2SO4 mist (from SO3)	< 100	1600	3400	2400				Aggravated
Hydrofluorosilicic Acid	1	Petroleum Naphtha	101	Evaporation of residuals at 50 C	< 100	< 100	< 100	< 100				Same
Hydrofluorosilicic Acid	1	Petroleum Residual Fuel	101	Evaporation of residuals at 50 C	< 100	< 100	< 100	< 100				Same
Hydrofluorosilicic Acid	1	Petroleum, Refined	101	Evaporation of residuals at 50 C	< 100	< 100	< 100	< 100				Same
Hydrofluorosilicic Acid	1	Phenol	31	Evaporation of residuals at 50 C	< 100	< 100	100	200				Aggravated
Hydrofluorosilicic Acid	1	Phosphorus	105	Evaporation of residuals at 50 C	< 100	0	100	0				Aggravated
Hydrofluorosilicic Acid	1	Potassium Hydroxide, Liq	10	Evaporation of residuals at 100 C	< 100	0	800	0				Aggravated
Hydrofluorosilicic Acid	1	Propylene Oxide	34	Mitigate propylene oxide release	< 100	1700	800	1500				Mitigated
Hydrofluorosilicic Acid	1	Pulp Mill Liquid	101	Evaporation of residuals at 50 C	< 100	?	< 100	?				Same
Hydrofluorosilicic Acid	1	Sodium Hydroxide, Liq.	10	Evaporation of residuals at 100 C	< 100	0	800	0				Aggravated
Hydrofluorosilicic Acid	1	Sodium Metal	21	Boil-off HF, release H2 **	< 100	0	800	0	< 100			Aggravated
Hydrofluorosilicic Acid	1	Styrene Monomer	16	Evaporation of residuals at 100 C	< 100	< 100	800	200				Aggravated
Hydrofluorosilicic Acid	1	Sulfuric Acid	2	Displaces HF from solution	< 100	0	3400	0				Aggravated
Hydrofluorosilicic Acid	1	Sulfuric Acid, Spent	2	None	< 100	0	< 100	0				Same
Hydrofluorosilicic Acid	1	Toluene Diisocyanate	18	Evaporation of residuals at 100 C	< 100	< 100	800	600				Aggravated
Hydrofluorosilicic Acid	1	Vinyl Acetate	13	Evaporation of residuals at 100 C	< 100	4100*	800	5700*				Aggravated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Hydrofluorosilicic Acid	1	Vinyl Chloride	17	Mitigate release of vinyl chloride	< 100	19100*	100	18100*				Mitigated
Hydrogen Fluoride	1	Acetaldehyde	5	Mitigate release of HF	8500	1100	8100	700				Mitigated
Hydrogen Fluoride	1	Acetic Acid, Glacial	3	Mitigate HF release	8500	100	8100	300				Mitigated
Hydrogen Fluoride	1	Acetic Anhydride	107	Release acetyl fluoride **	8500	< 100	8100	200	?			Mitigated
Hydrogen Fluoride	1	Acetone	19	Mitigate HF release	8500	100	8100	600				Mitigated
Hydrogen Fluoride	1	Acrylic Acid	3	Mitigate HF release	8500	800*	8100	1600*				Mitigated
Hydrogen Fluoride	1	Acrylonitrile	26	Mitigate HF release	8500	200	8100	900				Mitigated
Hydrogen Fluoride	1	Alcoholic Beverage	4	Mitigate HF release; release C2H5F gas	8500	< 100	7400	< 100	?			Mitigated
Hydrogen Fluoride	1	Alkaline Liquid	10	Mitigate HF release	8500	0	7400	0				Mitigated
Hydrogen Fluoride	1	Ammonium Nitrate Soln.	108	Mitigate HF release	8500	0	8100	0				Mitigated
Hydrogen Fluoride	1	Anhydrous Ammonia	10	Mitigate HF and NH3 releases	8500	4100	6000	3400				Mitigated
Hydrogen Fluoride	1	Aniline Oil	7	Mitigate HF release	8500	100	8100	200				Mitigated
Hydrogen Fluoride	1	Butadiene	28	Mitigate HF release	8500	800	8100	800				Mitigated
Hydrogen Fluoride	1	Butyl Acrylate	13	Mitigate HF release	8500	700*	8100	1500*				Mitigated
Hydrogen Fluoride	1	Butyl Alcohol	4	Mitigate HF release	8500	< 100	8100	< 100				Mitigated
Hydrogen Fluoride	1	Butyraldehyde	5	Mitigate release of HF	8500	< 100	8100	< 100				Mitigated
Hydrogen Fluoride	1	Carbon Tetrachloride	17	Releases CL3CF and HCl gas	8500	600	8100	1100	700	3100		Mitigated
Hydrogen Fluoride	1	Chloroprene	17	Mitigate HF release	8500	800	8100	2100				Mitigated
Hydrogen Fluoride	1	Coal Tar Distillate	101	Mitigate HF release	8500	< 100	8100	< 100				Mitigated
Hydrogen Fluoride	1	Combustible Liquid	101	Mitigate HF release	8500	?	8100	?				Mitigated
Hydrogen Fluoride	1	Compound, Cleaning	101	Mitigate HF release	8500	?	8100	?				Mitigated
Hydrogen Fluoride	1	Crude Oil Petroleum	101	Mitigate HF release	8500	< 100	8100	< 100				Mitigated
Hydrogen Fluoride	1	Denatured Alcohol	4	Mitigate HF release; release C2H5F gas	8500	< 100	8100	< 100	?			Mitigated
Hydrogen Fluoride	1	Distillate Fuel Oil	101	Mitigate HF release	8500	< 100	8100	< 100				Mitigated
Hydrogen Fluoride	1	Ethyl Acetate	13	Mitigate HF release	8500	100	8100	200				Mitigated
Hydrogen Fluoride	1	Ethyl Acrylate	13	Mitigate HF release	8500	100	8100	300				Mitigated
Hydrogen Fluoride	1	Ethyl Alcohol	4	Mitigate HF release; release C2H5F gas	8500	< 100	8100	< 100	?			Mitigated
Hydrogen Fluoride	1	Ethylene Oxide	34	Mitigate ethylene oxide and HF releases	8500	2500	800	2300				Mitigated
Hydrogen Fluoride	1	Flammable Liquid	101	Mitigate HF release	8500	?	8100	?				Mitigated
Hydrogen Fluoride	1	Formaldehyde Solution	5	Mitigate release of HF	8500	100	7400	500				Mitigated
Hydrogen Fluoride	1	Fuel Oil	101	Mitigate HF release	8500	< 100	8100	< 100				Mitigated
Hydrogen Fluoride	1	Fuel, Aviation	101	Mitigate HF release	8500	< 100	8100	< 100				Mitigated
Hydrogen Fluoride	1	Gasoline	101	Mitigate HF release	8500	< 100	8100	< 100				Mitigated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Hydrogen Fluoride	1	Gasoline, nec	101	Mitigate HF release	8500	< 100	8100	< 100				Mitigated
Hydrogen Fluoride	1	Glycol Ethers	14	Mitigate HF release	8500	< 100	8100	100				Mitigated
Hydrogen Fluoride	1	Hexamethylene Diamine Soln	7	Mitigate HF release	8500	< 100	8100	< 100				Mitigated
Hydrogen Fluoride	1	Hydrogen Peroxide	104	Releases fluorine gas	8500	200	7400	400	2400			Mitigated
Hydrogen Fluoride	1	Isopropanol	4	Mitigate HF release; release C3H7F gas	8500	< 100	8100	100	?			Mitigated
Hydrogen Fluoride	1	Maleic Anhydride	107	Mitigate HF release	8500	900*	8100	3000*				Mitigated
Hydrogen Fluoride	1	Methyl Alcohol	4	Mitigate HF release; release CH3F gas	8500	100	8100	100	?			Mitigated
Hydrogen Fluoride	1	Methyl Chloride	17	Releases HCL, methyl fluoride gases	8500	1000	7400	900	3000	?		Mitigated
Hydrogen Fluoride	1	Methyl Ethyl Ketone	19	Mitigate HF release	8500	200	8100	300				Mitigated
Hydrogen Fluoride	1	Methyl Methacrylate	13	Mitigate HF release	8500	100	8100	200				Mitigated
Hydrogen Fluoride	1	Motor Fuel Antiknock Compo	24	Mitigate HF release **	8500	100	8100	100				Mitigated
Hydrogen Fluoride	1	Octyl Alcohol	4	Mitigate HF release	8500	< 100	8100	< 100	< 100			Mitigated
Hydrogen Fluoride	1	Oil	101	Mitigate HF release	8500	< 100	8100	< 100				Mitigated
Hydrogen Fluoride	1	Petroleum Naphtha	101	Mitigate HF release	8500	< 100	8100	< 100				Mitigated
Hydrogen Fluoride	1	Petroleum Residual Fuel	101	Mitigate HF release	8500	< 100	8100	< 100				Mitigated
Hydrogen Fluoride	1	Petroleum, Refined	101	Mitigate HF release	8500	< 100	8100	< 100				Mitigated
Hydrogen Fluoride	1	Phenol	31	Mitigate HF release	8500	< 100	8100	200				Mitigated
Hydrogen Fluoride	1	Phosphorus	105	Releases PF3 and PH3 gas.	8500	0	8100	0	16700*	1700		Mitigated
Hydrogen Fluoride	1	Potassium Hydroxide, Liq	10	Mitigate HF release	8500	0	7400	0				Mitigated
Hydrogen Fluoride	1	Propylene Oxide	34	Mitigate propylene oxide and HF releases	8500	1700	7400	1500				Mitigated
Hydrogen Fluoride	1	Pulp Mill Liquid	101	Mitigate HF release	8500	?	8100	?				Mitigated
Hydrogen Fluoride	1	Sodium Hydroxide, Liq.	10	Mitigate HF release	8500	0	7400	0				Mitigated
Hydrogen Fluoride	1	Sodium Metal	21	Mitigate HF release **	8500	0	8100	0	< 100			Mitigated
Hydrogen Fluoride	1	Styrene Monomer	16	Evaporation of residuals at 100 C	8500	< 100	8100	200				Mitigated
Hydrogen Fluoride	1	Sulfuric Acid, Spent	2	Dissolution of some HF	8500	0	8100	0				Mitigated
Hydrogen Fluoride	1	Toluene Diisocyanate	18	Mitigate HF release	8500	< 100	8100	600				Mitigated
Hydrogen Fluoride	1	Vinyl Acetate	13	Mitigate HF release	8500	4100*	8100	8000*				Mitigated
Hydrogen Fluoride	1	Vinyl Chloride	17	Mitigate HF, vinyl chloride releases	8500	19100*	7400	16500*				Mitigated
Hydrogen Peroxide	104	Acetic Anhydride	107	Evaporation at 100 C; explosion **	200	< 100	1300	400				Aggravated
Hydrogen Peroxide	104	Maleic Anhydride	107	Evaporation at 100 C; explosion **	200	900*	1300	20700*				Aggravated
Hydrogen Peroxide	104	Phosphorus	105	Evaporation at 50 C; explosion **	200	0	400	0				Aggravated
Hydroiodic Acid	1	Acetaldehyde	5	Evaporation of residuals at 100 C	0	1100	0	700				Mitigated
Hydroiodic Acid	1	Acetic Acid, Glacial	3	Evaporation of residuals at 50 C	0	100	0	300				Aggravated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Hydroiodic Acid	1	Acetic Anhydride	107	Evaporation of residuals at 100 C **	0	< 100	0	400				Aggravated
Hydroiodic Acid	1	Acetone	19	Evaporation of residuals at 50 C	0	100	0	600				Aggravated
Hydroiodic Acid	1	Acrylic Acid	3	Evaporation of residuals at 50 C	0	800*	0	1600*				Aggravated
Hydroiodic Acid	1	Acrylonitrile	26	Evaporation of residuals at 100 C	0	200	0	900				Aggravated
Hydroiodic Acid	1	Alcoholic Beverage	4	Ethyl iodide formed dissolves in water	0	< 100	0	< 100				Same
Hydroiodic Acid	1	Alkaline Liquid	10	Local consequences	0	0	0	0				Same
Hydroiodic Acid	1	Ammonium Nitrate Soln.	106	Same as individual chemicals	0	0	0	0				Same
Hydroiodic Acid	1	Anhydrous Ammonia	10	Mitigate NH3 release	0	4100	0	3700				Mitigated
Hydroiodic Acid	1	Aniline Oil	7	Evaporation of residuals at 50 C	0	100	0	200				Aggravated
Hydroiodic Acid	1	Butadiene	28	Evaporation of residual HI at 50 C	0	800	0	800				Same
Hydroiodic Acid	1	Butyl Acrylate	13	Release acrylic acid and butanol	0	700*	0	3000*	6300*	< 100		Aggravated
Hydroiodic Acid	1	Butyl Alcohol	4	Local consequences	0	< 100	0	< 100				Same
Hydroiodic Acid	1	Butyraldehyde	5	Evaporation of residuals at 50 C	0	< 100	0	< 100				Same
Hydroiodic Acid	1	Carbon Tetrachloride	17	Evaporation of residuals at 100 C	0	600	0	1500				Aggravated
Hydroiodic Acid	1	Chlorine	104	Releases HCL gas	0	8000	0	7600	2000			Mitigated
Hydroiodic Acid	1	Chloroprene	17	Evaporation of residuals at 100 C	0	800	0	1700				Aggravated
Hydroiodic Acid	1	Coal Tar Distillate	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Hydroiodic Acid	1	Combustible Liquid	101	Evaporation of residuals at 50 C	0	?	< 100	?				Same
Hydroiodic Acid	1	Compound, Cleaning	101	Evaporation of residuals at 50 C	0	?	< 100	?				Same
Hydroiodic Acid	1	Crude Oil Petroleum	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Hydroiodic Acid	1	Denatured Alcohol	4	Evaporate ethyl iodide	0	< 100	0	< 100	?			Aggravated
Hydroiodic Acid	1	Distillate Fuel Oil	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Hydroiodic Acid	1	Ethyl Acetate	13	Release acetic acid and ethanol	0	100	0	200	300	< 100		Aggravated
Hydroiodic Acid	1	Ethyl Acrylate	13	Release acrylic acid and ethanol	0	100	0	900	6300*	< 100		Aggravated
Hydroiodic Acid	1	Ethyl Alcohol	4	Evaporate ethyl iodide	0	< 100	0	< 100	?			Aggravated
Hydroiodic Acid	1	Ethylene Oxide	34	Mitigate ethylene oxide release	0	2500	0	2300				Mitigated
Hydroiodic Acid	1	Flammable Liquid	101	Evaporation of residuals at 50 C	0	?	< 100	?				Same
Hydroiodic Acid	1	Formaldehyde Solution	5	Evaporation of residuals at 50 C	0	100	0	200				Aggravated
Hydroiodic Acid	1	Fuel Oil	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Hydroiodic Acid	1	Fuel, Aviation	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Hydroiodic Acid	1	Gasoline	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Hydroiodic Acid	1	Gasoline, nec	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Hydroiodic Acid	1	Glycol Ethers	14	Evaporation of residuals at 100 C	0	< 100	0	400				Aggravated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	Distances for Gas Releases IDLH Gas 2	Distances for Gas Releases IDLH Gas 3	Conclusions
Hydroiodic Acid	1	Hexamethylene Diamine Soln	7	Evaporation of residuals at 50 C	0	< 100	0	< 100				Same
Hydroiodic Acid	1	Hydrogen Peroxide	104	Evaporation of residuals at 50 C	0	200	0	400				Aggravated
Hydroiodic Acid	1	Isopropanol	4	Evaporate isopropyl iodide	0	< 100	0	< 100	?			Aggravated
Hydroiodic Acid	1	Maleic Anhydride	107	Evaporation of residuals at 100 C	0	900*	0	20700*				Aggravated
Hydroiodic Acid	1	Methyl Alcohol	4	Releases methyl iodide gas	0	100	0	100	1200			Aggravated
Hydroiodic Acid	1	Methyl Chloride	17	Same as individual chemicals	0	1000	0	1000				Same
Hydroiodic Acid	1	Methyl Ethyl Ketone	19	Evaporation of residuals at 50 C	0	200	0	300				Aggravated
Hydroiodic Acid	1	Methyl Methacrylate	13	Release methacrylic acid and methanol	0	100	0	700	?	600		Aggravated
Hydroiodic Acid	1	Motor Fuel Antiknock Compo	24	Releases ethane gas **	0	100	0	100	< 100			Same
Hydroiodic Acid	1	Nitric Acid, Fuming	2	Evaporation of residuals at 50 C	0	900	< 100	2800				Aggravated
Hydroiodic Acid	1	Octyl Alcohol	4	Local consequences	0	< 100	0	< 100				Same
Hydroiodic Acid	1	Oil	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Hydroiodic Acid	1	Oleum	2	Releases SO2 gas, H2SO4 mist	0	1600	0	2400	1800			Aggravated
Hydroiodic Acid	1	Petroleum Naphtha	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100	8000*			Same
Hydroiodic Acid	1	Petroleum Residual Fuel	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Hydroiodic Acid	1	Petroleum, Refined	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Hydroiodic Acid	1	Phenol	31	Same as individual chemicals	0	< 100	0	< 100				Same
Hydroiodic Acid	1	Phosphorus	105	Releases PH3 gas	0	0	0	0	1800			Aggravated
Hydroiodic Acid	1	Potassium Hydroxide, Liq	10	Local consequences	0	0	0	0				Same
Hydroiodic Acid	1	Propylene Oxide	34	Mitigate propylene oxide release	0	1700	0	1500				Mitigated
Hydroiodic Acid	1	Pulp Mill Liquid	101	Evaporation of residuals at 50 C	0	?	< 100	?				Same
Hydroiodic Acid	1	Sodium Hydroxide, Liq.	10	Local consequences	0	0	0	0				Same
Hydroiodic Acid	1	Sodium Metal	21	Releases H2 gas **	0	0	0	0	< 100			Aggravated
Hydroiodic Acid	1	Styrene Monomer	16	Evaporation of residuals at 100 C	0	< 100	0	200				Aggravated
Hydroiodic Acid	1	Sulfuric Acid	2	Releases SO2 gas	0	0	0	0	1800			Aggravated
Hydroiodic Acid	1	Sulfuric Acid, Spent	2	Releases SO2 gas	0	0	0	0	1100			Aggravated
Hydroiodic Acid	1	Toluene Diisocyanate	18	Evaporation of residuals at 100 C	0	< 100	0	600				Aggravated
Hydroiodic Acid	1	Vinyl Acetate	13	Release acetic acid and acetaldehyde	0	4100*	0	5700*	300	900		Aggravated
Hydroiodic Acid	1	Vinyl Chloride	17	Mitigate release of vinyl chloride	0	19100*	0	18100*				Mitigated
Isopropanol	4	Acetaldehyde	5	Evaporation of residuals at 100 C	< 100	1100	500	700				Mitigated
Isopropanol	4	Butyraldehyde	5	Evaporation of residuals at 100 C	< 100	< 100	500	< 100				Same
Isopropanol	4	Chlorine	104	Evaporation at 50 C; explosion **	< 100	8000	100	7600				Mitigated
Isopropanol	4	Ethylene Oxide	34	Evaporation of residuals at 50 C	< 100	2500	100	2000				Mitigated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Isopropanol	4	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	< 100	200	500	1300				Aggravated
Isopropanol	4	Propylene Oxide	34	Evaporation of residuals at 50 C	< 100	1700	100	1300				Mitigated
Isopropanol	4	Sodium Metal	21	Release of hydrogen gas **	< 100	0	500	0				Aggravated
Isopropanol	4	Toluene Diisocyanate	18	Evaporation of residuals at 100 C **	< 100	< 100	500	600				Aggravated
LPG	28	Chlorine	104	Fire	900	8000	700	7600				Mitigated
LPG (Butene)	28	Chlorine	104	Fire	800	8000	600	7600				Mitigated
LPG (Butene)	28	Hydrogen Peroxide	104	Fire/explosion	800	200	600	400				Mitigated
LPG (Isobutane)	29	Chlorine	104	Fire	< 100	8000	< 100	7600				Mitigated
LPG (Isobutylene)	28	Chlorine	104	Fire	< 100	8000	< 100	7600				Mitigated
LPG (Isobutylene)	28	Hydrogen Peroxide	104	Fire/explosion	900	200	700	400				Mitigated
LPG (Propane)	29	Chlorine	104	Fire	< 100	8000	< 100	7600				Mitigated
LPG (Propylene)	28	Chlorine	104	Fire	< 100	8000	< 100	7600				Mitigated
LPG (Propylene)	28	Hydrogen Peroxide	104	Fire/explosion	< 100	200	< 100	400				Aggravated
Methyl Alcohol	4	Acetaldehyde	5	Evaporation of residuals at 100 C	100	1100	600	700				Mitigated
Methyl Alcohol	4	Butyraldehyde	5	Evaporation of residuals at 100 C	100	< 100	600	< 100				Same
Methyl Alcohol	4	Chlorine	104	Evaporation at 50 C; explosion **	100	8000	100	7600				Mitigated
Methyl Alcohol	4	Ethylene Oxide	34	Evaporation of residuals at 50 C	100	2500	100	2000				Mitigated
Methyl Alcohol	4	Ferric Chloride Solution	104	Release of formaldehyde	100	0	100	0	300			Aggravated
Methyl Alcohol	4	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	100	200	600	1300				Aggravated
Methyl Alcohol	4	Propylene Oxide	34	Evaporation of residuals at 50 C	100	1700	100	1300				Mitigated
Methyl Alcohol	4	Sodium Metal	21	Release of hydrogen gas **	100	0	600	0				Aggravated
Methyl Alcohol	4	Toluene Diisocyanate	18	Evaporation of residuals at 100 C **	100	< 100	600	600				Aggravated
Methyl Chloride	17	Chlorine	104	Mitigation of chlorine release **	1000	8000	900	6900				Mitigated
Methyl Chloride	17	Ferric Chloride Solution	104	Evaporation of residuals at 50 C	1000	0	1000	0				Same
Methyl Chloride	17	Hydrogen Peroxide	104	Evaporation at 50 C; explosion **	1000	200	1000	400				Same
Methyl Chloride	17	Sodium Metal	21	Evaporation at 50 C; explosion	1000	0	1000	0				Same
Methyl Ethyl Ketone	19	Chlorine	104	Mitigation of chlorine release **	200	8000	300	7600				Mitigated
Methyl Ethyl Ketone	19	Ferric Chloride Solution	104	Evaporation of residuals at 50 C	200	0	300	0				Aggravated
Methyl Ethyl Ketone	19	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	200	200	900	1300				Aggravated
Methyl Ethyl Ketone	19	Sodium Metal	21	Releases H2 gas	200	0	900	0				Aggravated
Methyl Methacrylate	13	Chlorine	104	Mitigation of chlorine release **	100	8000	200	7600				Mitigated
Methyl Methacrylate	13	Ferric Chloride Solution	104	Evaporation of residuals at 50 C	100	0	200	0				Aggravated
Methyl Methacrylate	13	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	100	200	700	1300				Aggravated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Methyl Methacrylate	13	Sodium Metal	21	Evaporation of residuals at 100 C **	100	0	700	0				Aggravated
Motor Fuel Antiknock Comp	24	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	100	200	500	1300				Aggravated
Nitric Acid, Fuming	2	Acetaldehyde	5	Evaporation at 100 C; release of NO **	900	1100	2800	700	2000			Aggravated
Nitric Acid, Fuming	2	Acetic Acid, Glacial	3	Evaporation of residuals at 50 C	900	100	1600	300				Aggravated
Nitric Acid, Fuming	2	Acetic Anhydride	107	Evaporation of residuals at 100 C **	900	< 100	2800	200				Aggravated
Nitric Acid, Fuming	2	Acetone	19	Evaporation of residuals at 100 C **	900	100	2800	500				Aggravated
Nitric Acid, Fuming	2	Acrylic Acid	3	Evaporation of residuals at 50 C	900	800*	1600	1600*				Aggravated
Nitric Acid, Fuming	2	Acrylonitrile	26	Evaporation of residuals at 100 C **	900	200	2800	900				Aggravated
Nitric Acid, Fuming	2	Alcoholic Beverage	4	Evaporation of residuals at 100 C **	900	< 100	2800	< 100		< 100		Aggravated
Nitric Acid, Fuming	2	Alkaline Liquid	10	Evaporation of residuals at 100 C	900	0	2800	0				Aggravated
Nitric Acid, Fuming	2	Ammonium Nitrate Soln.	106	Heat of dissolution of HNO3	900	0	1600	0				Aggravated
Nitric Acid, Fuming	2	Anhydrous Ammonia	10	Mitigate release of NH3	900	4100	1600	3200				Mitigated
Nitric Acid, Fuming	2	Aniline Oil	7	Evaporation of residuals at 100 C **	900	100	2800	700				Aggravated
Nitric Acid, Fuming	2	Benzene	16	Evaporation of residuals at 100 C **	900	200	2800	1000				Aggravated
Nitric Acid, Fuming	2	Butadiene	28	Evaporation of residuals at 50 C **	900	800	1600	600				Aggravated
Nitric Acid, Fuming	2	Butyl Acrylate	13	Evaporation of residuals at 100 C	900	700*	2800	3000*				Aggravated
Nitric Acid, Fuming	2	Butyl Alcohol	4	Evaporation of residuals at 100 C **	900	< 100	2800	600				Aggravated
Nitric Acid, Fuming	2	Butyraldehyde	5	Evaporation at 100 C; release of NO **	900	< 100	2800	< 100	2400			Aggravated
Nitric Acid, Fuming	2	Carbon Disulfide	20	Evaporation of residuals at 50 C	900	900	1600	2000				Aggravated
Nitric Acid, Fuming	2	Carbon Tetrachloride	17	Unknown	900	600	?	?				Unknown
Nitric Acid, Fuming	2	Chloroprene	17	Evaporation of residuals at 100 C **	900	800	2800	1700				Aggravated
Nitric Acid, Fuming	2	Coal Tar Distillate	101	Evaporation of residuals at 50 C	900	< 100	1600	< 100				Aggravated
Nitric Acid, Fuming	2	Combustible Liquid	101	Evaporation of residuals at 50 C	900	?	1600	?				Aggravated
Nitric Acid, Fuming	2	Compound, Cleaning	101	Evaporation of residuals at 50 C	900	?	1600	?				Aggravated
Nitric Acid, Fuming	2	Crude Oil Petroleum	101	Evaporation of residuals at 50 C	900	< 100	1600	< 100				Aggravated
Nitric Acid, Fuming	2	Denatured Alcohol	4	Evaporation of residuals at 100 C **	900	< 100	2800	< 100				Aggravated
Nitric Acid, Fuming	2	Dinitrotoluene, Liquid	27	Evaporation of residuals at 50 C	900	0	1600	0				Aggravated
Nitric Acid, Fuming	2	Distillate Fuel Oil	101	Evaporation of residuals at 50 C	900	< 100	1600	< 100				Aggravated
Nitric Acid, Fuming	2	Ethyl Acetate	13	Evaporation of residuals at 50 C	900	100	1600	200				Aggravated
Nitric Acid, Fuming	2	Ethyl Acrylate	13	Evaporation of residuals at 100 C	900	100	2800	900				Aggravated
Nitric Acid, Fuming	2	Ethyl Alcohol	4	Evaporation of residuals at 100 C **	900	< 100	2800	< 100				Aggravated
Nitric Acid, Fuming	2	Ethylene Oxide	34	Evaporation of residuals at 100 C	900	2500	2800	1600				Aggravated
Nitric Acid, Fuming	2	Flammable Liquid	101	Evaporation of residuals at 50 C	900	?	1600	?	< 100			Aggravated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Nitric Acid, Fuming	2	Formaldehyde Solution	5	Releases formic acid and NO **	900	100	2800	500	2300	2000		Aggravated
Nitric Acid, Fuming	2	Fuel Oil	101	Evaporation of residuals at 50 C	900	< 100	1600	< 100				Aggravated
Nitric Acid, Fuming	2	Fuel, Aviation	101	Evaporation of residuals at 50 C	900	< 100	1600	< 100				Aggravated
Nitric Acid, Fuming	2	Gasoline	101	Evaporation of residuals at 50 C	900	< 100	1600	< 100				Aggravated
Nitric Acid, Fuming	2	Gasoline, nec	101	Evaporation of residuals at 50 C	900	< 100	1600	< 100				Aggravated
Nitric Acid, Fuming	2	Glycol Ethers	14	Evaporation of residuals at 100 C **	900	< 100	2800	400				Aggravated
Nitric Acid, Fuming	2	Hexamethylene Diamine Soln	7	Evaporation of residuals at 100 C **	900	< 100	2800	< 100				Aggravated
Nitric Acid, Fuming	2	Hydrogen Peroxide	104	Evaporation of residuals at 50 C **	900	200	1600	400				Aggravated
Nitric Acid, Fuming	2	Isopropanol	4	Evaporation of residuals at 100 C **	900	< 100	2800	500				Aggravated
Nitric Acid, Fuming	2	LPG	28	Evaporation of residuals at 50 C **	900	600	1600	700				Aggravated
Nitric Acid, Fuming	2	LPG (Butene)	28	Evaporation of residuals at 50 C **	900	800	1600	600				Aggravated
Nitric Acid, Fuming	2	LPG (Isobutylene)	28	Evaporation of residuals at 50 C **	900	?	1600	?				Aggravated
Nitric Acid, Fuming	2	LPG (Propylene)	28	Evaporation of residuals at 50 C **	900	?	1600	?				Aggravated
Nitric Acid, Fuming	2	Maleic Anhydride	107	Evaporation of residuals at 100 C **	900	900*	2800	3000*				Aggravated
Nitric Acid, Fuming	2	Methyl Alcohol	4	Evaporation of residuals at 100 C **	900	100	2800	600				Aggravated
Nitric Acid, Fuming	2	Methyl Chloride	17	Releases HCL, NO and CO gas **	900	1000	1600	1000	2200	2500	900	Aggravated
Nitric Acid, Fuming	2	Methyl Ethyl Ketone	19	Evaporation of residuals at 100 C **	900	200	2800	900				Aggravated
Nitric Acid, Fuming	2	Methyl Methacrylate	13	Evaporation of residuals at 100 C	900	100	2800	700				Aggravated
Nitric Acid, Fuming	2	Motor Fuel Antiknock Compo	24	Releases ethane gas **.	900	100	2800	500	< 100			Aggravated
Nitric Acid, Fuming	2	Octyl Alcohol	4	Evaporation of residuals at 50 C	900	< 100	1600	< 100				Aggravated
Nitric Acid, Fuming	2	Oil	101	Evaporation of residuals at 50 C	900	< 100	1600	< 100				Aggravated
Nitric Acid, Fuming	2	Oleum	2	Evaporation of residuals at 50 C	900	1600	1600	2400				Aggravated
Nitric Acid, Fuming	2	Petroleum Naphtha	101	Evaporation of residuals at 50 C	900	< 100	1600	< 100				Aggravated
Nitric Acid, Fuming	2	Petroleum Residual Fuel	101	Evaporation of residuals at 50 C	900	< 100	1600	< 100				Aggravated
Nitric Acid, Fuming	2	Petroleum, Refined	101	Evaporation of residuals at 50 C	900	< 100	1600	< 100				Aggravated
Nitric Acid, Fuming	2	Phenol	31	Evaporation of residuals at 100 C **	900	< 100	2800	700	8000*			Aggravated
Nitric Acid, Fuming	2	Phosphorus	105	Evaporation of residuals at 100 C **	900	0	2800	0				Aggravated
Nitric Acid, Fuming	2	Potassium Hydroxide, Liq	10	Evaporation of residuals at 100 C	900	0	2800	0				Aggravated
Nitric Acid, Fuming	2	Propylene Oxide	34	Evaporation of residuals at 100 C	900	1700	2800	1500				Aggravated
Nitric Acid, Fuming	2	Pulp Mill Liquid	101	Evaporation of residuals at 50 C	900	?	1600	?				Aggravated
Nitric Acid, Fuming	2	Sodium Hydroxide, Liq.	10	Evaporation of residuals at 100 C	900	0	2800	0				Aggravated
Nitric Acid, Fuming	2	Sodium Metal	21	Releases hydrogen gas **.	900	0	2800	0	< 100			Aggravated
Nitric Acid, Fuming	2	Styrene Monomer	16	Evaporation of residuals at 100 C **	900	< 100	2800	200				Aggravated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Nitric Acid, Fuming	2	Sulfur Dioxide	105	Releases NO and SO3 gases	900	4500	2800	4300	1800	3600		Mitigated
Nitric Acid, Fuming	2	Toluene	18	Evaporation of residuals at 100 C **	900	100	2800	900				Aggravated
Nitric Acid, Fuming	2	Toluene Diisocyanate	18	Releases NO2 gas **	900	< 100	2800	600	900			Aggravated
Nitric Acid, Fuming	2	Vinyl Acetate	13	Evaporation of residuals at 50 C	900	4100*	1600	5700*				Aggravated
Nitric Acid, Fuming	2	Vinyl Chloride	17	Evaporation of residuals at 50 C **	900	19100*	1600	13500*	< 100			Aggravated
Nitric Acid, Fuming	2	Xylene	18	Evaporation of residuals at 100 C **	900	< 100	2800	100				Aggravated
Octyl Alcohol	4	Acetaldehyde	5	Evaporation of residuals at 100 C	< 100	1100	< 100	700	?			Mitigated
Octyl Alcohol	4	Butyraldehyde	5	Evaporation of residuals at 100 C	< 100	< 100	< 100	< 100				Same
Octyl Alcohol	4	Chlorine	104	Evaporation at 50 C; explosion **	< 100	8000	< 100	7600				Mitigated
Octyl Alcohol	4	Ethylene Oxide	34	Evaporation of residuals at 50 C	< 100	2500	< 100	2000				Mitigated
Octyl Alcohol	4	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	< 100	200	< 100	1300				Aggravated
Octyl Alcohol	4	Propylene Oxide	34	Evaporation of residuals at 50 C	< 100	1700	< 100	1300				Mitigated
Octyl Alcohol	4	Sodium Metal	21	Release of hydrogen gas **	< 100	0	< 100	0	< 100			Same
Octyl Alcohol	4	Toluene Diisocyanate	18	Evaporation of residuals at 100 C	< 100	< 100	< 100	600				Aggravated
Oil	101	Chlorine	104	Evaporation of residuals at 50 C **	< 100	8000	100	7600				Mitigated
Oil	101	Hydrogen Peroxide	104	Evaporation at 50 C; explosion **	< 100	200	100	400				Aggravated
Oleum	2	Acetaldehyde	5	Evaporation at 100 C, SO2 gas **	1600	1100	3200	700	2600			Aggravated
Oleum	2	Acetic Acid, Glacial	3	Evaporation at 100 C, SO2 gas **	1600	100	3200	1300	2600			Aggravated
Oleum	2	Acetic Anhydride	107	Evaporation at 100 C, SO2 gas **	1600	< 100	3200	400	2600			Aggravated
Oleum	2	Acetone	19	Evaporation at 100 C, SO2 gas **	1600	100	3200	500	2600			Aggravated
Oleum	2	Acrylic Acid	3	Evaporation at 100 C, SO2 gas **	1600	800*	3200	6300*	2600			Aggravated
Oleum	2	Acrylonitrile	26	Releases NO2, SO2 and CO gas **	1600	200	3200	900	800	1500	500	Aggravated
Oleum	2	Alcoholic Beverage	4	Releases acetaldehyde and SO2 gas **	1600	< 100	3200	< 100	900	2600		Aggravated
Oleum	2	Alkaline Liquid	10	Release residual SO3	1600	0	3200	0				Aggravated
Oleum	2	Ammonium Nitrate Soln.	106	Explosion	1600	0	3200	0				Aggravated
Oleum	2	Anhydrous Ammonia	10	Releases SO2 gas	1600	4100	3200	3700	2600			Mitigated
Oleum	2	Aniline Oil	7	Releases NOx, SO2 and CO gases **	1600	100	3200	700	700	1500	500	Aggravated
Oleum	2	Benzene	18	Evaporation at 100 C, SO2 gas **	1600	200	3200	1000	2600			Aggravated
Oleum	2	Butadiene	28	Releases SO2 gas **	1600	800	2400	800	2600			Aggravated
Oleum	2	Butyl Acrylate	13	Evaporation at 100 C, SO2 gas **	1600	700*	3200	3000*	2600			Aggravated
Oleum	2	Butyl Alcohol	4	Releases butyraldehyde and SO2 gas **	1600	< 100	3200	600	< 100	2600		Aggravated
Oleum	2	Butyraldehyde	5	Evaporation at 100 C, SO2 gas **	1600	< 100	3200	< 100	2600			Aggravated
Oleum	2	Carbon Tetrachloride	17	Releases COCL2 and HCL gas	1600	600	3200	1500	2700	1000		Aggravated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Oleum	2	Chloroprene	17	Releases HCL, SO2 and CO gas **	1600	800	2400	2600	900	1500	500	Aggravated
Oleum	2	Coal Tar Distillate	101	Evaporation of residuals at 50 C	1600	< 100	2400	< 100				Aggravated
Oleum	2	Combustible Liquid	101	Evaporation of residuals at 50 C	1600	< 100	2400	?				Aggravated
Oleum	2	Compound, Cleaning	101	Evaporation of residuals at 50 C	1600	< 100	2400	?				Aggravated
Oleum	2	Crude Oil Petroleum	101	Evaporation of residuals at 50 C	1600	< 100	2400	< 100				Aggravated
Oleum	2	Denatured Alcohol	4	Releases acetaldehyde and SO2 gas **	1600	< 100	3200	< 100	900	2600		Aggravated
Oleum	2	Dinitrotoluene, Liquid	27	Evaporation at 100 C; explosion **	1600	0	3200	< 100				Aggravated
Oleum	2	Distillate Fuel Oil	101	Evaporation of residuals at 50 C	1600	< 100	2400	< 100				Aggravated
Oleum	2	Ethyl Acetate	13	Evaporation at 100 C, SO2 gas **	1600	100	3200	500	2600			Aggravated
Oleum	2	Ethyl Acrylate	13	Evaporation at 100 C, SO2 gas **	1600	100	3200	900	2600			Aggravated
Oleum	2	Ethyl Alcohol	4	Releases acetaldehyde and SO2 gas **	1600	< 100	3200	< 100	900	2600		Aggravated
Oleum	2	Ethylene Oxide	34	Evaporation at 100 C, SO2 gas **	1600	2500	3200	2200	2600			Aggravated
Oleum	2	Flammable Liquid	101	Evaporation of residuals at 50 C	1600	< 100	2400	?				Aggravated
Oleum	2	Formaldehyde Solution	5	Evaporation at 100 C, SO2 gas	1600	100	2400	500	2600			Aggravated
Oleum	2	Fuel Oil	101	Evaporation of residuals at 50 C	1600	< 100	2400	< 100				Aggravated
Oleum	2	Fuel, Aviation	101	Evaporation of residuals at 50 C	1600	< 100	2400	< 100				Aggravated
Oleum	2	Gasoline	101	Evaporation of residuals at 50 C	1600	< 100	2400	< 100				Aggravated
Oleum	2	Gasoline, nec	101	Evaporation of residuals at 50 C	1600	< 100	2400	< 100				Aggravated
Oleum	2	Glycol Ethers	14	Evaporation at 100 C, SO2 gas **	1600	< 100	3200	400	2600			Aggravated
Oleum	2	Hexamethylene Diamine Soln	7	Evaporation at 100 C, SO2 gas	1600	< 100	2400	< 100	2600			Aggravated
Oleum	2	Hydrogen Peroxide	104	Evaporation at 100 C; Explosion	1600	200	3200	1300				Aggravated
Oleum	2	Isopropanol	4	Evaporation at 100 C, SO2 gas **	1600	< 100	3200	500	2600			Aggravated
Oleum	2	LPG	28	Releases SO2 gas **	1600	600	2400	700	2600			Aggravated
Oleum	2	LPG (Butene)	28	Releases SO2 gas **	1600	800	2400	500	2600			Aggravated
Oleum	2	LPG (Isobutylene)	28	Releases SO2 gas **	1600	< 100	2400	< 100	2600			Aggravated
Oleum	2	LPG (Propylene)	28	Releases SO2 gas **	1600	< 100	2400	< 100	2600			Aggravated
Oleum	2	Maleic Anhydride	107	Evaporation at 100 C, SO2 gas	1600	900*	3200	20700*	2600			Aggravated
Oleum	2	Methyl Alcohol	4	Releases formaldehyde and SO2 gas **	1600	< 100	3200	600	2600	2600		Aggravated
Oleum	2	Methyl Chloride	17	Releases HCL, SO2 and CO gas **	1600	1000	2400	1000	1200	1500	500	Aggravated
Oleum	2	Methyl Ethyl Ketone	19	Evaporation at 100 C, SO2 gas **	1600	200	3200	900	2600			Aggravated
Oleum	2	Methyl Methacrylate	13	Evaporation at 100 C, SO2 gas **	1600	100	3200	700	2600			Aggravated
Oleum	2	Motor Fuel Antiknock Compo	24	Releases SO2 and ethane gas	1600	100	3200	100	2600	< 100		Aggravated
Oleum	2	Octyl Alcohol	4	Evaporation at 100 C, SO2 gas **	1600	< 100	3200	< 100	2600			Aggravated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	Distances for Gas Releases IDLH Gas 2	Distances for Gas Releases IDLH Gas 3	Conclusions
Oleum	2	Oil	101	Evaporation of residuals at 50 C	1600	< 100	2400	< 100				Aggravated
Oleum	2	Petroleum Naphtha	101	Evaporation of residuals at 50 C	1600	< 100	2400	< 100				Aggravated
Oleum	2	Petroleum Residual Fuel	101	Evaporation of residuals at 50 C	1600	< 100	2400	< 100				Aggravated
Oleum	2	Petroleum, Refined	101	Evaporation of residuals at 50 C	1600	< 100	2400	< 100				Aggravated
Oleum	2	Phenol	31	Evaporation at 100 C, SO2 gas	1600	< 100	3200	700	2600			Aggravated
Oleum	2	Phosphorus	105	Releases H3PO4 mist and SO2 gas **	1600	0	3200	0	11700*	1500		Aggravated
Oleum	2	Potassium Hydroxide, Liq	10	Release residual SO3	1600	0	3200	0				Aggravated
Oleum	2	Propylene Oxide	34	Evaporation at 100 C, SO2 gas **	1600	1700	3200	1500	2600			Aggravated
Oleum	2	Pulp Mill Liquid	101	Evaporation of residuals at 50 C	1600	< 100	2400	?				Aggravated
Oleum	2	Sodium Hydroxide, Liq.	10	Release residual SO3	1600	0	3200	0				Aggravated
Oleum	2	Sodium Metal	21	Releases SO2 and hydrogen gas **	1600	0	2400	0	2600	< 100		Aggravated
Oleum	2	Styrene Monomer	16	Evaporation at 100 C, SO2 gas **	1600	< 100	3200	200	2600			Aggravated
Oleum	2	Toluene	16	Evaporation at 100 C, SO2 gas **	1600	100	3200	900	2600			Aggravated
Oleum	2	Toluene Diisocyanate	18	Releases SO2, CO and NO2 gas	1600	< 100	3200	600	1500	500	800	Aggravated
Oleum	2	Vinyl Acetate	13	Evaporation at 100 C, SO2 gas **	1600	4100*	3200	5700*	2600			Aggravated
Oleum	2	Vinyl Chloride	17	Releases HCL, SO2 and CO gas **	1600	19100*	2400	19000*	1100	1500	500	Aggravated
Oleum	2	Xylene	16	Evaporation at 100 C, SO2 gas **	1600	< 100	3200	100	2600			Aggravated
Petroleum Naphtha	101	Chlorine	104	Evaporation of residuals at 50 C **	< 100	8000	100	7600				Mitigated
Petroleum Naphtha	101	Hydrogen Peroxide	104	Evaporation at 50 C; explosion **	< 100	200	100	400				Aggravated
Petroleum Residual Fuel	101	Chlorine	104	Evaporation of residuals at 50 C **	< 100	8000	100	7600				Mitigated
Petroleum Residual Fuel	101	Hydrogen Peroxide	104	Evaporation at 50 C; explosion **	< 100	200	100	400				Aggravated
Petroleum, Refined	101	Chlorine	104	Evaporation of residuals at 50 C **	< 100	8000	100	7600				Mitigated
Petroleum, Refined	101	Hydrogen Peroxide	104	Evaporation at 50 C; explosion **	< 100	200	100	400				Aggravated
Phenol	31	Chlorine	104	Evaporation of residuals at 50 C **	< 100	8000	200	7600				Mitigated
Phenol	31	Ethylene Oxide	34	Evaporation of residuals at 100 C **	< 100	2500	700	1600				Mitigated
Phenol	31	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	< 100	200	700	1300				Aggravated
Phenol	31	Phosphorus	105	Evaporation of residuals at 50 C	< 100	0	200	0				Aggravated
Phenol	31	Propylene Oxide	34	Evaporation of residuals at 100 C **	< 100	1700	700	1100				Mitigated
Phosphoric Acid	1	Acetaldehyde	5	Evaporation of residuals at 100 C	0	1100	0	700				Mitigated
Phosphoric Acid	1	Acetic Acid, Glacial	3	Evaporation of residuals at 50 C	0	100	0	300				Aggravated
Phosphoric Acid	1	Acetic Anhydride	107	Evaporation of residuals at 100 C **	0	< 100	0	400				Aggravated
Phosphoric Acid	1	Acetone	19	Evaporation of residuals at 50 C	0	100	0	600				Aggravated
Phosphoric Acid	1	Acrylic Acid	3	Evaporation of residuals at 50 C	0	800*	0	1600*				Aggravated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Phosphoric Acid	1	Acrylonitrile	26	Evaporation of residuals at 100 C	0	200	0	900				Aggravated
Phosphoric Acid	1	Alcoholic Beverage	4	Local consequences	0	< 100	0	< 100				Same
Phosphoric Acid	1	Alkaline Liquid	10	Local consequences	0	0	0	0				Same
Phosphoric Acid	1	Ammonium Nitrate Soln.	106	Same as individual chemicals	0	0	0	0				Same
Phosphoric Acid	1	Anhydrous Ammonia	10	Mitigate NH3 release	0	4100	0	3700				Mitigated
Phosphoric Acid	1	Aniline Oil	7	Evaporation of residuals at 50 C	0	100	0	200				Aggravated
Phosphoric Acid	1	Butadiene	28	Evaporation of residual H3PO4 at 50 C	0	800	0	800				Same
Phosphoric Acid	1	Butyl Acrylate	13	Local consequences	0	700*	0	700*				Same
Phosphoric Acid	1	Butyl Alcohol	4	Local consequences	0	< 100	0	< 100				Same
Phosphoric Acid	1	Butyraldehyde	5	Evaporation of residuals at 50 C	0	< 100	0	< 100				Same
Phosphoric Acid	1	Chlorine	104	Same as individual chemicals	0	8000	0	8000				Same
Phosphoric Acid	1	Chloroprene	17	Evaporation of residuals at 100 C	0	800	0	1700				Aggravated
Phosphoric Acid	1	Coal Tar Distillate	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Phosphoric Acid	1	Combustible Liquid	101	Evaporation of residuals at 50 C	0	?	< 100	?				Same
Phosphoric Acid	1	Compound, Cleaning	101	Evaporation of residuals at 50 C	0	?	< 100	?				Same
Phosphoric Acid	1	Crude Oil Petroleum	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Phosphoric Acid	1	Denatured Alcohol	4	Local consequences	0	< 100	0	< 100				Same
Phosphoric Acid	1	Distillate Fuel Oil	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Phosphoric Acid	1	Ethyl Acetate	13	Local consequences	0	100	0	100				Same
Phosphoric Acid	1	Ethyl Acrylate	13	Local consequences	0	100	0	100				Same
Phosphoric Acid	1	Ethyl Alcohol	4	Local consequences	0	< 100	0	< 100				Same
Phosphoric Acid	1	Ethylene Oxide	34	Mitigate ethylene oxide release	0	2500	0	2300				Mitigated
Phosphoric Acid	1	Flammable Liquid	101	Evaporation of residuals at 50 C	0	?	< 100	?				Same
Phosphoric Acid	1	Formaldehyde Solution	5	Evaporation of residuals at 50 C	0	100	0	200				Aggravated
Phosphoric Acid	1	Fuel Oil	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Phosphoric Acid	1	Fuel, Aviation	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Phosphoric Acid	1	Gasoline	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Phosphoric Acid	1	Gasoline, nec	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Phosphoric Acid	1	Glycol Ethers	14	Local consequences	0	< 100	0	< 100				Same
Phosphoric Acid	1	Hexamethylene Diamine Soln	7	Evaporation of residuals at 50 C	0	< 100	0	< 100				Same
Phosphoric Acid	1	Hydrogen Peroxide	104	Evaporation of residuals at 50 C	0	200	0	400				Aggravated
Phosphoric Acid	1	Isopropanol	4	Local consequences	0	< 100	0	< 100				Same
Phosphoric Acid	1	Maleic Anhydride	107	Evaporation of residuals at 100 C	0	900*	0	20700*				Aggravated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Phosphoric Acid	1	Methyl Alcohol	4	Local consequences	0	100	0	100				Same
Phosphoric Acid	1	Methyl Ethyl Ketone	19	Evaporation of residuals at 50 C	0	200	0	300				Aggravated
Phosphoric Acid	1	Methyl Methacrylate	13	Local consequences	0	100	0	100				Same
Phosphoric Acid	1	Motor Fuel Antiknock Compo	24	Releases ethane gas **	0	100	0	100	< 100			Same
Phosphoric Acid	1	Octyl Alcohol	4	Local consequences	0	< 100	0	< 100				Same
Phosphoric Acid	1	Oil	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Phosphoric Acid	1	Petroleum Naphtha	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Phosphoric Acid	1	Petroleum Residual Fuel	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Phosphoric Acid	1	Petroleum, Refined	101	Evaporation of residuals at 50 C	0	< 100	< 100	< 100				Same
Phosphoric Acid	1	Phenol	31	Same as individual chemicals	0	< 100	0	< 100				Same
Phosphoric Acid	1	Potassium Hydroxide, Liq	10	Local consequences	0	0	0	0				Same
Phosphoric Acid	1	Propylene Oxide	34	Mitigate propylene oxide release	0	1700	0	1500				Mitigated
Phosphoric Acid	1	Pulp Mill Liquid	101	Evaporation of residuals at 50 C	0	< 100	< 100	?				Same
Phosphoric Acid	1	Sodium Hydroxide, Liq.	10	Local consequences	0	0	0	0				Same
Phosphoric Acid	1	Sodium Metal	21	Releases H2 gas **	0	0	0	0	< 100			Aggravated
Phosphoric Acid	1	Styrene Monomer	16	Evaporation of residuals at 100 C	0	< 100	0	200				Aggravated
Phosphoric Acid	1	Toluene Diisocyanate	18	Evaporation of residuals at 100 C	0	< 100	0	600				Aggravated
Phosphoric Acid	1	Vinyl Acetate	13	Local consequences	0	4100*	0	4100*				Same
Phosphoric Acid	1	Vinyl Chloride	17	Mitigate release of vinyl chloride	0	19100*	0	18100*				Mitigated
Phosphorus	105	Acetic Anhydride	107	Unknown	0	< 100	?	?				Unknown
Phosphorus	105	Ammonium Nitrate Soln.	106	Explosion	0	0	0	0				Same
Phosphorus	105	Maleic Anhydride	107	Evaporation of residuals at 100 C	0	900*	0	20700*				Aggravated
Potassium Hydroxide, Liq	10	Acetic Anhydride	107	Evaporation of residuals at 100 C	0	< 100	0	400				Aggravated
Potassium Hydroxide, Liq	10	Acetone	19	Evaporation of residuals at 50 C	0	100	0	600				Aggravated
Potassium Hydroxide, Liq	10	Acrylonitrile	26	Evaporation of residuals at 100 C	0	200	0	900				Aggravated
Potassium Hydroxide, Liq	10	Ammonium Nitrate Soln.	106	Local consequences	0	0	0	0				Same
Potassium Hydroxide, Liq	10	Carbon Tetrachloride	17	Releases HCL and phosgene	0	600	0	1500	900	2100		Aggravated
Potassium Hydroxide, Liq	10	Chloroprene	17	Evaporation of residuals at 100 C	0	800	0	1700				Aggravated
Potassium Hydroxide, Liq	10	Dinitrotoluene, Liquid	27	Evaporation at 100 C; Explosion	0	< 100	0	< 100	< 100			Same
Potassium Hydroxide, Liq	10	Ethyl Acetate	13	Releases acetic acid and ethanol	0	100	0	500	300	< 100		Aggravated
Potassium Hydroxide, Liq	10	Ethylene Oxide	34	Evaporation of residuals at 100 C **	0	2500	0	1600				Mitigated
Potassium Hydroxide, Liq	10	Maleic Anhydride	107	Evaporation of residuals at 100 C	0	900*	0	20700*				Aggravated
Potassium Hydroxide, Liq	10	Methyl Chloride	17	Mitigate CH3CL; release methanol	0	1000	0	1000	100			Same

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Potassium Hydroxide, Liq	10	Methyl Ethyl Ketone	19	Evaporation of residuals at 50 C	0	200	0	300				Aggravated
Potassium Hydroxide, Liq	10	Phosphorus	105	Releases PH3 gas	0	0	0	0	800			Aggravated
Potassium Hydroxide, Liq	10	Propylene Oxide	34	Evaporation of residuals at 100 C **	0	1700	0	1100				Mitigated
Potassium Hydroxide, Liq	10	Sodium Metal	21	Releases H2 gas	0	0	0	0	< 100			Same
Potassium Hydroxide, Liq	10	Styrene Monomer	16	Evaporation of residuals at 100 C	0	< 100	0	200				Aggravated
Potassium Hydroxide, Liq	10	Sulfur Dioxide	105	Mitigate release of SO2	0	4500	0	4100				Mitigated
Potassium Hydroxide, Liq	10	Toluene Diisocyanate	18	Evaporation of residuals at 100 C	0	< 100	0	600				Aggravated
Potassium Hydroxide, Liq	10	Vinyl Acetate	13	Releases acetic acid and acetaldehyde	0	4100*	0	5700*	300	900		Aggravated
Potassium Hydroxide, Liq	10	Vinyl Chloride	17	Release acetylene gas	0	19100*	0	18100*				Mitigated
Propylene Oxide	34	Chlorine	104	Evaporation of residuals at 50 C **	1700	8000	1300	7600				Mitigated
Propylene Oxide	34	Ferric Chloride Solution	104	Evaporation of residuals at 50 C	1700	0	1300	0				Mitigated
Propylene Oxide	34	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	1700	200	1100	1300				Mitigated
Propylene Oxide	34	Phosphorus	105	Evaporation of residuals at 100 C	1700	0	1100	0				Mitigated
Pulp Mill Liquid	101	Chlorine	104	Evaporation of residuals at 50 C **	< 100	8000	?	7600				Mitigated
Pulp Mill Liquid	101	Hydrogen Peroxide	104	Evaporation at 50 C; explosion **	< 100	200	?	400				Aggravated
Sodium Hydroxide, Liq.	10	Acetic Anhydride	107	Evaporation of residuals at 100 C	0	< 100	0	400				Aggravated
Sodium Hydroxide, Liq.	10	Acetone	19	Evaporation of residuals at 50 C	0	100	0	600				Aggravated
Sodium Hydroxide, Liq.	10	Acrylonitrile	26	Evaporation of residuals at 100 C	0	200	0	900				Aggravated
Sodium Hydroxide, Liq.	10	Ammonium Nitrate Soln.	106	Local consequences	0	0	0	0				Same
Sodium Hydroxide, Liq.	10	Carbon Tetrachloride	17	Releases HCL and phosgene	0	600	0	1500	900	2100		Aggravated
Sodium Hydroxide, Liq.	10	Chloroprene	17	Evaporation of residuals at 100 C	0	800	0	1700				Aggravated
Sodium Hydroxide, Liq.	10	Dinitrotoluene, Liquid	27	Evaporation at 100 C; Explosion	0	< 100	0	< 100				Same
Sodium Hydroxide, Liq.	10	Ethyl Acetate	13	Releases acetic acid and ethanol	0	100	0	500	300	< 100		Aggravated
Sodium Hydroxide, Liq.	10	Ethylene Oxide	34	Evaporation of residuals at 100 C **	0	2500	0	1600				Mitigated
Sodium Hydroxide, Liq.	10	Maleic Anhydride	107	Evaporation of residuals at 100 C	0	900*	0	20700*				Aggravated
Sodium Hydroxide, Liq.	10	Methyl Chloride	17	Mitigate CH3CL; release methanol	0	1000	0	1000	100			Same
Sodium Hydroxide, Liq.	10	Methyl Ethyl Ketone	19	Evaporation of residuals at 50 C	0	200	0	300				Aggravated
Sodium Hydroxide, Liq.	10	Phosphorus	105	Releases PH3 gas	0	0	0	0	800			Aggravated
Sodium Hydroxide, Liq.	10	Propylene Oxide	34	Evaporation of residuals at 100 C **	0	1700	0	1100				Mitigated
Sodium Hydroxide, Liq.	10	Styrene Monomer	16	Evaporation of residuals at 100 C	0	< 100	0	200				Aggravated
Sodium Hydroxide, Liq.	10	Sulfur Dioxide	105	Mitigate release of SO2	0	4500	0	4100				Mitigated
Sodium Hydroxide, Liq.	10	Toluene Diisocyanate	18	Evaporation of residuals at 100 C	0	< 100	0	600				Aggravated
Sodium Hydroxide, Liq.	10	Vinyl Acetate	13	Releases acetic acid and acetaldehyde	0	4100*	0	5700*	300	900		Aggravated

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	IDLH Gas 2	IDLH Gas 3	Conclusions
Sodium Hydroxide, Liq.	10	Vinyl Chloride	17	Release acetylene gas	0	19100*	0	18100*	< 100			Mitigated
Sodium Metal	21	Acetic Anhydride	107	Evaporation of residuals at 100 C	0	< 100	0	400				Aggravated
Sodium Metal	21	Acrylonitrile	26	Evaporation of residuals at 100 C **	0	200	0	900				Aggravated
Sodium Metal	21	Ammonium Nitrate Soln.	106	Releases hydrogen gas; explosion **	0	0	0	0	< 100			Same
Sodium Metal	21	Butadiene	28	Mitigate release of butadiene	0	800	0	800				Same
Sodium Metal	21	Chlorine	104	Fire	0	8000	0	8000				Same
Sodium Metal	21	Dinitrotoluene, Liquid	27	Evaporation at 100 C; Explosion	0	< 100	0	< 100				Same
Sodium Metal	21	Ethylene Oxide	34	Mitigate release of ethylene oxide	0	2500	0	1600				Mitigated
Sodium Metal	21	Ferric Chloride Solution	104	Releases hydrogen gas **	0	0	0	0	< 100			Same
Sodium Metal	21	Hydrogen Peroxide	104	Releases hydrogen gas **	0	200	0	1300	< 100			Aggravated
Sodium Metal	21	Maleic Anhydride	107	Evaporation of residuals at 100 C	0	900*	0	20700*				Aggravated
Sodium Metal	21	Phosphorus	105	Fire; releases P205 mist	0	0	0	0	?			Same
Sodium Metal	21	Propylene Oxide	34	Mitigate release of propylene oxide	0	1700	0	1100				Mitigated
Sodium Metal	21	Pulp Mill Liquid	101	Releases hydrogen gas	0	< 100	0	?	< 100			Same
Sodium Metal	21	Sulfur Dioxide	105	Fire	0	4500	0	4500				Same
Styrene Monomer	16	Chlorine	104	Mitigation of chlorine release **	< 100	8000	< 100	7600				Mitigated
Styrene Monomer	16	Ferric Chloride Solution	104	Evaporation of residuals at 50 C	< 100	0	< 100	0				Same
Styrene Monomer	16	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	< 100	200	200	1300				Aggravated
Styrene Monomer	16	Sodium Metal	21	Evaporation of residuals at 50 C	< 100	0	< 100	0				Same
Sulfur Dioxide	105	Acetic Anhydride	107	Unknown	4500	< 100	?	?				Unknown
Sulfuric Acid	2	Acetaldehyde	5	Evaporation of residuals at 100 C **	0	1100	0	700				Mitigated
Sulfuric Acid	2	Acetic Acid, Glacial	3	Evaporation of residuals at 100 C **	0	100	0	1300				Aggravated
Sulfuric Acid	2	Acetic Anhydride	107	Evaporation of residuals at 100 C **	0	< 100	0	400				Aggravated
Sulfuric Acid	2	Acetone	19	Evaporation of residuals at 100 C	0	100	0	500				Aggravated
Sulfuric Acid	2	Acrylic Acid	3	Evaporation of residuals at 100 C	0	800*	0	6300*				Aggravated
Sulfuric Acid	2	Acrylonitrile	26	Releases NO2, SO2 and CO gas **	0	200	0	900	600	1100	400	Aggravated
Sulfuric Acid	2	Alcoholic Beverage	4	Releases diethyl ether **	0	< 100	0	< 100	< 100			Same
Sulfuric Acid	2	Alkaline Liquid	10	Local consequences	0	0	0	0				Same
Sulfuric Acid	2	Ammonium Nitrate Soln.	106	Explosion	0	0	0	0				Same
Sulfuric Acid	2	Anhydrous Ammonia	10	Mitigate release of NH3	0	4100	0	3700				Mitigated
Sulfuric Acid	2	Aniline Oil	7	Releases NOx, SO2 and CO gases **	0	100	0	700	500	1100	400	Aggravated
Sulfuric Acid	2	Benzene	16	Evaporation of residuals at 100 C **	0	200	0	1000				Aggravated
Sulfuric Acid	2	Butadiene	28	Mitigate release of butadiene **	0	800	0	800				Same

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	Distances for Gas Releases IDLH Gas 2	Distances for Gas Releases IDLH Gas 3	Conclusions
Sulfuric Acid	2	Butyl Acrylate	13	Evaporation of residuals at 100 C **	0	700*	0	3000*				Aggravated
Sulfuric Acid	2	Butyl Alcohol	4	Releases dibutyl ether **	0	< 100	0	600	< 100			Aggravated
Sulfuric Acid	2	Butyraldehyde	5	Evaporation of residuals at 100 C **	0	< 100	0	< 100				Same
Sulfuric Acid	2	Carbon Tetrachloride	17	Releases COCL2 and HCL gas	0	600	0	1500	2700	1000		Aggravated
Sulfuric Acid	2	Chloroprene	17	Releases HCL, SO2 and CO gas **	0	800	0	2600	700	1100	400	Aggravated
Sulfuric Acid	2	Coal Tar Distillate	101	Same as individual chemicals	0	< 100	0	< 100				Same
Sulfuric Acid	2	Combustible Liquid	101	Same as individual chemicals	0	< 100	0	?				Same
Sulfuric Acid	2	Compound, Cleaning	101	Same as individual chemicals	0	< 100	0	?				Same
Sulfuric Acid	2	Crude Oil Petroleum	101	Same as individual chemicals	0	< 100	0	< 100				Same
Sulfuric Acid	2	Denatured Alcohol	4	Releases diethyl ether **	0	< 100	0	< 100	< 100			Same
Sulfuric Acid	2	Dinitrotoluene, Liquid	27	Evaporation at 100 C; explosion **	0	0	0	< 100				Same
Sulfuric Acid	2	Distillate Fuel Oil	101	Same as individual chemicals	0	< 100	0	< 100				Same
Sulfuric Acid	2	Ethyl Acetate	13	Evaporation of residuals at 50 C	0	100	0	200				Aggravated
Sulfuric Acid	2	Ethyl Acrylate	13	Evaporation of residuals at 100 C	0	100	0	900				Aggravated
Sulfuric Acid	2	Ethyl Alcohol	4	Releases diethyl ether **	0	< 100	0	< 100	< 100			Same
Sulfuric Acid	2	Ethylene Oxide	34	Evaporation of residuals at 100 C **	0	2500	0	2200				Mitigated
Sulfuric Acid	2	Flammable Liquid	101	Same as individual chemicals	0	< 100	0	?				Same
Sulfuric Acid	2	Formaldehyde Solution	5	Evaporation of residuals at 100 C	0	100	0	500				Aggravated
Sulfuric Acid	2	Fuel Oil	101	Same as individual chemicals	0	< 100	0	< 100				Same
Sulfuric Acid	2	Fuel, Aviation	101	Same as individual chemicals	0	< 100	0	< 100				Same
Sulfuric Acid	2	Gasoline	101	Same as individual chemicals	0	< 100	0	< 100				Same
Sulfuric Acid	2	Gasoline, nec	101	Same as individual chemicals	0	< 100	0	< 100				Same
Sulfuric Acid	2	Glycol Ethers	14	Evaporation of residuals at 100 C **	0	< 100	0	400	< 100			Aggravated
Sulfuric Acid	2	Hexamethylene Diamine Soln	7	Evaporation of residuals at 100 C	0	< 100	0	< 100				Same
Sulfuric Acid	2	Hydrogen Peroxide	104	Evaporation at 100 C; Explosion	0	200	0	1300				Aggravated
Sulfuric Acid	2	Isopropanol	4	Evaporation of residuals at 100 C **	0	< 100	0	500				Aggravated
Sulfuric Acid	2	Maleic Anhydride	107	Evaporation of residuals at 100 C	0	900*	0	20700*				Aggravated
Sulfuric Acid	2	Methyl Alcohol	4	Releases dimethyl ether **	0	< 100	0	600	< 100			Aggravated
Sulfuric Acid	2	Methyl Chloride	17	Releases HCL, SO2 and CO gas **	0	1000	0	1000	900	1100	400	Aggravated
Sulfuric Acid	2	Methyl Ethyl Ketone	19	Evaporation of residuals at 100 C	0	200	0	900				Aggravated
Sulfuric Acid	2	Methyl Methacrylate	13	Evaporation of residuals at 100 C **	0	100	0	700				Aggravated
Sulfuric Acid	2	Motor Fuel Antiknock Compo	24	Releases ethane gas	0	100	0	100	< 100			Same
Sulfuric Acid	2	Octyl Alcohol	4	Evaporation of residuals at 100 C **	0	< 100	0	< 100	< 100			Same

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	Distances for Gas Releases IDLH Gas 2	Distances for Gas Releases IDLH Gas 3	Conclusions
Sulfuric Acid	2	Oil	101	Same as individual chemicals	0	< 100	0	< 100				Same
Sulfuric Acid	2	Petroleum Naphtha	101	Same as individual chemicals	0	< 100	0	< 100				Same
Sulfuric Acid	2	Petroleum Residual Fuel	101	Same as individual chemicals	0	< 100	0	< 100				Same
Sulfuric Acid	2	Petroleum, Refined	101	Same as individual chemicals	0	< 100	0	< 100				Same
Sulfuric Acid	2	Phenol	31	Evaporation of residuals at 100 C	0	< 100	0	700				Aggravated
Sulfuric Acid	2	Phosphorus	105	Releases H3PO4 mist **	0	0	0	0				Aggravated
Sulfuric Acid	2	Potassium Hydroxide, Liq	10	Local consequences	0	0	0	0				Same
Sulfuric Acid	2	Propylene Oxide	34	Evaporation of residuals at 100 C **	0	1700	0	1500				Mitigated
Sulfuric Acid	2	Pulp Mill Liquid	101	Same as individual chemicals	0	< 100	0	?				Same
Sulfuric Acid	2	Sodium Hydroxide, Liq.	10	Local consequences	0	0	0	0				Same
Sulfuric Acid	2	Sodium Metal	21	Releases SO2 and hydrogen gas **	0	0	0	0	1500	< 100		Aggravated
Sulfuric Acid	2	Styrene Monomer	16	Evaporation of residuals at 100 C **	0	< 100	0	200				Aggravated
Sulfuric Acid	2	Toluene	16	Evaporation of residuals at 100 C **	0	100	0	900	< 100			Aggravated
Sulfuric Acid	2	Toluene Diisocyanate	18	Evaporation of residuals at 50 C	0	< 100	0	600				Aggravated
Sulfuric Acid	2	Vinyl Acetate	13	Evaporation of residuals at 100 C **	0	4100*	0	5700*				Aggravated
Sulfuric Acid	2	Vinyl Chloride	17	Releases HCL, SO2 and CO gas **	0	19100*	0	19000*	800	1100	400	Aggravated
Sulfuric Acid	2	Xylene	16	Evaporation of residuals at 100 C **	0	< 100	0	100				Aggravated
Sulfuric Acid, Spent	2	Acetaldehyde	5	Evaporation of residuals at 100 C	0	1100	0	700				Mitigated
Sulfuric Acid, Spent	2	Acetic Acid, Glacial	3	Evaporation of residuals at 100 C	0	0	0	1300				Aggravated
Sulfuric Acid, Spent	2	Acetic Anhydride	107	Evaporation of residuals at 100 C	0	< 100	0	400				Aggravated
Sulfuric Acid, Spent	2	Acetone	19	Evaporation of residuals at 50 C	0	100	0	600				Aggravated
Sulfuric Acid, Spent	2	Acrylic Acid	3	Evaporation of residuals at 100 C	0	800*	0	6300*				Aggravated
Sulfuric Acid, Spent	2	Acrylonitrile	26	Releases NO2 gas **	0	200	0	900	1000			Aggravated
Sulfuric Acid, Spent	2	Alcoholic Beverage	4	Releases diethyl ether	0	< 100	0	< 100	< 100			Same
Sulfuric Acid, Spent	2	Alkaline Liquid	10	Local consequences	0	0	0	0				Same
Sulfuric Acid, Spent	2	Ammonium Nitrate Soln.	106	Local consequences	0	0	0	0				Same
Sulfuric Acid, Spent	2	Anhydrous Ammonia	10	Mitigate release of NH3	0	4100	0	3700				Mitigated
Sulfuric Acid, Spent	2	Aniline Oil	7	Evaporation of residuals at 100 C	0	100	0	700				Aggravated
Sulfuric Acid, Spent	2	Benzene	16	Evaporation of residuals at 50 C	0	200	0	400				Aggravated
Sulfuric Acid, Spent	2	Butadiene	28	Mitigate release of butadiene	0	800	0	800				Same
Sulfuric Acid, Spent	2	Butyl Acrylate	13	Evaporation of residuals at 50 C	0	700*	0	1500*				Aggravated
Sulfuric Acid, Spent	2	Butyl Alcohol	4	Releases dibutyl ether **	0	< 100	0	600	< 100			Aggravated
Sulfuric Acid, Spent	2	Butyraldehyde	5	Evaporation of residuals at 100 C	0	< 100	0	< 100				Same

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	Distances for Gas Releases IDLH Gas 2	Distances for Gas Releases IDLH Gas 3	Conclusions
Sulfuric Acid, Spent	2	Carbon Tetrachloride	17	Releases HCL gas	0	600	0	1500	1200			Aggravated
Sulfuric Acid, Spent	2	Chloroprene	17	Evaporation of residuals at 100 C	0	800	0	1700				Aggravated
Sulfuric Acid, Spent	2	Coal Tar Distillate	101	Same as individual chemicals	0	< 100	0	< 100				Same
Sulfuric Acid, Spent	2	Combustible Liquid	101	Same as individual chemicals	0	< 100	0	?				Same
Sulfuric Acid, Spent	2	Compound, Cleaning	101	Same as individual chemicals	0	< 100	0	?				Same
Sulfuric Acid, Spent	2	Crude Oil Petroleum	101	Same as individual chemicals	0	< 100	0	< 100				Same
Sulfuric Acid, Spent	2	Denatured Alcohol	4	Releases diethyl ether **	0	< 100	0	< 100	< 100			Same
Sulfuric Acid, Spent	2	Dinitrotoluene, Liquid	27	Evaporation at 100 C; explosion **	0	0	0	< 100				Same
Sulfuric Acid, Spent	2	Distillate Fuel Oil	101	Same as individual chemicals	0	< 100	0	< 100				Same
Sulfuric Acid, Spent	2	Ethyl Acetate	13	Evaporation of residuals at 50 C	0	100	0	200				Aggravated
Sulfuric Acid, Spent	2	Ethyl Acrylate	13	Evaporation of residuals at 50 C	0	100	0	300				Aggravated
Sulfuric Acid, Spent	2	Ethyl Alcohol	4	Releases diethyl ether **	0	< 100	0	< 100	< 100			Same
Sulfuric Acid, Spent	2	Ethylene Oxide	34	Evaporation of residuals at 100 C **	0	2500	0	2200				Mitigated
Sulfuric Acid, Spent	2	Flammable Liquid	101	Same as individual chemicals	0	< 100	0	?				Same
Sulfuric Acid, Spent	2	Formaldehyde Solution	5	Evaporation of residuals at 50 C	0	100	0	200				Aggravated
Sulfuric Acid, Spent	2	Fuel Oil	101	Same as individual chemicals	0	< 100	0	< 100				Same
Sulfuric Acid, Spent	2	Fuel, Aviation	101	Same as individual chemicals	0	< 100	0	< 100				Same
Sulfuric Acid, Spent	2	Gasoline	101	Same as individual chemicals	0	< 100	0	< 100	< 100			Same
Sulfuric Acid, Spent	2	Gasoline, nec	101	Same as individual chemicals	0	< 100	0	< 100	< 100			Same
Sulfuric Acid, Spent	2	Glycol Ethers	14	Evaporation of residuals at 50 C	0	< 100	0	100	< 100			Aggravated
Sulfuric Acid, Spent	2	Hexamethylene Diamine Soln	7	Evaporation of residuals at 100 C	0	< 100	0	< 100				Same
Sulfuric Acid, Spent	2	Isopropanol	4	Evaporation of residuals at 100 C **	0	< 100	0	500				Aggravated
Sulfuric Acid, Spent	2	Maleic Anhydride	107	Evaporation of residuals at 100 C	0	900*	0	20700*				Aggravated
Sulfuric Acid, Spent	2	Methyl Alcohol	4	Releases dimethyl ether **	0	< 100	0	600	< 100			Aggravated
Sulfuric Acid, Spent	2	Methyl Chloride	17	Releases SO2 gas **	0	1000	0	1000	1100			Aggravated
Sulfuric Acid, Spent	2	Methyl Ethyl Ketone	19	Evaporation of residuals at 50 C	0	200	0	300				Aggravated
Sulfuric Acid, Spent	2	Methyl Methacrylate	13	Evaporation of residuals at 50 C	0	100	0	200				Aggravated
Sulfuric Acid, Spent	2	Motor Fuel Antiknock Compo	24	Releases ethane gas	0	100	0	100	< 100			Same
Sulfuric Acid, Spent	2	Octyl Alcohol	4	Evaporation of residuals at 100 C **	0	< 100	0	< 100				Same
Sulfuric Acid, Spent	2	Oil	101	Same as individual chemicals	0	< 100	0	< 100	< 100			Same
Sulfuric Acid, Spent	2	Petroleum Naphtha	101	Same as individual chemicals	0	< 100	0	< 100	< 100			Same
Sulfuric Acid, Spent	2	Petroleum Residual Fuel	101	Same as individual chemicals	0	< 100	0	< 100	< 100			Same
Sulfuric Acid, Spent	2	Petroleum, Refined	101	Same as individual chemicals	0	< 100	0	< 100	< 100			Same

Summary of Toxic Emission Consequence Calculations

Chemical Name #1	ASTM Group	Chemical Name #2	ASTM Group	Toxic Emission Consequences	Non-mixed Distance (m) IDLH #1	Non-mixed Distance (m) IDLH #2	Mixed Distance (m) IDLH #1	Mixed Distance (m) IDLH #2	Distances for Gas Releases IDLH Gas 1	Distances for Gas Releases IDLH Gas 2	Distances for Gas Releases IDLH Gas 3	Conclusions
Sulfuric Acid, Spent	2	Phenol	31	Evaporation of residuals at 50 C	0	< 100	0	200				Aggravated
Sulfuric Acid, Spent	2	Phosphorus	105	Same as individual chemicals **	0	0	0	0				Same
Sulfuric Acid, Spent	2	Potassium Hydroxide, Liq	10	Local consequences	0	0	0	0				Same
Sulfuric Acid, Spent	2	Propylene Oxide	34	Evaporation of residuals at 100 C **	0	1700	0	1500				Mitigated
Sulfuric Acid, Spent	2	Pulp Mill Liquid	101	Same as individual chemicals	0	< 100	0	?				Same
Sulfuric Acid, Spent	2	Sodium Hydroxide, Liq.	10	Local consequences	0	0	0	0				Same
Sulfuric Acid, Spent	2	Sodium Metal	21	Releases hydrogen gas **	0	0	0	0	< 100			Same
Sulfuric Acid, Spent	2	Styrene Monomer	16	Evaporation of residuals at 50 C	0	< 100	0	< 100				Same
Sulfuric Acid, Spent	2	Toluene	16	Evaporation of residuals at 50 C	0	100	0	200	< 100			Aggravated
Sulfuric Acid, Spent	2	Toluene Diisocyanate	18	Evaporation of residuals at 100 C	0	< 100	0	800				Aggravated
Sulfuric Acid, Spent	2	Vinyl Acetate	13	Evaporation of residuals at 50 C	0	4100*	0	8000*				Aggravated
Sulfuric Acid, Spent	2	Vinyl Chloride	17	Mitigate release of vinyl chloride	0	19100*	0	18100*				Mitigated
Sulfuric Acid, Spent	2	Xylene	16	Evaporation of residuals at 50 C	0	< 100	0	< 100				Same
Toluene	16	Chlorine	104	Mitigation of chlorine release **	100	8000	200	7600	6900*			Mitigated
Toluene	16	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	100	200	900	1300				Aggravated
Toluene Diisocyanate	18	Ammonium Nitrate Soln.	106	Evaporation of residuals at 50 C	< 100	0	100	0				Aggravated
Toluene Diisocyanate	18	Chlorine	104	Mitigation of chlorine release **	< 100	8000	100	7600				Mitigated
Toluene Diisocyanate	18	Ethylene Oxide	34	Evaporation of residuals at 100 C	< 100	2500	600	1600				Mitigated
Toluene Diisocyanate	18	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	< 100	200	600	1300				Aggravated
Toluene Diisocyanate	18	Phosphorus	105	Evaporation of residuals at 50 C	< 100	0	100	0				Aggravated
Toluene Diisocyanate	18	Sodium Metal	21	Evaporation at 50 C; release H2 gas	< 100	0	100	0	< 100			Aggravated
Toluene Diisocyanate	18	Sulfur Dioxide	105	Unknown	< 100	4500	?	?				Unknown
Vinyl Acetate	13	Chlorine	104	Mitigation of chlorine release **	4100*	8000	8000*	7600				Mitigated
Vinyl Acetate	13	Ferric Chloride Solution	104	Evaporation of residuals at 50 C	4100*	0	8000*	0				Aggravated
Vinyl Acetate	13	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	4100*	200	5700*	1300				Aggravated
Vinyl Acetate	13	Sodium Metal	21	Evaporation of residuals at 100 C **	4100*	0	5700*	0				Aggravated
Vinyl Chloride	17	Chlorine	104	Mitigation of chlorine release **	19100*	8000	16500*	6900				Mitigated
Vinyl Chloride	17	Ferric Chloride Solution	104	Evaporation of residuals at 100 C	19100*	0	18100*	0				Mitigated
Vinyl Chloride	17	Hydrogen Peroxide	104	Evaporation at 50 C; explosion **	19100*	200	18100*	400				Aggravated
Vinyl Chloride	17	Motor Fuel Antiknock Compo	24	Evaporation of residuals at 50 C	19100*	100	18100*	100				Mitigated
Vinyl Chloride	17	Sodium Metal	21	Evaporation at 50 C; explosion	19100*	0	18100*	0				Mitigated
Xylene	16	Chlorine	104	Mitigation of chlorine release **	< 100	8000	< 100	7600				Mitigated
Xylene	16	Hydrogen Peroxide	104	Evaporation at 100 C; explosion **	< 100	200	100	1300				Aggravated

* = Distance to the TLV (Threshold Limiting Value) reported because of unavailability of the IDLH value.
** = Assumes that the mixture and/or vapors do not ignite.

IDLH = Immediately Dangerous to Life and Health concentration.

Mitigated = Consequences of mixed chemicals are less than the consequences of the unmixed chemicals.
Aggravated = Consequences of mixed chemicals are greater than the consequences of the unmixed chemicals.
Same = Consequences of mixed chemicals are equivalent to the consequences of the unmixed chemicals.
? = Unknown consequences.

Note : All distances in meters from source of spill.

Table I3. Continuous Release Fireballs

Case	Chemical Name	Amb. Temp K	Release Rate kg/sec	LFL	Stoic Conc	Mole Wt.	Heat Combust kJ/kg	Cloud Rad. (m)	Vapor > LFL kg	Dist to LFL m	Fire Ball diam m	Rad Fract	Dur sec	Distance From Ball Pain m	Distance From Ball Leth m	Total Distance Pain m	Total Distance Leth m	Area Covered sq.m.	Net Area sq.m.
25c	Acetic Acid	298	2.0	0.054	0.095	60.1	13110	1.73	71	10	22	0.2	3	15	4	26	15	167	
50c	Acetic Acid	298	9.0	0.054	0.095	60.1	13110	2.84	791	26	47	0.2	7	47	12	70	35	988	821
25c	Acetic Anhydride	298	1.1	0.027	0.050	102	16420	1.49	30	8	16	0.2	3	12	3	20	11	95	
50c	Acetic Anhydride	298	5.6	0.027	0.050	102	16420	2.55	408	21	38	0.2	6	39	10	58	29	649	554
100c	Acetic Anhydride	298	44.1	0.027	0.050	102	16420	5.03	11091	74	112	0.2	16	178	46	234	102	8145	8050
25c	Acetone	298	46.4	0.021	0.050	58.1	28500	6.40	19344	122	134	0.2	18	303	78	370	146	16644	
25c	Acrylic Acid	298	1.1	0.024	0.065	72.1	18840	1.62	39	11	18	0.2	3	14	3	23	12	118	
50c	Acrylic Acid	298	4.0	0.024	0.065	72.1	18840	2.49	315	23	35	0.2	5	37	9	54	27	559	441
25c	Acrylonitrile	298	13.2	0.030	0.053	53.1	33200	4.07	2215	49	66	0.4	10	170	43	203	76	4573	
50c	Acrylonitrile	298	41.9	0.030	0.053	53.1	33200	5.95	14060	98	121	0.4	17	399	103	460	164	21000	16427
25c	Alcoholic Bev.	298	0.1	0.033	0.065	46.1	26880	0.81	1	3	5	0.2	1	3	1	6	3	9	
50c	Alcoholic Bev.	298	0.3	0.033	0.065	46.1	26880	1.17	5	5	9	0.2	2	7	2	11	6	31	22
100c	Alcoholic Bev.	298	0.8	0.033	0.065	46.1	26880	1.61	26	9	15	0.2	2	14	3	22	11	97	88
25c	Aniline	298	0.2	0.013	0.026	93.1	34830	1.10	3	5	8	0.4	1	8	2	12	6	28	
50c	Aniline	298	0.6	0.013	0.026	93.1	34830	1.57	19	9	14	0.4	2	19	5	26	12	107	79
100c	Aniline	298	9.4	0.013	0.026	93.1	34830	3.90	1532	48	59	0.4	9	147	37	176	67	3480	3452
25c	Benzene	298	17.6	0.013	0.027	78.1	40600	5.06	4645	77	84	0.4	12	264	68	307	110	9474	
50c	Benzene	298	56.3	0.013	0.027	78.1	40600	7.42	29850	155	155	0.4	21	625	162	702	240	45097	35623
25c	Butyl Acrylate	298	1.3	0.014	0.023	128	32240	1.85	51	11	19	0.2	3	21	5	30	15	171	
50c	Butyl Acrylate	298	6.1	0.014	0.023	128	32240	3.08	606	29	43	0.2	6	65	16	87	38	1136	965
100c	Butyl Acrylate	298	26.4	0.014	0.023	128	32240	5.00	6313	70	93	0.2	13	192	49	239	96	7217	7046
25c	Butyl alcohol	298	0.9	0.014	0.034	74.1	33100	1.84	39	13	18	0.2	3	19	5	27	13	142	
50c	Butyl alcohol	298	7.4	0.014	0.034	74.1	33100	3.69	1146	45	53	0.2	8	88	22	115	49	1891	1749
25c	Butyraldehyde	298	31.8	0.025	0.037	72.1	35380	5.39	8481	78	103	0.2	14	231	59	282	111	9607	
25c	Carbon disulfide	298	68.6	0.013	0.065	76.1	14210	6.92	41592	177	173	0.4	23	431	112	517	198	30928	
25c	Chloroprene	298	47.6	0.040	0.050	88.5	30000	5.07	10786	66	111	0.4	15	336	86	391	142	15824	
25c	Coal Tar Distill	298	0.7	0.013	0.030	100	40570	1.58	23	10	15	0.4	2	23	6	30	13	133	
50c	Coal Tar Distill	298	2.7	0.013	0.030	100	40570	2.47	199	22	30	0.4	5	62	15	77	30	730	597
100c	Coal Tar Distill	298	13.1	0.013	0.030	100	40570	4.16	2497	56	69	0.4	10	198	51	233	85	5668	5535
25c	Crude Oil	298	0.7	0.060	0.023	100	43500	1.28	9	4	11	0.4	2	15	4	21	9	67	
50c	Crude Oil	298	2.3	0.060	0.023	100	43500	1.90	62	8	21	0.4	3	37	9	47	19	297	230
100c	Crude Oil	298	13.4	0.060	0.023	100	43500	3.40	1034	23	52	0.4	8	137	35	162	60	2864	2797
25c	Cyclohexane	298	24.0	0.013	0.023	84.2	43459	5.61	7193	88	97	0.4	14	335	86	384	135	14235	
50c	Cyclohexane	298	61.8	0.013	0.023	84.2	43459	7.66	32671	155	160	0.4	22	674	175	754	255	51002	36767
25c	Ethyl acetate	298	20.1	0.022	0.040	88.1	23510	4.37	3897	57	80	0.2	11	131	34	171	73	4224	
50c	Ethyl acetate	298	67.1	0.022	0.040	88.1	23510	6.50	26816	117	150	0.2	20	320	83	395	158	19547	15323
25c	Ethyl acrylate	298	7.7	0.018	0.034	100	27630	3.24	877	33	49	0.2	7	71	18	96	42	1418	
50c	Ethyl acrylate	298	28.5	0.018	0.034	100	27630	5.00	7119	73	97	0.2	14	188	48	236	97	7347	5929
25c	Ethyl Alcohol	298	8.7	0.033	0.065	46.1	26880	3.54	1180	40	54	0.2	8	81	20	108	47	1764	
50c	Ethyl Alcohol	298	26.1	0.033	0.065	46.1	26880	5.09	6845	77	96	0.2	13	182	47	230	95	7024	5260
25c	Formaldehyde	298	0.04	0.070	0.173	30.0	19035	0.52	0	1	3	0.2	1	1	0	3	2	3	
50c	Formaldehyde	298	0.2	0.070	0.173	30.0	19035	0.88	2	3	7	0.2	1	4	1	7	4	15	13
100c	Formaldehyde	298	1.5	0.070	0.173	30.0	19035	1.72	58	11	20	0.2	3	17	4	27	14	160	157
25c	Fuel Oil	298	0.9	0.013	0.023	100	43100	1.80	34	11	17	0.4	3	28	7	37	15	187	
50c	Fuel Oil	298	2.7	0.013	0.023	100	43100	2.58	199	22	30	0.4	5	64	16	79	31	753	565
100c	Fuel Oil	298	17.1	0.013	0.023	100	43100	4.75	3824	65	79	0.4	11	249	64	289	103	8365	8178

Table I3. (Cont.) Continuous Release Fireballs

Case	Chemical Name	Amb. Temp K	Release Rate kg/sec	LFL	Stoic Conc	Mole Wt.	Heat Combust kJ/kg	Cloud Rad. (m)	Vapor > LFL kg	Dist to LFL m	Fire Ball diam m	Rad Fract	Dur sec	Distance From Ball Pain m	Distance From Ball Leth m	Total Distance Pain m	Total Distance Leth m	Area Covered sq.m.	Net Area sq.m.
25c	Fuel, Aviation	298	0.7	0.007	0.023	100	43100	1.83	33	14	17	0.4	3	28	7	36	15	183	
50c	Fuel, Aviation	298	2.1	0.007	0.023	100	43100	2.63	193	27	30	0.4	5	63	16	78	31	734	552
100c	Fuel, Aviation	298	13.2	0.007	0.023	100	43100	4.83	3664	81	78	0.4	11	244	62	283	101	8073	7891
25c	Glycol Ethers	298	2.2	0.025	0.050	76.1	22000	2.09	114	15	25	0.4	4	35	9	48	21	356	
50c	Glycol Ethers	298	7.4	0.025	0.050	76.1	22000	3.11	797	31	47	0.4	7	86	22	110	45	1622	1266
100c	Glycol Ethers	298	58.6	0.025	0.050	76.1	22000	6.17	21834	109	140	0.4	19	398	103	468	173	23504	23147
25c	Hexane	298	32.1	0.012	0.022	86.2	44765	6.28	12014	110	115	0.4	16	431	111	488	169	22317	
50c	Hexane	298	93.8	0.012	0.022	86.2	44765	8.95	66803	208	202	0.4	27	953	249	1053	349	95880	73563
25c	Hexamethylenedia	298	0.04	0.007	0.021	116	28400	0.69	0	2	4	0.4	1	3	1	4	2	5	
50c	Hexamethylenedia	298	0.2	0.007	0.021	116	28400	1.17	4	6	8	0.4	1	9	2	13	6	31	27
100c	Hexamethylenedia	298	1.5	0.007	0.021	116	28400	2.28	103	20	24	0.4	4	38	9	50	22	367	362
25c	Isopropanol	298	6.0	0.023	0.044	60.1	30150	3.24	690	34	45	0.2	7	67	17	89	39	1221	
50c	Isopropanol	298	28.3	0.023	0.044	60.1	30150	5.41	8252	85	102	0.2	14	210	54	261	105	8641	7420
25c	Maleic Anhydride	298	0.05	0.014	0.065	98.1	14200	0.58	0	2	4	0.4	1	2	0	4	2	4	
50c	Maleic Anhydride	298	0.5	0.014	0.065	98.1	14200	1.24	13	8	12	0.4	2	10	3	16	9	59	55
100c	Maleic Anhydride	298	5.6	0.014	0.065	98.1	14200	2.75	820	32	44	0.4	6	62	16	83	37	1097	1092
25c	Methyl alcohol	298	31.7	0.060	0.122	32.0	19580	5.00	8125	75	101	0.2	14	168	43	219	94	6914	
50c	Methyl alcohol	298	36.8	0.060	0.122	32.0	19580	5.25	10315	82	109	0.2	15	188	48	242	103	8342	1428
25c	Methylethylketon	298	21.4	0.018	0.037	72.1	31360	5.00	5481	75	89	0.2	13	177	45	222	90	6355	
50c	Methylethylketon	298	51.9	0.018	0.037	72.1	31360	6.69	22617	127	141	0.2	19	342	88	412	159	19905	13550
25c	Methylmethacryla	298	9.0	0.021	0.034	100	26400	3.33	1026	33	51	0.2	8	75	19	101	45	1570	
50c	Methylmethacryla	298	28.5	0.021	0.034	100	26400	4.87	6490	67	94	0.2	13	176	45	223	92	6674	5103
25c	Petroleum Naphth	298	1.3	0.008	0.030	100	42400	2.10	83	19	23	0.4	4	42	10	53	22	371	
50c	Petroleum Naphth	298	2.6	0.008	0.030	100	42400	2.64	251	28	32	0.4	5	70	18	86	34	898	527
100c	Petroleum Naphth	298	16.7	0.008	0.030	100	42400	4.88	4927	86	86	0.4	12	278	71	321	114	10221	9850
25c	Phenol	298	0.1	0.017	0.029	94.1	31170	0.82	1	3	5	0.2	1	3	1	6	3	9	
50c	Phenol	298	0.9	0.017	0.029	94.1	31170	1.69	30	10	16	0.2	3	16	4	24	12	115	106
100c	Phenol	298	9.3	0.017	0.029	94.1	31170	3.65	1274	40	55	0.2	8	90	23	118	50	1999	1991
25c	Styrene	298	1.3	0.011	0.021	104	41960	2.10	67	15	21	0.4	3	38	9	48	20	312	
50c	Styrene	298	5.7	0.011	0.021	104	41960	3.42	712	37	46	0.4	7	113	29	136	51	2070	1758
100c	Styrene	298	39.6	0.011	0.021	104	41960	6.48	15825	117	126	0.4	17	474	122	537	185	26970	26658
25c	Toluene	298	6.1	0.040	0.023	92.1	40550	2.89	393	19	38	0.4	6	84	21	103	40	1258	
50c	Toluene	298	23.0	0.040	0.023	92.1	40550	4.48	3289	42	75	0.4	11	225	58	263	95	7113	5856
25c	Toluene Diisocya	298	0.02	0.009	0.022	174	23900	0.46	0	1	2	0.4	0	1	0	2	1	2	
50c	Toluene Diisocya	298	0.1	0.009	0.022	174	23900	0.72	1	2	5	0.4	1	3	1	6	3	8	6
100c	Toluene Diisocya	298	1.2	0.009	0.022	174	23900	1.77	49	12	19	0.4	3	25	6	34	16	191	190
25c	Vinyl acetate	298	32.6	0.026	0.044	86.1	22690	4.94	7749	70	100	0.2	14	177	46	227	95	7138	
50c	Vinyl acetate	298	77.5	0.026	0.044	86.1	22690	6.57	30973	117	157	0.2	21	336	87	414	166	21542	14405
25c	Xylene	298	2.5	0.011	0.020	106	40841	2.60	188	22	30	0.4	5	60	15	75	30	699	
50c	Xylene	298	7.6	0.011	0.020	106	40841	3.76	1114	43	53	0.4	8	137	35	163	61	2936	2237
100c	Xylene	298	49.8	0.011	0.020	106	40841	6.99	22550	132	141	0.4	19	551	143	621	213	35713	35015

Table I3. (Cont.) Puff Release Fireballs

Case	Chemical Name	Amb. Temp K	Fuel Weight (kg)	LFL	Stoic Conc	Mole Wt.	Heat Combust kJ/kg	Cloud Rad. (m)	Vapor > LFL kg	Fire Ball diam m	Rad Fract	Dur sec	Distance From Ball Pain m	Distance From Ball Leth m	Total Distance Pain m	Total Distance Leth m	Area Covered sq.m.	Net Area sq.m.
	Acetaldehyde	298	90720	0.040	0.077	44.1	24640	71.69	83149	217	0.2	29	553	145	661	253	50198	50198
50c	Acetaldehyde	298	45360	0.040	0.077	44.1	24640	57.03	41575	173	0.2	23	401	104	488	191	28558	Mitigated
100c	Acetaldehyde	298	22680	0.040	0.077	44.1	24640	45.37	20787	138	0.2	19	291	75	360	144	16326	Mitigated
100c	Acetic Acid	298	22680	0.054	0.095	60.1	13110	37.70	19830	136	0.2	19	208	54	276	122	11600	11433
50c	Acetone	298	45360	0.021	0.050	58.1	28500	62.05	44126	176	0.2	24	444	115	532	203	32509	15865
100c	Acetone	298	22680	0.021	0.050	58.1	28500	49.36	22063	140	0.2	19	322	83	392	154	18511	1867
100c	Acrylic Acid	298	22680	0.024	0.065	72.1	18840	43.19	21903	140	0.2	19	261	68	331	138	14857	14739
100c	Acrylonitrile	298	22680	0.030	0.053	53.1	33200	47.51	21460	139	0.4	19	485	126	555	195	29902	8902
	Ammonia	298	90720	0.150	0.218	17.0	18610	66.52	61229	196	0.4	26	590	154	688	252	49807	49807
50c	Ammonia	298	45360	0.150	0.218	17.0	18610	52.92	30615	156	0.4	21	428	111	506	189	28115	Mitigated
100c	Ammonia	298	22680	0.150	0.218	17.0	18610	42.10	15307	125	0.4	17	311	80	373	142	15946	Mitigated
100c	Benzene	298	22680	0.013	0.027	78.1	40600	53.73	22507	141	0.4	19	549	142	619	213	35515	26041
	Butadiene	298	90720	0.020	0.037	54.1	44600	84.96	88617	221	0.4	29	1084	283	1194	394	121871	121871
50c	Butadiene	298	45360	0.020	0.037	54.1	44600	67.59	44308	176	0.4	24	786	205	875	293	67312	Mitigated
100c	Butadiene	298	22680	0.020	0.037	54.1	44600	53.77	22154	141	0.4	19	571	148	641	218	37331	Mitigated
	Butane	298	90720	0.018	0.031	58.1	45760	86.73	89075	221	0.4	29	1100	288	1211	398	124699	124699
100c	Butyl alcohol	298	22680	0.014	0.034	74.1	33100	52.13	22466	141	0.2	19	350	91	420	161	20404	20262
50c	Butyraldehyde	298	45360	0.025	0.037	72.1	35380	59.18	43675	175	0.2	24	492	128	580	216	36547	26940
100c	Butyraldehyde	298	22680	0.025	0.037	72.1	35380	47.08	21837	140	0.2	19	357	92	427	162	20703	11096
50c	Carbon disulfide	298	45360	0.013	0.065	76.1	14210	58.96	45014	177	0.4	24	447	116	536	205	32988	2060
100c	Carbon disulfide	298	22680	0.013	0.065	76.1	14210	46.90	22507	141	0.4	19	325	84	395	155	18783	Mitigated
50c	Chloroprene	298	45360	0.040	0.050	88.5	30000	48.73	41575	173	0.4	23	626	163	713	249	48769	32945
100c	Chloroprene	298	22680	0.040	0.050	88.5	30000	38.77	20787	138	0.4	19	455	118	523	186	27295	11471
100c	Cyclohexane	298	22680	0.013	0.023	84.2	43459	53.80	22495	141	0.4	19	567	147	638	218	37160	22925
100c	Ethyl acetate	298	22680	0.022	0.040	88.1	23510	44.39	22032	140	0.2	19	292	76	362	146	16693	12469
100c	Ethyl acrylate	298	22680	0.018	0.034	100	27630	45.29	22269	141	0.2	19	318	82	389	153	18340	16922
100c	Ethyl alcohol	298	22680	0.033	0.065	46.1	26880	47.49	21283	139	0.2	19	308	80	377	149	17422	15658
	Ethylene oxide	298	90720	0.036	0.077	44.1	27650	72.96	84282	217	0.2	29	589	154	698	263	54260	54260
50c	Ethylene oxide	298	45360	0.036	0.077	44.1	27650	58.04	42141	173	0.2	23	428	111	514	198	30780	Mitigated
100c	Ethylene oxide	298	22680	0.036	0.077	44.1	27650	46.18	21071	138	0.2	19	310	80	380	149	17545	Mitigated
100c	Hexane	298	22680	0.012	0.022	86.2	44765	54.75	22544	141	0.4	19	576	149	647	220	37982	15665
	Hydrogen cyanide	298	90720	0.056	0.143	27.0	24530	72.01	78799	213	0.4	28	761	199	867	305	73186	73186
50c	Hydrogen cyanide	298	45360	0.056	0.143	27.0	24530	57.28	39400	170	0.4	23	552	144	637	228	40978	Mitigated
100c	Hydrogen cyanide	298	22680	0.056	0.143	27.0	24530	45.57	19700	135	0.4	18	401	104	469	171	23050	Mitigated
100c	Isopropanol	298	22680	0.023	0.044	60.1	30150	49.16	21968	140	0.2	19	331	86	401	156	19022	17801
	LPG-Butene	298	90720	0.016	0.034	56.1	45330	88.33	89493	222	0.4	29	1097	287	1208	398	124352	124352
50c	LPG-Butene	298	45360	0.016	0.034	56.1	45330	70.27	44747	177	0.4	24	796	207	885	296	68656	Mitigated
100c	LPG-Butene	298	22680	0.016	0.034	56.1	45330	55.90	22373	141	0.4	19	578	150	648	220	38061	Mitigated
	LPG-Isobutane	298	90720	0.018	0.031	58.1	45660	86.73	89075	221	0.4	29	1099	287	1210	398	124502	124502
50c	LPG-Isobutane	298	45360	0.018	0.031	58.1	45660	69.00	44537	177	0.4	24	798	208	886	296	68730	Mitigated
100c	LPG-Isobutane	298	22680	0.018	0.031	58.1	45660	54.89	22269	141	0.4	19	579	150	649	220	38098	Mitigated
	LPG-Isobutylene	298	90720	0.018	0.147	56.1	45030	87.96	89075	221	0.4	29	1091	285	1202	396	123261	123261
50c	LPG-Isobutylene	298	45360	0.018	0.147	56.1	45030	54.06	44537	177	0.4	24	792	206	880	294	68064	Mitigated
100c	LPG-Isobutylene	298	22680	0.018	0.147	56.1	45030	43.01	22269	141	0.4	19	575	149	645	219	37740	Mitigated
	LPG-Propane	298	90720	0.021	0.040	44.1	46360	88.81	88375	221	0.4	29	1103	289	1214	399	125027	125027
50c	LPG-Propane	298	45360	0.021	0.040	44.1	46360	70.66	44188	176	0.4	24	801	208	889	296	69002	Mitigated
100c	LPG-Propane	298	22680	0.021	0.040	44.1	46360	56.21	22094	140	0.4	19	581	150	651	221	38238	Mitigated

Table I3. (Cont.) Puff Release Fireballs

Case	Chemical Name	Amb. Temp K	Fuel Weight (kg)	LFL	Stoic Conc	Mole Wt.	Heat Combust kJ/kg	Cloud Rad. (m)	Vapor > LFL kg	Fire Ball diam m	Rad Fract	Dur sec	Distance From Ball Pain m	Distance From Ball Leth m	Total Distance Pain m	Total Distance Leth m	Area Covered sq.m.	Net Area sq.m.
	LPG-Propylene	298	90720	0.111	0.044	42.1	45790	67.38	67112	202	0.4	27	965	252	1066	353	97827	97827
50c	LPG-Propylene	298	45360	0.111	0.044	42.1	45790	53.60	33556	161	0.4	22	701	182	781	262	54090	Mitigated
100c	LPG-Propylene	298	22680	0.111	0.044	42.1	45790	42.64	16778	128	0.4	18	509	131	573	196	30032	Mitigated
100c	Methyl alcohol	298	22680	0.060	0.122	32.0	19580	43.72	19444	135	0.2	18	252	65	319	132	13775	6861
	Methyl chloride	298	90720	0.107	0.122	50.5	12680	54.02	67809	203	0.4	27	510	133	612	235	43200	43200
50c	Methyl chloride	298	45360	0.107	0.122	50.5	12680	42.97	33905	161	0.4	22	370	96	451	177	24595	Mitigated
100c	Methyl chloride	298	22680	0.107	0.122	50.5	12680	34.19	16952	129	0.4	18	269	69	333	134	14071	Mitigated
100c	Methylethylketon	298	22680	0.018	0.037	72.1	31360	49.76	22269	141	0.2	19	339	88	410	158	19656	13301
100c	Methylmethacryla	298	22680	0.021	0.034	100	26400	44.15	22094	140	0.2	19	310	80	380	150	17784	16214
	Propylene Oxide	298	90720	0.021	0.05	58.1	30230	78.30	88375	221	0.2	29	630	165	740	275	59482	59482
50c	Propylene Oxide	298	45360	0.021	0.05	58.1	30230	62.29	44188	176	0.2	24	457	119	545	207	33660	Mitigated
100c	Propylene Oxide	298	22680	0.021	0.05	58.1	30230	49.56	22094	140	0.2	19	332	86	402	156	19138	Mitigated
100c	Toluene	298	22680	0.040	0.023	92.1	40550	43.56	20787	138	0.4	19	528	137	597	206	33183	31952
100c	Vinyl acetate	298	22680	0.026	0.044	86.1	22690	42.80	21770	140	0.2	19	286	74	355	144	16234	9096
	Vinyl chloride	298	90720	0.036	0.077	63.5	18490	64.69	84282	217	0.4	29	682	178	790	287	64672	64672
50c	Vinyl chloride	298	45360	0.036	0.077	63.5	18490	51.46	42141	173	0.4	23	495	129	581	215	36433	Mitigated
100c	Vinyl chloride	298	22680	0.036	0.077	63.5	18490	40.94	21071	138	0.4	19	359	93	428	162	20621	Mitigated

Table I3. (Cont.) Fire Balls

Case	Chemical Name	Amb. Temp K	Fuel Weight kg/sec or kg*	LFL	Stoic Conc	Mole Wt.	Heat Combust kJ/kg	Cloud Rad. (m)	> LFL Vapor kg	Fire Ball diam m	Rad Fract	Dur sec	Distance From Ball Pain m	Distance From Ball Leth m	Total Distance Pain m	Total Distance Leth m	Area Covered sq.m.	Non Mixed Area sq.m.	Net Area sq.m.
50c	Acetic Acid	298	9	0.054	0.095	60.1	13110	2.84	791	47	0.2	7	47	12	70	35	988	167	821
	w/ Acrylonitrile	298	41.9	0.030	0.053	53.1	33200	5.97	14991	124	0.4	17	411	106	473	168	22154	4740	17414
	w/ Aniline	298	0.6	0.013	0.026	93.1	34830	1.58	810	48	0.3	7	95	24	118	48	1787	195	1592
	w/ Ammonia*	298	45360	0.150	0.218	17	18610	52.93	31405	157	0.4	21	433	112	512	191	28710	49974	Mitigated
	w/ HexaCH3 Diamine	298	0.05	0.007	0.021	116	28400	0.74	791	47	0.3	7	84	21	108	45	1589	172	1417
	w/ Propylene Oxide*	298	45360	0.021	0.050	58.1	30230	62.23	44979	177	0.2	24	461	120	550	209	34152	59649	Mitigated
100c	Acetic Acid*	298	22680	0.054	0.095	60.1	13110	37.68	19830	136	0.2	19	208	54	276	122	11600	167	11433
	w/ Acetaldehyde*	298	22680	0.040	0.077	44.1	24640	45.40	40618	171	0.2	23	397	103	483	189	28025	50365	Mitigated
	w/ Butyraldehyde*	298	22680	0.025	0.037	72.1	35380	47.08	41668	173	0.2	23	481	125	568	212	35159	9774	25385
	w/ Formaldehyde	298	1.5	0.070	0.173	30	19035	1.72	19889	136	0.2	19	251	65	319	133	13831	170	13661
	w/ Chloroprene*	298	22680	0.040	0.050	88.5	30000	38.74	40618	171	0.3	23	537	140	622	225	39824	15991	23833
	w/ TDI	298	1.2	0.009	0.022	174	23900	1.76	19879	136	0.3	19	344	89	412	157	19319	169	19150
	w/ Sodium (H2)*	298	3944	0.040	0.295	2	119780	56.68	23445	143	0.2	19	679	176	750	247	48077	167	47910
	w/ Ethylene oxide*	298	22680	0.036	0.077	44.1	27650	46.20	40901	172	0.2	23	422	110	508	196	30041	54427	Mitigated
	w/ Acetic Anhydride	298	44.1	0.027	0.050	102	16420	5.03	30927	157	0.2	21	286	74	364	153	18266	262	18004
50c	Acrylic Acid	298	4.0	0.024	0.065	72.1	18840	2.49	315	35	0.2	5	37	9	54	27	560	118	442
	w/ Acrylonitrile	298	41.9	0.030	0.053	53.1	33200	5.97	14515	122	0.4	17	405	105	466	166	21566	4691	16875
100c	Acrylic Acid*	298	22680	0.024	0.065	72.1	18840	43.19	21903	140	0.2	19	261	68	331	138	14857	118	14739
	w/ Acetic Anhydride	298	44.1	0.027	0.050	102	16420	5.03	33000	160	0.2	22	294	76	374	156	19231	213	19018
	w/ Aniline	298	9.4	0.013	0.026	93.1	34830	3.91	23436	143	0.3	19	448	116	520	188	27662	146	27516
	w/ TDI	298	1.2	0.009	0.022	174	23900	1.76	21952	140	0.3	19	360	93	430	163	20948	120	20828
	w/ Formaldehyde	298	1.5	0.070	0.173	30	19035	1.72	21962	140	0.2	19	263	68	333	138	14964	121	14843
	w/ Sodium (H2)*	298	3944	0.040	0.295	2	119780	56.68	25518	147	0.2	20	706	183	780	257	51698	118	51580
	w/ Butyraldehyde*	298	22680	0.025	0.037	72.1	35380	47.08	43741	176	0.2	24	492	128	580	216	36592	9725	26867
	w/ HexaCH3 Diamine	298	0.6	0.007	0.021	116	28400	1.68	21927	140	0.3	19	393	102	463	172	23138	123	23015
	w/ Chloroprene*	298	22680	0.040	0.050	88.5	30000	38.74	42691	174	0.3	23	549	143	636	230	41506	15942	25564
50c	Acetaldehyde*	298	45360	0.040	0.077	44.1	24640	57.07	41575	173	0.2	23	401	104	488	191	28558	50198	Mitigated
	w/ Ammonia*	298	45360	0.150	0.218	17	18610	52.93	72189	207	0.3	27	551	144	655	247	48050	50198	Mitigated
	w/ Acetic Anhydride	298	5.6	0.027	0.050	102	16420	2.54	41983	173	0.2	23	329	86	416	172	23285	50198	Mitigated
	w/ HCN*	298	45360	0.056	0.143	27	24530	57.31	80974	215	0.3	28	667	174	775	282	62362	73186	Mitigated
	w/ Sodium (H2)*	298	3944	0.040	0.295	2	119780	56.68	45190	177	0.2	24	920	239	1008	328	84507	50198	34309
100c	Acetaldehyde*	298	22680	0.040	0.077	44.1	24640	45.40	20787	138	0.2	19	291	75	360	144	16326	50198	Mitigated
	w/ Butyl Alcohol*	298	22680	0.014	0.034	74.1	33100	52.06	43253	175	0.2	23	474	123	561	211	34861	50198	Mitigated
	w/ Isopropanol*	298	22680	0.023	0.044	60.1	30150	49.25	42756	174	0.2	23	450	117	537	204	32715	50198	Mitigated
	w/ Methyl Alcohol*	298	22680	0.060	0.122	32	19580	43.75	40232	171	0.2	23	352	92	438	177	24608	50198	Mitigated
	w/ Aniline	298	9.4	0.013	0.026	93.1	34830	3.91	22320	141	0.3	19	438	113	509	184	26563	50198	Mitigated
	w/ TDI	298	1.2	0.009	0.022	174	23900	1.76	20836	138	0.3	19	352	91	421	160	20075	50198	Mitigated
50c	Butyraldehyde*	298	45360	0.025	0.037	72.1	35380	59.18	43675	175	0.2	24	492	128	580	216	36547	9607	26940
	w/ Acetic Anhydride	298	5.6	0.027	0.050	102	16420	2.54	44083	176	0.2	24	337	88	425	176	24208	9702	14506
	w/ HexaCH3 Diamine	298	0.05	0.007	0.021	116	28400	0.74	43675	175	0.3	24	540	140	628	228	40889	9612	31277
100c	Butyraldehyde*	298	22680	0.025	0.037	72.1	35380	47.08	21837	140	0.2	19	357	92	427	162	20703	9607	11096
	w/ Butyl Alcohol*	298	22680	0.014	0.034	74.1	33100	52.06	44303	176	0.2	24	479	125	567	213	35554	9749	25805
	w/ Isopropanol*	298	22680	0.023	0.044	60.1	30150	49.25	43806	176	0.2	24	455	118	543	206	33370	10828	22542
	w/ Ethyl Alcohol*	298	22680	0.033	0.065	46.1	26880	47.46	43121	175	0.2	23	426	111	514	198	30869	11371	19498
	w/ Methyl Alcohol*	298	22680	0.060	0.122	32	19580	43.75	41281	172	0.2	23	357	93	443	179	25122	16521	8601
	w/ Aniline	298	9.4	0.013	0.026	93.1	34830	3.91	23370	143	0.3	19	448	116	519	187	27597	9635	17962
	w/ TDI	298	1.2	0.009	0.022	174	23900	1.76	21886	140	0.3	19	360	93	430	163	20897	9609	11288
	w/ Phenol	298	9.3	0.017	0.029	94.1	31170	3.65	23111	142	0.2	19	344	89	415	160	20190	9616	10574

Table I3. (Cont.) Fire Balls

Case	Chemical Name	Amb. Temp K	Fuel Weight kg/sec or kg*	LFL	Stoic Conc	Mole Wt.	Heat Combust kJ/kg	Cloud Rad. (m)	Vapor > LFL kg	Fire Ball diam m	Rad Fract	Dur sec	Distance From Ball Pain m	Distance From Ball Leth m	Distance Total Pain m	Distance Total Leth m	Area Covered sq.m.	Non Mixed Area sq.m.	Net Area sq.m.
50c	Formaldehyde	298	0.2	0.070	0.173	30	19035	0.88	2	7	0.2	1	4	1	7	4	15	3	12
w/	Acetic Anhydride	298	5.6	0.027	0.050	102	16420	2.54	411	38	0.2	6	39	10	58	29	852	98	554
100c	Formaldehyde	298	1.5	0.070	0.173	30	19035	1.72	58	20	0.2	3	17	4	27	14	160	3	157
w/	Aniline	298	9.4	0.013	0.026	93.1	34830	3.91	1591	59	0.3	9	129	33	159	63	3069	31	3038
w/	HexaCH3 Diamine	298	0.6	0.007	0.021	116	28400	1.68	82	23	0.3	4	30	7	41	19	273	8	265
w/	TDI	298	1.2	0.009	0.022	174	23900	1.76	107	25	0.3	4	31	8	43	20	312	5	307
50c	HCN*	298	45360	0.056	0.143	27	24530	57.31	39400	170	0.4	23	552	144	637	228	40978	73186	Mitigated
w/	Acetone*	298	45360	0.021	0.050	58.1	28500	62.23	83587	217	0.3	29	730	191	839	299	70364	73186	Mitigated
w/	Acrylonitrile	298	41.9	0.030	0.053	53.1	33200	5.97	53600	188	0.4	25	741	193	835	287	64624	73186	Mitigated
w/	Vinyl acetate	298	77.5	0.026	0.044	86.1	22690	6.58	70372	205	0.3	27	602	157	704	260	52928	73186	Mitigated
w/	Ethyl acetate	298	67.1	0.022	0.040	88.1	23510	6.50	66216	201	0.3	27	595	155	696	256	51424	73186	Mitigated
w/	Isopropanol	298	28.3	0.023	0.044	60.1	30150	5.42	47652	180	0.3	24	579	151	669	241	45623	73186	Mitigated
w/	Methyl alcohol	298	36.8	0.060	0.122	32	19580	5.25	49714	183	0.3	24	476	124	567	215	36456	73186	Mitigated
w/	Butyl Acrylate	298	6.1	0.014	0.023	128	32240	3.08	40006	170	0.3	23	552	144	638	229	41130	73186	Mitigated
w/	Butyl alcohol	298	7.4	0.014	0.034	74.1	33100	3.68	40546	171	0.3	23	563	146	649	232	42287	73186	Mitigated
100c	HCN*	298	22680	0.056	0.143	27	24530	45.59	19700	135	0.4	18	401	104	469	171	23050	73186	Mitigated
w/	Styrene	298	39.6	0.011	0.021	104	41960	6.45	35525	164	0.4	22	689	179	771	261	53460	73186	Mitigated
50c	Ammonia*	298	45360	0.150	0.218	17	18610	52.93	30615	156	0.4	21	428	111	506	189	28115	49807	Mitigated
w/	MEK	298	51.9	0.018	0.037	72.1	31360	6.68	53231	187	0.3	25	622	162	715	256	51290	56162	Mitigated
w/	Vinyl acetate	298	77.5	0.026	0.044	86.1	22690	6.58	61587	196	0.3	26	566	148	664	246	47408	49807	Mitigated
w/	Ethyl acetate	298	67.1	0.022	0.040	88.1	23510	6.50	57431	192	0.3	26	557	145	653	241	45716	49807	Mitigated
w/	Styrene	298	5.7	0.011	0.021	104	41960	3.40	31326	157	0.4	21	650	169	728	247	48045	49807	Mitigated
w/	Acetic Anhydride	298	5.6	0.027	0.050	102	16420	2.54	31023	157	0.4	21	405	105	483	183	26432	49807	Mitigated
50c	Ethylene oxide*	298	45360	0.036	0.077	44.1	27650	58.07	42141	173	0.2	23	428	111	514	198	30780	54260	Mitigated
w/	Isopropanol	298	28.3	0.023	0.044	60.1	30150	5.42	50393	184	0.2	25	485	126	577	218	37425	54260	Mitigated
w/	Methyl alcohol	298	36.8	0.060	0.122	32	19580	5.25	52456	186	0.2	25	398	104	491	197	30452	54260	Mitigated
w/	Butyl alcohol	298	7.4	0.014	0.034	74.1	33100	3.68	43287	175	0.2	23	474	123	561	211	34884	54260	Mitigated
100c	Ethylene oxide*	298	22680	0.036	0.077	44.1	27650	46.20	21071	138	0.2	19	310	80	380	149	17545	54260	Mitigated
w/	Aniline	298	9.4	0.013	0.026	93.1	34830	3.91	22603	141	0.3	19	441	114	512	185	26843	54260	Mitigated
w/	Phenol	298	9.3	0.017	0.029	94.1	31170	3.65	22345	141	0.2	19	339	88	409	158	19644	54260	Mitigated
50c	Propylene oxide*	298	45360	0.021	0.050	58.1	30230	62.23	44188	176	0.2	24	457	119	545	207	33660	59482	Mitigated
w/	Isopropanol	298	28.3	0.023	0.044	60.1	30150	5.42	52440	186	0.2	25	494	129	587	222	38666	60703	Mitigated
w/	Methyl alcohol	298	36.8	0.060	0.122	32	19580	5.25	54503	189	0.2	25	485	126	580	200	31404	33674	Mitigated
w/	Butyl alcohol	298	7.4	0.014	0.034	74.1	33100	3.68	45334	178	0.2	24	484	126	573	215	36232	59624	Mitigated
100c	Propylene oxide*	298	22680	0.021	0.050	58.1	30230	49.51	22094	140	0.2	19	332	86	402	156	19138	33674	Mitigated
w/	Phenol	298	9.3	0.017	0.029	94.1	31170	3.65	23368	143	0.2	19	346	90	417	161	20372	33674	Mitigated
w/	Aniline	298	9.4	0.013	0.026	93.1	34830	3.91	23626	143	0.3	20	450	117	522	188	27848	33674	Mitigated
50c	Aniline	298	0.6	0.013	0.026	93.1	34830	1.58	19	14	0.4	2	19	5	26	12	107	28	79
w/	Methyl chloride*	298	45360	0.107	0.122	50.5	12680	43.00	33923	162	0.4	22	371	96	451	177	24606	43200	Mitigated
w/	Vinyl chloride*	298	45360	0.036	0.077	63.5	18490	51.49	42160	173	0.4	23	495	129	582	215	36446	64672	Mitigated
100c	Aniline	298	9.4	0.013	0.026	93.1	34830	3.91	1532	59	0.4	9	147	37	176	67	3480	28	3452
w/	Chloroprene*	298	22680	0.040	0.050	88.5	30000	38.74	22320	141	0.4	19	470	122	540	192	28964	15852	13112
w/	Acrylonitrile*	298	22680	0.030	0.053	53.1	33200	47.62	23027	142	0.4	19	501	130	572	201	31721	4601	27120
w/	Sodium (H2)*	298	3944	0.040	0.295	2	119780	56.68	5147	87	0.3	12	412	106	456	149	17494	28	17466
w/	Acetic Anhydride	298	44.1	0.027	0.050	102	16420	5.03	12629	117	0.2	16	189	49	247	107	9017	123	8894
w/	Maleic Anhydride	298	5.6	0.014	0.065	98.1	14200	2.75	2152	66	0.2	9	77	20	110	52	2165	32	2133

Table I3. (Cont.) Fire Balls

Case	Chemical Name	Amb. Temp K	Fuel Weight kg/sec or kg*	LFL	Stoic Conc	Mole Wt.	Heat Combust kJ/kg	Cloud Rad. (m)	Vapor > LFL kg	Fire Ball diam m	Rad Fract	Dur sec	Distance From Ball Pain m	Distance From Ball Leth m	Total Distance Pain m	Total Distance Leth m	Area Covered sq.m.	Non Mixed Area sq.m.	Net Area sq.m.
100c	HexaCH3 Diamine	298	0.6	0.007	0.021	116	28400	1.68	24	15	0.4	2	19	5	27	12	118	5	113
w/	Acetic Anhydride	298	44.1	0.027	0.050	102	16420	5.03	11121	112	0.2	16	178	46	234	102	8162	100	8062
w/	Maleic Anhydride	298	5.6	0.014	0.065	98.1	14200	2.75	644	44	0.2	7	44	11	66	33	870	9	861
w/	Chloroprene*	298	22680	0.040	0.050	88.5	30000	38.74	20811	138	0.4	19	455	118	524	187	27321	15829	11492
w/	Acrylonitrile*	298	22680	0.030	0.053	53.1	33200	47.62	21518	139	0.4	19	486	126	555	195	29970	4578	25392
50c	Sodium (H2)*	298	3944	0.040	0.295	2	119780	56.68	3615	78	0.2	11	286	73	325	112	9835	0	9835
w/	Carbon disulfide	298	45360	0.013	0.065	76.1	14210	59.00	48628	182	0.4	24	463	121	554	212	35136	30928	4208
w/	HCN*	298	45360	0.056	0.143	27	24530	57.31	43015	175	0.4	23	575	150	663	237	44090	73186	Mitigated
w/	Styrene	298	5.7	0.011	0.021	104	41960	3.40	4327	82	0.3	12	225	58	266	99	7670	312	7358
100c	Sodium (H2)*	298	3944	0.040	0.295	2	119780	56.68	3615	78	0.2	11	286	73	325	112	9835	0	9835
w/	Acetone*	298	22680	0.021	0.050	58.1	28500	49.51	25709	148	0.2	20	346	90	419	163	20951	16644	4307
w/	Ethyl Acrylate	298	22680	0.018	0.034	100	27630	45.24	25884	148	0.2	20	341	88	415	162	20712	1418	19294
w/	Methylmethacryla	298	22680	0.021	0.034	100	26400	44.10	25709	148	0.2	20	333	86	406	160	20097	1570	18527
w/	Acetic Anhydride	298	44.1	0.027	0.050	102	16420	5.03	14712	123	0.2	17	203	52	264	114	10164	95	10069
w/	Acrylonitrile*	298	22680	0.030	0.053	53.1	33200	47.62	25109	146	0.4	20	522	135	595	208	34111	4573	29538
w/	Aniline	298	9.4	0.013	0.026	93.1	34830	3.91	5147	87	0.3	12	222	57	266	101	7943	28	7915
w/	Butyl Acrylate	298	26.4	0.014	0.023	128	32240	4.99	9934	108	0.2	15	237	61	291	115	10386	171	10215
w/	Butyl Alcohol*	298	22680	0.014	0.034	74.1	33100	52.06	26081	148	0.2	20	375	97	449	171	23042	142	22900
w/	Ethyl Acetate*	298	22680	0.022	0.040	88.1	23510	44.43	25647	147	0.2	20	314	81	387	155	18859	4224	14635
w/	Ethyl Alcohol*	298	22680	0.033	0.065	46.1	26880	47.46	24898	146	0.2	20	331	86	404	159	19775	1764	18011
w/	Formaldehyde	298	1.5	0.070	0.173	30	19035	1.72	3673	78	0.2	11	115	29	154	68	3673	3	3670
w/	HexaCH3 Diamine	298	0.6	0.007	0.021	116	28400	1.68	3639	78	0.3	11	171	44	210	83	5362	5	5357
w/	Isopropanol*	298	22680	0.023	0.044	60.1	30150	49.25	25583	147	0.2	20	355	92	428	166	21526	1221	20305
w/	Methyl Alcohol*	298	22680	0.060	0.122	32	19580	43.75	23059	142	0.2	19	272	71	344	142	15775	6914	8861
w/	MEK*	298	22680	0.018	0.037	72.1	31360	49.70	25884	148	0.2	20	364	94	438	168	22214	6355	15859
w/	Vinyl Acetate*	298	22680	0.026	0.044	86.1	22690	42.87	25385	147	0.2	20	307	79	380	153	18361	7138	11223
100c	Phenol	298	9.3	0.017	0.029	94.1	31170	3.65	1274	55	0.2	8	90	23	118	50	1999	9	1990
w/	Butadiene*	298	22680	0.020	0.037	54.1	44600	53.70	23428	143	0.4	19	586	152	657	223	39143	121871	Mitigated
w/	Acrylonitrile*	298	22680	0.030	0.053	53.1	33200	47.62	44923	177	0.3	24	591	154	680	242	46153	4582	41571
100c	TDI	298	1.2	0.009	0.022	174	23900	1.76	49	19	0.4	3	25	6	34	16	191	2	189
w/	Ethyl Alcohol*	298	22680	0.033	0.065	46.1	26880	47.46	21332	139	0.2	19	308	80	377	149	17454	1766	15688
w/	Butyl Alcohol*	298	22680	0.014	0.034	74.1	33100	52.06	22515	141	0.2	19	350	91	421	161	20440	144	20296
w/	Isopropanol*	298	22680	0.023	0.044	60.1	30150	49.25	22017	140	0.2	19	331	86	401	156	19056	1223	17833
w/	Methyl Alcohol*	298	22680	0.060	0.122	32	19580	43.75	19493	135	0.2	18	252	65	319	133	13802	6916	6886
w/	Aniline	298	9.4	0.013	0.026	93.1	34830	3.91	1581	59	0.4	9	149	38	178	67	3570	30	3540
w/	HexaCH3 Diamine	298	0.6	0.007	0.021	116	28400	1.68	73	22	0.4	3	32	8	43	19	279	7	272
50c	Alcoholic Bev.	298	0.3	0.033	0.065	46.1	26880	1.17	5	9	0.2	2	7	2	11	6	31	9	22
w/	Acetaldehyde*	298	45360	0.040	0.077	44.1	24640	57.07	41580	173	0.2	23	401	104	488	191	28561	50207	Mitigated
w/	Butyraldehyde*	298	45360	0.025	0.037	72.1	35380	59.18	43680	175	0.2	24	492	128	580	216	36550	9616	26934
w/	Ethylene oxide*	298	45360	0.036	0.077	44.1	27650	58.07	42146	173	0.2	23	428	111	515	198	30784	54260	Mitigated
w/	Propylene oxide*	298	45360	0.021	0.050	58.1	30230	62.23	44193	176	0.2	24	457	119	545	207	33663	59482	Mitigated
w/	Sodium (H2)*	298	3944	0.040	0.295	2	119780	56.68	3620	78	0.2	11	286	73	325	112	9848	9	9839
100c	Alcoholic Bev.	298	0.8	0.033	0.065	46.1	26880	1.61	26	15	0.2	2	14	3	22	11	97	9	88
w/	TDI	298	1.2	0.009	0.022	174	23900	1.76	75	22	0.3	3	26	6	37	17	237	11	226

Table I3. (Cont.) Fire Balls

Case	Chemical Name	Amb. Temp K	Fuel Weight kg/sec* or kg	LFL	Stoic Conc	Mole Wt.	Heat Combust kJ/kg	Cloud Rad. (m)	Vapor > LFL kg	Fire Ball diam m	Rad Fract	Dur sec	Distance From Ball Pain m	Distance From Ball Leth m	Distance Pain m	Distance Leth m	Total Area Covered sq.m.	Non Mixed Area sq.m.	Net Area sq.m.
1	Hydrogen	298	3944	0.040	0.295	2.0	119780	56.68	3615	78	0.2	11	286	73	325	112	9835	0	9835
2	Methyl amine	298	55738	0.049	0.085	31.1	31400												
"	Ammonia	298	60154	0.150	0.218	17.0	18610												
"	Average	298	115892	0.089	0.143	21.7	24761	77.77	90972	223	0.4	29	817	214	929	325	83088	93007	Mitigated
3	Ethane	298	17040	0.030	0.057	30.1	47510												
"	Ammonia	298	81064	0.150	0.218	17.0	18610												
"	Average	298	98104	0.105	0.167	18.4	23630	73.72	73714	208	0.4	28	724	189	828	293	67545	49807	17738
4	Ethane	298	14940	0.030	0.057	30.1	47510	49.45	14159	121	0.4	17	479	124	540	184	26670	0	26670
5	Ethane	298	34080	0.030	0.057	30.1	47510												
"	HCN	298	60048	0.056	0.143	27.0	24530												
"	Average	298	94128	0.043	0.094	28.0	32850	80.66	85399	218	0.4	29	914	239	1023	348	95238	73186	22052
6	Hydrogen	298	534	0.040	0.295	2.0	119780												
"	Ammonia	298	81648	0.150	0.218	17.0	18610												
"	Average	298	82182	0.131	0.221	16.2	19267	66.76	57891	192	0.4	26	585	152	681	249	48566	49807	Mitigated
7	Vinyl chloride	298	45360	0.036	0.077	63.5	18490	51.49	42141										
"	Acetylene	298	3715	0.025	0.077	26.0	48240	32.15	45718	178	0.4	24	830	216	919	305	73062	64672	8390
8	Ammonia	298	45360	0.150	0.218	17.0	18610	52.93	76333	211	0.4	28	653	171	759	276	59801	114479	Mitigated
9	HexaCH3 Diamine*	298	0.2	0.007	0.021	116	28400	1.17	45722	178	0.4	24	637	166	726	255	50971	64677	Mitigated
10	Aniline*	298	0.6	0.013	0.026	93.1	34830	1.58	45737	178	0.4	24	705	184	794	273	58360	64700	Mitigated
11	Ethyl ether	298	14578	0.018	0.034	74.1	33840	43.17	14314	122	0.3	17	352	91	413	152	18073		
"	Ethyl Alcohol	298	9072	0.033	0.065	46.1	26880	35.10	22827	142	0.3	19	389	101	460	172	23153	1764	21389
12	Ethyl ether	298	72970	0.018	0.034	74.1	33840	73.44	71647	206	0.3	27	741	193	844	297	69080		
"	Ethyl Alcohol	298	22680	0.033	0.065	46.1	26880	47.49	92930	225	0.3	30	745	195	857	307	74068	1764	72304
13	Butene	298	6856	0.016	0.034	56.1	45330	37.61	6763	95	0.3	13	288	74	336	122	11604		
"	Butyl Alcohol	298	22680	0.014	0.034	74.1	33100	52.06	29229	154	0.3	21	484	126	561	202	32202	142	32060
14	Propene	298	31700	0.111	0.044	42.1	45790	47.72	23451	143	0.3	19	514	133	586	205	32925		
"	Isopropanol	298	22680	0.023	0.044	60.1	30150	49.25	45419	178	0.3	24	566	147	655	236	43836	1221	42615
15	Methyl ether	298	65205	0.034	0.065	46.1	28710	66.96	60986	196	0.3	26	633	165	731	263	54337		
"	Methyl Alcohol	298	22680	0.060	0.122	32.0	19580	43.75	80430	214	0.3	28	594	155	702	262	54103	6914	47189
16	Ethyl ether	298	36485	0.018	0.034	74.1	33840	58.43	35823	164	0.3	22	538	140	620	222	38673		
"	Ethyl Alcohol	298	9072	0.033	0.065	46.1	26880	35.10	44337	176	0.3	24	529	138	617	226	40030	1764	38266
17	Ethyl ether	298	7289	0.018	0.034	74.1	33840	34.34	7157	97	0.3	14	255	66	304	114	10227		
"	Ethyl Alcohol	298	22680	0.033	0.065	46.1	26880	47.49	28440	152	0.3	21	431	112	507	188	27742	1764	25978
18	Methyl ether	298	32603	0.034	0.065	46.1	28710	53.27	30493	156	0.3	21	460	119	538	197	30568		
"	Methyl Alcohol	298	22680	0.060	0.122	32.0	19580	43.75	49938	183	0.3	24	477	124	569	216	36590	6914	29676
19	Chloroethane	298	24410	0.062	0.065	99.0	7700	34.07	20793	138	0.4	19	230	60	299	128	12950		
"	Ethyl Alcohol	298	9072	0.033	0.065	46.1	26880	35.10	29306	154	0.3	21	437	113	514	190	28436	1764	26672
20	Chloroethane	298	32117	0.062	0.065	99.0	7700	37.30	27358	151	0.4	20	261	68	337	143	16075		
"	Ethyl Alcohol	298	45360	0.033	0.065	46.1	26880	59.70	69924	205	0.3	27	653	170	755	273	58431	1764	56667
21	Chloromethane	298	25114	0.107	0.122	50.5	12680	35.38	18772	133	0.3	18	244	63	311	130	13206		
"	Methyl alcohol*	298	36.8	0.060	0.122	32	19580	5.25	29086	154	0.3	21	371	96	448	173	23547	6914	16633
22	Isopropylchlor.	298	19536	0.028	0.044	78.6	25000	41.54	18635	133	0.3	18	342	88	408	155	18801		
"	Isopropanol*	298	28.3	0.023	0.044	60.1	30150	5.42	26887	150	0.3	20	444	115	519	190	28376	1221	27155
23	Phosphine	298	497	0.010	0.095	34.0	32000	17.03	495	41	0.3	6	72	18	92	38	1162	0	1162
24	Phosphine	298	558	0.010	0.095	34.0	32000	17.69	556	42	0.3	6	76	19	97	40	1273	0	1273

Table I3. (Cont.)

Case 1 = Sodium metal / Alkaline Liquid, Ammonium Nitrate Solution, Ferric Chloride Solution, Hydrochloric Acid, Hydrofluorosilicic Acid, Hydrogen Peroxide, Hydroiodic Acid, Phosphoric Acid, Potassium Hydroxide Liq., Pulp Mill Liquid, Sulfuric Acid Spent, Toluene Diisocyanate

Case 2 = Anhydrous Ammonia / Methyl Chloride

Case 3 = Anhydrous Ammonia / Motor Fuel Antiknock Compound

Case 4 = Motor Fuel Antiknock Compound / Hydrochloric Acid, Hydroiodic Acid, Hydrofluorosilicic Acid, Phosphoric Acid, Sulfuric Acid Spent, Aniline Oil

Case 5 = Motor Fuel Antiknock Compound / Hydrocyanic Acid

Case 6 = Anhydrous Ammonia / Sodium Metal

Case 7 = Vinyl Chloride / Alkaline Liquid, Potassium Hydroxide Liq., Sodium Hydroxide Liq.

Case 8 = Vinyl Chloride / Anhydrous Ammonia

Case 9 = Vinyl Chloride / Hexamethylene Diamine Solution

Case 10 = Vinyl Chloride / Aniline Oil

Case 11 = Alcoholic Beverage / Nitric Acid Fuming, Oleum, Sulfuric Acid

Case 12 = Ethyl Alcohol or Denatured Alcohol / Nitric Acid Fuming, Oleum, Sulfuric Acid

Case 13 = Butyl Alcohol / Nitric Acid Fuming, Oleum

Case 14 = Isopropanol / Nitric Acid Fuming, Oleum

Case 15 = Methyl Alcohol / Nitric Acid Fuming, Oleum, Sulfuric Acid

Case 16 = Sulfuric Acid Spent / Ethyl Alcohol, Denatured Alcohol

Case 17 = Sulfuric Acid Spent / Alcoholic Beverage

Case 18 = Sulfuric Acid Spent / Methyl Alcohol

Case 19 = Hydrochloric Acid / Alcoholic Beverage

Case 20 = Hydrochloric Acid / Ethyl Alcohol, Denatured Alcohol

Case 21 = Hydrochloric Acid / Methyl Alcohol

Case 22 = Hydrochloric Acid / Isopropanol

Case 23 = Phosphorus / Alkaline Liquid, Potassium Hydroxide Liq., Sodium Hydroxide Liq.

Case 24 = Phosphorus / Hydrochloric Acid, Hydroiodic Acid

Puff Release Unconfined Vapor Cloud Explosions

#	Chemical Name	Amb. Temp K	Fuel Weight (kg)	LFL	Stoic Conc	Mole Wt.	Heat Comb. kJ/kg	Cloud Rad. (m)	Virt. Dist. m	Vapor > LFL kg	Maximum TNT Equiv kg TNT	Expl. Eff.
	Acetaldehyde	298	90720	0.040	0.077	44.1	24640	71.69	75.30	83149	489442	0.309
50c	Acetaldehyde	298	45360	0.040	0.077	44.1	24640	57.03	53.24	41575	244721	0.161
100c	Acetaldehyde	298	22680	0.040	0.077	44.1	24640	45.37	37.65	20787	122360	0.068
100c	Acetic Acid	298	22680	0.054	0.095	60.1	13110	37.68	37.65	19830	62106	0.023
50c	Acetone	298	45360	0.021	0.050	58.1	28500	62.23	53.24	44188	300848	0.200
100c	Acetone	298	22680	0.021	0.050	58.1	28500	49.51	37.65	22094	150424	0.090
100c	Acrylic Acid	298	22680	0.024	0.065	72.1	18840	43.19	37.65	21903	98581	0.050
100c	Acrylonitrile	298	22680	0.030	0.053	53.1	33200	47.62	37.65	21495	170478	0.106
	Ammonia	298	90720	0.150	0.218	17.0	18610	66.52	75.30	61229	272210	0.180
50c	Ammonia	298	45360	0.150	0.218	17.0	18610	52.92	53.24	30615	136105	0.079
100c	Ammonia	298	22680	0.150	0.218	17.0	18610	42.10	37.65	15307	68053	0.027
100c	Benzene	298	22680	0.013	0.027	78.1	40600	53.80	37.65	22507	218293	0.142
	Butadiene	298	90720	0.020	0.037	54.1	44600	84.96	75.30	88617	944173	0.484
50c	Butadiene	298	45360	0.020	0.037	54.1	44600	67.59	53.24	44308	472086	0.300
100c	Butadiene	298	22680	0.020	0.037	54.1	44600	53.77	37.65	22154	236043	0.155
	Butane	298	90720	0.018	0.031	58.1	45760	86.73	75.30	89075	973738	0.493
100c	Butyl Alcohol	298	22680	0.014	0.034	74.1	33100	52.06	37.65	22466	177644	0.112
50c	Butyraldehyde	298	45360	0.025	0.037	72.1	35380	59.18	53.24	43675	369137	0.243
100c	Butyraldehyde	298	22680	0.025	0.037	72.1	35380	47.08	37.65	21837	184568	0.117
50c	Carbon Disulfide	298	45360	0.013	0.065	76.1	14210	59.00	53.24	45014	152805	0.092
100c	Carbon Disulfide	298	22680	0.013	0.065	76.1	14210	46.94	37.65	22507	76403	0.033
50c	Chloroprene	298	45360	0.040	0.050	88.5	30000	48.70	53.24	41575	297956	0.198
100c	Chloroprene	298	22680	0.040	0.050	88.5	30000	38.74	37.65	20787	148978	0.089
100c	Cyclohexane	298	22680	0.013	0.023	84.2	43459	53.89	37.65	22507	233665	0.153
100c	Ethyl Acetate	298	22680	0.022	0.040	88.1	23510	44.43	37.65	22032	123738	0.069
100c	Ethyl Acrylate	298	22680	0.018	0.034	100	27630	45.24	37.65	22269	146986	0.088
100c	Ethyl Alcohol	298	22680	0.033	0.065	46.1	26880	47.49	37.65	21283	136669	0.080
	Ethylene oxide	298	90720	0.036	0.077	44.1	27650	72.96	75.30	84282	556713	0.341
50c	Ethylene oxide	298	45360	0.036	0.077	44.1	27650	58.04	53.24	42141	278357	0.185
100c	Ethylene oxide	298	22680	0.036	0.077	44.1	27650	46.18	37.65	21071	139178	0.082
100c	Hexane	298	22680	0.012	0.022	86.2	44765	54.58	37.65	22544	241082	0.159

07/28/88

TNT Equiv kg TNT	Expl. Prob	Dist. m	Pso psi	Pref psi	Dur sec	TNO Dist. Heavy Damage m	TNO Dist. Glass Damage m	Area Covered sq.m.	Net Area sq.m.
151096	0.485	371	2.000	4.212	0.42	177	884	108103	108103
39468	0.354	232	2.000	4.213	0.27	140	702	42273	Mitigated
8359	0.238	132	2.007	4.227	0.16	111	557	13685	Mitigated
1451	0.231	57	2.006	4.227	0.09	89	444	2552	2552
60092	0.365	275	1.999	4.211	0.33	150	752	59396	42654
13592	0.247	162	2.005	4.222	0.20	119	597	20612	3870
4912	0.248	105	1.995	4.202	0.14	104	518	8659	8659
18067	0.243	182	2.003	4.218	0.20	124	622	26016	25862
49130	0.426	232	1.996	4.203	0.30	145	727	42273	42273
10768	0.300	132	1.996	4.204	0.18	115	577	13685	Mitigated
1864	0.194	65	2.013	4.242	0.10	92	458	3318	Mitigated
31026	0.250	226	1.996	4.203	0.25	135	676	40115	37909
456991	0.497	570	2.000	4.213	0.60	220	1101	255176	255176
141552	0.365	383	2.003	4.219	0.40	175	874	115209	Mitigated
36600	0.247	241	1.995	4.201	0.26	139	693	45617	Mitigated
479655	0.498	581	1.998	4.208	0.61	222	1112	265120	265120
19808	0.250	189	2.001	4.214	0.23	126	631	28055	28055
89555	0.363	322	1.997	4.206	0.33	161	805	81433	75758
21560	0.245	196	1.994	4.200	0.21	128	639	30172	24497
14092	0.368	149	2.002	4.217	0.24	120	600	17437	2043
2543	0.250	77	1.993	4.196	0.14	95	476	4657	Mitigated
58945	0.354	273	1.999	4.209	0.25	150	749	58535	52173
13292	0.238	161	1.997	4.207	0.15	119	595	20358	13996
35830	0.250	239	1.995	4.202	0.26	138	691	44863	38359
8587	0.247	134	1.999	4.209	0.16	112	559	14103	13876
12885	0.248	159	1.997	4.205	0.18	118	592	19856	19856
10873	0.241	148	2.000	4.211	0.18	116	578	17203	17203
189943	0.487	407	1.996	4.203	0.45	185	923	130100	130100
51408	0.358	258	2.003	4.219	0.29	147	733	52279	Mitigated
11347	0.240	151	1.994	4.199	0.18	116	581	17908	Mitigated
38253	0.250	245	1.996	4.204	0.27	140	698	47144	29473

Puff Release Unconfined Vapor Cloud Explosions

#	Chemical Name	Amb. Temp K	Fuel Weight (kg)	LFL	Stoic Conc	Mole Wt.	Heat Comb. kJ/kg	Cloud Rad. (m)	Virt. Dist. m	Vapor > LFL kg	Maximum TNT Equiv kg TNT	Expl. Eff.
	Hydrogen Cyanide	298	90720	0.056	0.143	27.0	24530	72.01	75.30	78799	461765	0.294
50c	Hydrogen Cyanide	298	45360	0.056	0.143	27.0	24530	57.28	53.24	39400	230882	0.151
100c	Hydrogen Cyanide	298	22680	0.056	0.143	27.0	24530	45.57	37.65	19700	115441	0.063
100c	Isopropanol	298	22680	0.023	0.044	60.1	30150	49.25	37.65	21968	158228	0.098
	LPG-Butene	298	90720	0.018	0.034	56.1	45330	88.33	75.30	89493	969121	0.491
50c	LPG-Butene	298	45360	0.018	0.034	56.1	45330	70.27	53.24	44747	484560	0.306
100c	LPG-Butene	298	22680	0.018	0.034	56.1	45330	55.90	37.65	22373	242280	0.160
	LPG-Isobutane	298	90720	0.018	0.031	58.1	45660	86.73	75.30	89075	971610	0.492
	LPG-Isobutylene	298	90720	0.018	0.147	56.1	45030	87.98	75.30	89075	958204	0.488
	LPG-Propane	298	90720	0.021	0.040	44.1	46360	88.81	75.30	88375	978760	0.494
	LPG-Propylene	298	90720	0.111	0.044	42.1	45790	87.38	75.30	87112	734129	0.415
100c	Methyl Alcohol	298	22680	0.060	0.122	32.0	19580	43.75	37.65	19444	90950	0.044
	Methyl chloride	298	90720	0.107	0.122	50.5	12680	54.02	75.30	67809	205404	0.133
50c	Methyl chloride	298	45360	0.107	0.122	50.5	12680	42.97	53.24	33905	102702	0.053
100c	Methyl chloride	298	22680	0.107	0.122	50.5	12680	34.19	37.65	16952	51351	0.017
100c	Methylethylketon	298	22680	0.018	0.037	72.1	31360	49.70	37.65	22269	166829	0.103
100c	Methylmethacryla	298	22680	0.021	0.034	100	26400	44.10	37.65	22094	139340	0.082
	Propylene Oxide	298	90720	0.021	0.050	58.1	30230	78.30	75.30	88375	638221	0.377
50c	Propylene Oxide	298	45360	0.021	0.050	58.1	30230	62.29	53.24	44188	319110	0.212
100c	Propylene Oxide	298	22680	0.021	0.050	58.1	30230	49.58	37.65	22094	159555	0.097
100c	Toluene	298	22680	0.040	0.023	92.1	40550	43.46	37.65	20787	201368	0.130
100c	Vinyl Acetate	298	22680	0.026	0.044	86.1	22690	42.87	37.65	21770	118004	0.065
	Vinyl chloride	298	90720	0.036	0.077	63.5	18490	64.69	75.30	84282	372283	0.244
50c	Vinyl chloride	298	45360	0.036	0.077	63.5	18490	51.46	53.24	42141	186142	0.118
100c	Vinyl chloride	298	22680	0.036	0.077	63.5	18490	40.94	37.65	21071	93071	0.046

TNT Equiv kg TNT	Expl. Prob	Dist. m	Pso psi	Pref psi	Dur sec	TNO Dist. Heavy Damage m	TNO Dist. Glass Damage m	Area Covered sq.m.	Net Area sq.m.
									07/28/88
135976	0.474	356	1.997	4.206	0.41	173	867	99538	99538
34939	0.344	221	1.996	4.204	0.26	138	688	38360	Mitigated
7260	0.230	125	1.993	4.196	0.16	109	546	12272	Mitigated
15262	0.246	170	2.003	4.218	0.20	121	607	22698	22698
476099	0.499	579	2.000	4.212	0.62	222	1110	263298	263298
148391	0.367	390	2.002	4.217	0.42	176	881	119459	Mitigated
38651	0.249	246	1.996	4.204	0.27	140	700	47529	Mitigated
478015	0.498	580	1.999	4.211	0.61	222	1111	264208	264208
467715	0.498	575	2.000	4.213	0.48	221	1106	259672	259672
483530	0.496	583	1.997	4.206	0.63	223	1114	266948	266948
304364	0.443	489	1.996	4.204	0.41	202	1012	187805	187805
4004	0.228	98	1.987	4.183	0.13	101	505	7238	6163
27229	0.445	177	1.997	4.206	0.23	132	662	24606	24606
5443	0.318	94	2.003	4.218	0.13	105	525	6940	Mitigated
849	0.208	42	1.988	4.187	0.07	83	417	1385	Mitigated
17208	0.248	179	1.995	4.202	0.21	124	618	25165	23503
11378	0.247	151	1.997	4.205	0.17	116	582	17908	17908
240553	0.496	446	1.999	4.210	0.50	193	966	156228	156228
67530	0.365	288	2.000	4.211	0.33	153	767	65144	Mitigated
15556	0.247	172	1.993	4.197	0.20	122	609	23235	Mitigated
26085	0.238	211	1.998	4.208	0.19	132	658	34967	34967
7658	0.245	128	1.991	4.193	0.15	110	550	12868	11347
91017	0.487	302	1.997	4.205	0.36	161	807	71631	71631
21967	0.356	181	2.005	4.224	0.22	128	641	25730	Mitigated
4246	0.240	98	2.001	4.214	0.13	102	509	7543	Mitigated

Continuous Release Unconfined Vapor Cloud Explosions

07/28/88

Case	Chemical Name	Amb. Temp K	Release Rate kg/sec	LFL	Stoic Conc	Mole Wt.	Heat Combust kJ/kg	Cloud Rad. (m)	Virt. Dist. m	Vapor > LFL kg	Max TNT Equiv kg TNT	Max Expl Effc	TNT Equiv kg TNT	Expl Prob	Dist m	Pso psi	Pref psi	Dur sec	TNO Dist Heavy Damage m	TNO Dist Glass Damage m	Area Covered sq.m.	Net Area sq.m.
25c	Acetic Acid	298	2.0	0.054	0.095	60.1	13110	1.73	2.1	71												
50c	Acetic Acid	298	9.0	0.054	0.095	60.1	13110	2.84	7.0	791												
25c	Acetic Anhydride	298	1.1	0.027	0.050	102	16420	1.49	1.4	30												
50c	Acetic Anhydride	298	5.6	0.027	0.050	102	16420	2.55	5.1	408												
100c	Acetic Anhydride	298	44.1	0.027	0.050	102	16420	5.03	26.3	11091	43504	0.012	523	0.153	41	2.008	4.230	0.07	79	395	1320	1320
25c	Acetone	298	46.4	0.021	0.050	58.1	28500	6.40	34.8	19344	131701	0.076	9963	0.227	146	1.992	4.195	0.18	114	571	16742	16742
25c	Acrylic Acid	298	1.082	0.024	0.065	72.1	18840	1.62	1.6	39												
50c	Acrylic Acid	298	3.995	0.024	0.065	72.1	18840	2.49	4.4	315												
25c	Acrylonitrile	298	13.2	0.030	0.053	53.1	33200	4.07	11.8	2215	17567	0.002	28	0.033	14	1.956	4.115	0.02	58	292	154	154
50c	Acrylonitrile	298	41.9	0.030	0.053	53.1	33200	5.95	29.6	14060	111514	0.060	6672	0.182	128	2.002	4.216	0.14	108	540	12868	12714
25c	Aniline	298	0.2	0.013	0.026	93.1	34830	1.10	0.4	3												
50c	Aniline	298	0.6	0.013	0.026	93.1	34830	1.57	1.1	19												
100c	Aniline	298	9.4	0.013	0.026	93.1	34830	3.90	9.8	1532	12750	0.001	9	0.021	8	1.914	4.022	0.02	52	262	50	50
25c	Benzene	298	17.6	0.013	0.027	78.1	40600	5.06	17.0	4645	45048	0.013	580	0.072	53	1.993	4.197	0.07	80	399	2206	2206
50c	Benzene	298	58.3	0.013	0.027	78.1	40600	7.42	43.2	29850	289512	0.192	55648	0.296	277	1.997	4.206	0.31	148	742	60263	58057
25c	Butyl Acrylate	298	1.3	0.014	0.023	128	32240	1.85	1.8	51												
50c	Butyl Acrylate	298	6.1	0.014	0.023	128	32240	3.08	6.2	606												
100c	Butyl Acrylate	298	26.4	0.014	0.023	128	32240	5.00	19.9	6313	48622	0.015	725	0.096	56	1.977	4.162	0.07	82	410	2463	2463
25c	Butyl alcohol	298	0.9	0.014	0.034	74.1	33100	1.84	1.8	39												
50c	Butyl alcohol	298	7.4	0.014	0.034	74.1	33100	3.69	8.5	1146	9064	0.000										
25c	Butyraldehyde	298	31.8	0.025	0.037	72.1	35380	5.39	23.0	8481	71680	0.030	2145	0.124	85	2.001	4.214	0.10	93	466	5675	5675
25c	Carbon disulfide	298	68.6	0.013	0.065	76.1	14210	6.92	51.0	41592	141189	0.083	11734	0.354	140	1.991	4.192	0.23	117	584	15394	15394
25c	Chloroprene	298	47.6	0.040	0.050	88.5	30000	5.07	26.0	10786	77299	0.034	2623	0.150	90	1.989	4.189	0.09	96	478	6362	6362
25c	Coal Tar Distill	298	0.7	0.013	0.030	100	40570	1.58	1.2	23												
50c	Coal Tar Distill	298	2.3	0.013	0.030	100	40570	2.34	3.1	154												
100c	Coal Tar Distill	298	13.1	0.013	0.030	100	40570	4.16	12.5	2497	24197	0.003	83	0.038	24	2.003	4.220	0.03	65	325	452	452
25c	Crude Oil	298	0.7	0.060	0.023	100	43500	1.28	0.8	9												
50c	Crude Oil	298	2.3	0.060	0.023	100	43500	1.90	2.0	62												
100c	Crude Oil	298	13.4	0.060	0.023	100	43500	3.40	8.0	1034	10746	0.000										
25c	Cyclohexane	298	24.0	0.013	0.023	84.2	43459	5.61	21.2	7193	74680	0.032	2393	0.108	91	1.997	4.205	0.11	95	473	6504	6504
50c	Cyclohexane	298	61.8	0.013	0.023	84.2	43459	7.66	45.2	32671	339193	0.224	76091	0.311	310	1.999	4.210	0.33	157	783	75477	68973
25c	Ethyl acetate	298	20.1	0.022	0.040	88.1	23510	4.37	15.6	3897	21888	0.003	59	0.061	17	2.006	4.225	0.03	63	314	227	227
50c	Ethyl acetate	298	67.1	0.022	0.040	88.1	23510	6.50	40.9	26816	150610	0.091	13631	0.278	160	1.988	4.186	0.19	119	597	20106	19879

Continuous Release Unconfined Vapor Cloud Explosions

07/28/88

Case	Chemical Name	Amb. Temp K	Release Rate kg/sec	LFL	Stoic Conc	Mole Wt.	Heat Combust kJ/kg	Cloud Rad. (m)	Virt. Dist. m	Vapor > LFL kg	Max TNT Equiv kg TNT	Max Expl Effc	TNT Equiv kg TNT	Expl Prob	Dist m	Pso psi	Pref psi	Dur sec	TNO Dist Heavy Damage m	TNO Dist Glass Damage m	Area Covered sq.m.	Net Area sq.m.
25c	Ethyl acrylate	298	7.7	0.018	0.034	100	27630	3.24	7.4	877												
50c	Ethyl acrylate	298	28.5	0.018	0.034	100	27630	5.00	21.1	7119	46989	0.014	656	0.107	52	1.989	4.188	0.07	81	405	2124	2124
25c	Ethyl Alcohol	298	8.72	0.033	0.065	46.1	26880	3.54	8.6	1185	7607	0.000										
50c	Ethyl Alcohol	298	26.05	0.033	0.065	46.1	26880	5.08	20.7	6824	43820	0.012	535	0.103	48	1.972	4.150	0.07	79	396	1810	1810
25c	Formaldehyde	298	0.04	0.070	0.173	30.0	19035	0.52	0.1	0												
50c	Formaldehyde	298	0.2	0.070	0.173	30.0	19035	0.88	0.4	2												
100c	Formaldehyde	298	1.5	0.070	0.173	30.0	19035	1.72	1.9	58												
25c	Fuel Oil	298	0.9	0.013	0.023	100	43100	1.80	1.5	34												
50c	Fuel Oil	298	2.7	0.013	0.023	100	43100	2.58	3.5	199												
100c	Fuel Oil	298	17.1	0.013	0.023	100	43100	4.75	15.5	3824	39372	0.010	388	0.060	48	1.983	4.175	0.06	76	382	1662	1662
25c	Fuel, Aviation	298	0.7	0.007	0.023	100	43100	1.83	1.4	33												
50c	Fuel, Aviation	298	2.1	0.007	0.023	100	43100	2.63	3.5	193												
100c	Fuel, Aviation	298	13.2	0.007	0.023	100	43100	4.83	15.1	3664	37724	0.009	341	0.057	43	2.020	4.256	0.06	75	376	1452	1452
25c	Glycol Ethers	298	2.2	0.025	0.050	76.1	22000	2.09	2.7	114												
50c	Glycol Ethers	298	7.4	0.025	0.050	76.1	22000	3.11	7.1	797												
100c	Glycol Ethers	298	58.6	0.025	0.050	76.1	22000	6.16	36.9	21834	114749	0.062	7155	0.245	125	1.991	4.193	0.16	109	545	12272	12272
25c	Hexane	298	32.1	0.012	0.022	86.2	44765	6.28	27.4	12014	128475	0.073	9393	0.162	150	1.990	4.190	0.17	113	566	17671	17671
50c	Hexane	298	93.8	0.012	0.022	86.2	44765	8.95	64.6	66803	714388	0.407	290888	0.442	491	1.998	4.207	0.52	201	1003	189345	171673
25c	Hexamethylenedia	298	0.01	0.007	0.021	116	28400	0.44	0.0	0												
50c	Hexamethylenedia	298	0.1	0.007	0.021	116	28400	0.74	0.2	0												
100c	Hexamethylenedia	298	0.6	0.007	0.021	116	28400	1.68	1.2	24												
25c	Isopropanol	298	6.0	0.023	0.044	60.1	30150	3.24	6.6	690												
50c	Isopropanol	298	28.3	0.023	0.044	60.1	30150	5.41	22.7	8252	59439	0.022	1284	0.121	69	1.980	4.167	0.09	88	438	3739	3739
25c	Maleic Anhydride	298	0.05	0.014	0.065	98.1	14200	0.58	0.1	0												
50c	Maleic Anhydride	298	0.5	0.014	0.065	98.1	14200	1.24	0.9	13												
100c	Maleic Anhydride	298	5.6	0.014	0.065	98.1	14200	2.75	6.2	620												
25c	Methyl alcohol	298	31.7	0.060	0.122	32.0	19580	5.00	22.5	8125	38002	0.009	348	0.119	37	1.971	4.149	0.06	75	377	1075	1075
50c	Methyl alcohol	298	36.8	0.060	0.122	32.0	19580	5.25	25.4	10315	48247	0.015	709	0.145	50	1.974	4.154	0.08	82	408	1963	888
25c	Methylethylketon	298	21.4	0.018	0.037	72.1	31360	5.00	18.5	5481	41058	0.011	440	0.084	46	1.965	4.134	0.06	77	387	1662	1662
50c	Methylethylketon	298	51.9	0.018	0.037	72.1	31360	6.69	37.6	22617	169435	0.105	17819	0.251	182	1.990	4.190	0.21	124	621	26016	24354
25c	Methylmethacryla	298	9.0	0.021	0.034	100	26400	3.33	8.0	1026	6473	0.000										
50c	Methylmethacryla	298	28.5	0.021	0.034	100	26400	4.87	20.1	6490	40931	0.011	436	0.098	44	1.972	4.151	0.06	77	387	1521	1521

Continuous Release Unconfined Vapor Cloud Explosions 07/28/88

Case	Chemical Name	Amb. Temp K	Release Rate kg/sec	LFL	Stoic Conc	Mole Wt.	Heat Combust kJ/kg	Cloud Rad. (m)	Virt. Dist. m	Vapor > LFL kg	Max TNT Equiv kg TNT	Max Expl Effc	TNT Equiv kg TNT	Expl Prob	Dist m	Pso psi	Pref psi	Dur sec	TNO Dist Heavy Damage m	TNO Dist Glass Damage m	Area Covered sq.m.	Net Area sq.m.
25c	Petroleum Naphth	298	1.3	0.008	0.030	100	42400	2.10	2.3	83												
50c	Petroleum Naphth	298	2.6	0.008	0.030	100	42400	2.64	4.0	251												
100c	Petroleum Naphth	298	16.7	0.008	0.030	100	42400	4.88	17.5	4927	49905	0.016	782	0.076	60	1.986	4.182	0.07	83	413	2827	2827
25c	Phenol	298	0.1	0.017	0.029	94.1	31170	0.82	0.2	1												
50c	Phenol	298	0.9	0.017	0.029	94.1	31170	1.69	1.4	30												
100c	Phenol	298	9.3	0.017	0.029	94.1	31170	3.65	8.9	1274	9488	0.000										
25c	Styrene	298	1.3	0.011	0.021	104	41960	2.10	2.0	67												
50c	Styrene	298	5.7	0.011	0.021	104	41960	3.42	6.7	712												
100c	Styrene	298	39.6	0.011	0.021	104	41960	6.48	31.4	15825	158627	0.097	15350	0.198	179	1.969	4.144	0.19	121	607	25165	25165
25c	Toluene	298	6.1	0.040	0.023	92.1	40550	2.89	5.0	393												
50c	Toluene	298	23.0	0.040	0.023	92.1	40550	4.48	14.3	3289	31860	0.006	202	0.051	35	1.988	4.186	0.04	71	356	962	962
25c	Toluene Diisocya	298	0.02	0.009	0.022	174	23900	0.46	0.1	0												
50c	Toluene Diisocya	298	0.1	0.009	0.022	174	23900	0.72	0.2	1												
100c	Toluene Diisocya	298	1.2	0.009	0.022	174	23900	1.77	1.7	49												
25c	Vinyl acetate	298	32.6	0.026	0.044	86.1	22690	4.94	22.0	7749	42003	0.011	471	0.115	43	2.009	4.232	0.06	78	390	1452	1452
50c	Vinyl acetate	298	77.5	0.026	0.044	86.1	22690	6.57	44.0	30973	167886	0.104	17455	0.302	174	1.991	4.193	0.20	124	619	23779	22327
25c	Xylene	298	2.5	0.011	0.020	106	40841	2.60	3.4	188												
50c	Xylene	298	7.6	0.011	0.020	106	40841	3.76	8.3	1114	10869	0.000										
100c	Xylene	298	49.8	0.011	0.020	106	40841	6.99	37.5	22550	220007	0.143	31547	0.250	228	1.991	4.193	0.25	135	677	40828	40828

Case	Chemical Name	Amb. Temp K	Release Rate kg/sec or kg*	LFL	Stoic Conc	Mole Wt.	Heat Combust kJ/kg	Cloud Rad. (m)	Virt. Dist. m	Vapor > LFL kg	Max TNT Equiv kg TNT	Max Expl Effc	TNT Equiv kg TNT	Expl Prob	Dist m	Pso psi	Pref psi	Dur sec	TNO Dist. Heavy Damage m	TNO Dist. Glass Damage m	Area Covered sq.m.	Unmixed Area sq.m.	Net Area sq.m.
50c	Acetic Acid	298	9.0	0.054	0.095	60.1	13110	2.84	7.0	791	2477	0.000	0										
w/	Acrylonitrile	298	41.9	0.030	0.053	53.1	33200	5.95	30.5	14060	113991	0.062	7040	0.190	130	2.002	4.217	0.15	108	540	13273	154	13119
w/	Aniline	298	0.6	0.013	0.026	93.1	34830	1.57	7.1	19	2633	0.000	0										
w/	Ammonia*	298	45360	0.150	0.218	17.0	18610	52.93	53.7	30615	138582	0.081	11234	0.304	134	1.999	4.210	0.18	115	577	14103	42273	Mitigated
w/	HexaCH3 Diamine	298	0.05	0.007	0.021	116	28400	0.74	7.0	0	2480	0.000	0										
w/	Propylene Oxide*	298	45360	0.021	0.050	58.1	30230	62.29	53.7	44188	321587	0.213	68565	0.368	289	2.002	4.217	0.33	153	767	65597	156228	Mitigated
100c	Acetic Acid*	298	22680	0.054	0.095	60.1	13110	37.68	37.6	19830	62106	0.023	1451										
w/	Acetaldehyde*	298	22680	0.040	0.077	44.1	24640	45.40	53.2	20787	184466	0.117	21533	0.350	180	1.998	4.208	0.19	111	557	25447	108103	Mitigated
w/	Butyraldehyde*	298	22680	0.025	0.037	72.1	35380	47.14	53.2	21837	246674	0.163	40124	0.354	234	1.998	4.203	0.23	128	639	43005	5675	37330
w/	Formaldehyde	298	1.5	0.070	0.173	30.0	19035	1.72	37.7	58	62372	0.024	1468	0.231	58	1.988	4.180	0.01	14	72	2642	0	2642
w/	Chloroprene*	298	22680	0.040	0.050	88.5	30000	38.77	53.2	20787	211084	0.137	28876	0.350	204	1.998	4.207	0.18	119	595	32685	6362	26323
w/	TDI	298	1.2	0.009	0.022	174	23900	1.77	37.7	49	62384	0.024	1469	0.231	58	1.986	4.182	0.02	15	73	2642	0	2642
w/	Sodium (H2)*	298	3944	0.040	0.295	2.0	119780	56.68	40.8	3815	165544	0.102	16911	0.256	174	2.004	4.220	0.23	105	527	23779	0	23779
w/	Ethylene oxide*	298	22680	0.036	0.077	44.1	27650	46.20	53.2	21071	201284	0.129	26062	0.351	195	2.002	4.217	0.21	116	581	29865	130100	Mitigated
w/	Acetic Anhydride	298	44.1	0.027	0.050	102	16420	5.03	45.9	11091	105610	0.055	5834	0.302	105	1.998	4.208	0.11	79	395	8659	0	8659
50c	Acrylic Acid	298	4	0.024	0.065	72.1	18840	2.49	4.4	315	1418	0.000	0										
w/	Acrylonitrile	298	41.9	0.030	0.053	53.1	33200	5.95	30.0	14060	112932	0.061	6881	0.185	130	1.989	4.187	0.14	108	540	13273	154	13119
100c	Acrylic Acid*	298	22680	0.024	0.065	72.1	18840	43.15	37.6	21903	98581	0.050	4912										
w/	Acetic Anhydride	298	44.1	0.027	0.050	102	16420	5.03	45.9	11091	142084	0.084	11909	0.313	146	1.991	4.192	0.12	79	395	16742	0	16742
w/	Aniline	298	9.4	0.013	0.026	93.1	34830	3.90	38.9	1532	111331	0.060	6645	0.256	119	1.993	4.196	0.07	52	262	11122	0	11122
w/	TDI	298	1.2	0.009	0.022	174	23900	1.77	37.7	49	98859	0.050	4947	0.246	105	2.002	4.216	0.02	15	73	8659	0	8659
w/	Formaldehyde	298	1.5	0.070	0.173	30.0	19035	1.72	37.7	58	98846	0.050	4945	0.246	105	2.001	4.215	0.02	14	72	8659	0	8659
w/	Sodium (H2)*	298	3944	0.040	0.295	2.0	119780	56.68	40.8	3815	202018	0.130	26268	0.270	208	2.003	4.220	0.25	105	527	33979	0	33979
w/	Butyraldehyde*	298	22680	0.025	0.037	72.1	35380	47.14	53.2	21837	283149	0.188	53213	0.363	262	1.999	4.210	0.24	128	639	53913	5675	48238
w/	HexaCH3 Diamine	298	0.6	0.007	0.021	116	28400	1.69	37.7	24	98743	0.050	4932	0.246	105	1.999	4.210	0.02	12	61	8659	0	8659
w/	Chloroprene*	298	22680	0.040	0.050	88.5	30000	38.77	53.2	20787	247559	0.163	40423	0.359	234	2.003	4.219	0.19	119	595	43005	6362	36643
50c	Acetaldehyde*	298	45360	0.040	0.077	44.1	24640	57.07	53.2	41575	244721	0.161	39466										
w/	Ammonia*	298	45360	0.150	0.218	17.0	18610	52.93	75.3	30615	380826	0.250	95029	0.457	307	2.000	4.213	0.26	115	577	74023	150378	Mitigated
w/	Acetic Anhydride	298	5.6	0.027	0.050	102	16420	2.55	53.5	408	246322	0.162	40005	0.355	233	2.001	4.214	0.05	26	131	42638	108103	Mitigated
w/	HCN*	298	45360	0.056	0.143	27.0	24530	57.31	75.3	39400	475603	0.302	143469	0.480	383	2.002	4.217	0.33	138	688	103491	207641	Mitigated
w/	Sodium (H2)*	298	3944	0.040	0.295	2.0	119780	56.68	55.5	3815	348158	0.230	80036	0.369	306	1.998	4.204	0.30	105	527	73542	108103	Mitigated

Unconfined Vapor Cloud Explosions

07/28/88

Case	Chemical Name	Amb. Temp K	Release Rate kg/sec or kg*	LFL	Stoic Conc	Mole Wt.	Heat Combust kJ/kg	Cloud Rad. (m)	Virt. Dist. m	Vapor > LFL kg	Max TNT Equiv kg TNT	Max Expl Effc	TNT Equiv kg TNT	Expl Prob	Dist m	Pso psi	Pref psi	Dur sec	TNO Dist. Heavy Damage m	TNO Dist. Glass Damage m	Area Covered sq.m.	Unmixed Area sq.m.	Net Area sq.m.
100c	Acetaldehyde*	298	22680	0.040	0.077	44.1	24640	45.40	37.6	20787	122360	0.068	8359										
	w/ Butyl Alcohol*	298	22680	0.014	0.034	74.1	33100	52.06	53.2	22466	300005	0.199	59757	0.361	274	2.003	4.219	0.27	126	631	58965	108103	Mitigated
	w/ Isopropanol*	298	22680	0.023	0.044	60.1	30150	49.25	53.2	21968	280588	0.186	52246	0.359	260	2.000	4.212	0.25	121	607	53093	108103	Mitigated
	w/ Methyl Alcohol*	298	22680	0.060	0.122	32.0	19580	43.75	53.2	19444	213311	0.138	29533	0.348	206	1.997	4.206	0.19	101	505	33329	109178	Mitigated
	w/ Aniline	298	9.4	0.013	0.026	93.1	34830	3.90	38.9	1532	135110	0.078	10584	0.249	145	2.001	4.214	0.08	52	262	16513	108103	Mitigated
	w/ TDI	298	1.2	0.009	0.022	174	23900	1.77	37.7	49	122639	0.069	8405	0.238	133	1.994	4.199	0.02	15	73	13893	108103	Mitigated
50c	Butyraldehyde*	298	45360	0.025	0.037	72.1	35380	59.25	53.2	43675	369137	0.243	89555										
	w/ Acetic Anhydride	298	5.6	0.027	0.050	102	18420	2.55	53.5	408	370738	0.244	90298	0.364	322	2.003	4.219	0.06	26	131	81433	5675	75758
	w/ Aniline	298	0.6	0.013	0.026	93.1	34830	1.57	53.3	19	369293	0.243	89628	0.363	322	1.998	4.207	0.03	12	60	81433	5675	75758
	w/ HexaCH3 Diamine	298	0.05	0.007	0.021	116	28400	0.74	53.2	0	369140	0.243	89557	0.363	322	1.997	4.206	0.01	3	16	81433	5675	75758
100c	Butyraldehyde*	298	22680	0.025	0.037	72.1	35380	47.14	37.6	21837	184568	0.117	21560										
	w/ Butyl Alcohol*	298	22680	0.014	0.034	74.1	33100	52.06	53.2	22466	362213	0.238	86370	0.365	317	2.001	4.214	0.29	126	631	78924	5675	73249
	w/ Isopropanol*	298	22680	0.023	0.044	60.1	30150	49.25	53.2	21968	342796	0.227	77667	0.363	304	2.002	4.217	0.27	121	607	72583	5675	66908
	w/ Methyl Alcohol*	298	22680	0.060	0.122	32.0	19580	43.75	53.2	19444	275518	0.183	50351	0.352	256	2.001	4.215	0.21	101	505	51472	6750	44722
	w/ TDI	298	1.2	0.009	0.022	174	23900	1.77	37.7	49	184847	0.117	21632	0.245	196	1.997	4.206	0.03	15	73	30172	5675	24497
	w/ Phenol	298	9.3	0.017	0.029	94.1	31170	3.65	38.7	1274	194056	0.124	24068	0.254	203	2.003	4.218	0.08	48	238	32365	5675	26690
	w/ Ethyl Alcohol*	298	22680	0.033	0.065	46.1	26880	47.46	53.2	21283	321237	0.213	68418	0.360	289	2.004	4.221	0.25	116	578	65597	5675	59922
50c	Formaldehyde	298	0.2	0.070	0.173	30.0	19035	0.88	0.4	2	11	0.000	0										
	w/ Acetic Anhydride	298	5.6	0.027	0.050	102	18420	2.55	5.1	408	1612	0.000	0										
100c	Formaldehyde	298	1.5	0.070	0.173	30.0	19035	1.72	1.9	58	266	0.000	0										
	w/ Aniline	298	9.4	0.013	0.026	93.1	34830	3.90	10.0	1532	13016	0.001	9	0.022	8	1.957	4.117	0.02	52	262	50	0	50
	w/ HexaCH3 Diamine	298	0.6	0.007	0.021	116	28400	1.69	2.3	24	427	0.000	0										
50c	HCN*	298	45360	0.056	0.143	27.0	24530	57.31	53.2	39400	230882	0.151	34939										
	w/ Acetone*	298	45360	0.021	0.050	58.1	28500	62.23	75.3	44188	531731	0.329	175186	0.486	393	2.003	4.220	0.38	150	752	121304	116280	5024
	w/ Acrylonitrile	298	41.9	0.030	0.053	53.1	33200	5.95	60.9	14060	342396	0.226	77491	0.400	296	2.002	4.217	0.22	108	540	68813	99692	Mitigated
	w/ Vinyl acetate	298	77.5	0.026	0.044	86.1	22690	6.57	69.1	30973	398769	0.260	103657	0.452	325	1.996	4.204	0.27	124	619	82958	100990	Mitigated
	w/ Ethyl acetate	298	67.1	0.022	0.040	88.1	23510	6.50	67.2	26816	381492	0.250	95345	0.441	316	1.997	4.206	0.27	119	597	78427	99765	Mitigated
	w/ Isopropanol	298	28.3	0.023	0.044	60.1	30150	5.41	57.9	8252	290321	0.193	55960	0.379	263	1.996	4.204	0.18	88	438	54325	99538	Mitigated
	w/ Methyl alcohol	298	36.8	0.060	0.122	32.0	19580	5.25	59.0	10315	279130	0.185	51698	0.387	253	2.001	4.215	0.17	82	408	50273	100613	Mitigated
	w/ Butyl Acrylate	298	6.1	0.014	0.023	128	32240	3.08	53.6	606	235547	0.155	36439	0.347	224	2.002	4.216	0.07	37	187	39408	99538	Mitigated
	w/ Butyl alcohol	298	7.4	0.014	0.034	74.1	33100	3.69	53.9	1146	239946	0.158	37878	0.349	227	2.005	4.223	0.10	47	234	40471	99538	Mitigated

Case	Chemical Name	Amb. Temp K	Release Rate kg/sec or kg*	LFL	Stoic Conc	Mole Wt.	Heat Combust kJ/kg	Cloud Rad. (m)	Virt. Dist. m	Vapor > LFL kg	Max TNT Equiv kg TNT	Max Expl Effc	TNT Equiv kg TNT	Expl Prob	Dist m	Pso psi	Pref psi	Dur sec	TNO Dist. Heavy Damage m	TNO Dist. Glass Damage m	Area Covered sq.m.	Unmixed Area sq.m.	Net Area sq.m.
100c	HCN*	298	22680	0.056	0.143	27.0	24530	45.59	37.6	19700	115441	0.063	7260										
	w/ Styrene	298	39.6	0.011	0.021	104	41960	6.48	49.1	15825	274068	0.182	49814	0.326	259	2.002	4.217	0.24	121	607	52685	99538	Mitigated
50c	Ammonia*	298	45360	0.150	0.218	17.0	18610	52.93	53.2	30615	136105	0.079	10768										
	w/ MEK	298	51.9	0.018	0.037	72.1	31360	6.69	65.2	22617	305540	0.203	61971	0.399	267	1.995	4.200	0.26	124	621	55990	43935	12055
	w/ Vinyl acetate	298	77.5	0.026	0.044	86.1	22690	6.57	69.1	30973	303992	0.202	61348	0.427	261	2.003	4.220	0.25	124	619	53502	43725	9777
	w/ Ethyl acetate	298	67.1	0.022	0.040	88.1	23510	6.50	67.2	26816	286715	0.190	54572	0.414	251	1.997	4.205	0.24	119	597	49481	42500	6981
	w/ Styrene	298	5.7	0.011	0.021	104	41960	3.42	53.7	712	143241	0.085	12136	0.304	139	1.998	4.208	0.07	43	216	15175	42273	Mitigated
	w/ Acetic Anhydride	298	5.6	0.027	0.050	102	16420	2.55	53.5	408	137707	0.080	11068	0.302	133	2.004	4.221	0.04	26	131	13893	42273	Mitigated
50c	Ethylene oxide*	298	45360	0.036	0.077	44.1	27650	58.07	53.2	42141	278357	0.185	51408										
	w/ Isopropanol	298	28.3	0.023	0.044	60.1	30150	5.41	57.9	8252	337795	0.223	75482	0.389	296	2.002	4.216	0.19	88	438	68813	130100	Mitigated
	w/ Methyl alcohol	298	36.8	0.060	0.122	32.0	19580	5.25	59.0	10315	326604	0.216	70678	0.397	287	2.004	4.220	0.18	82	408	64692	131175	Mitigated
	w/ Butyl alcohol	298	7.4	0.014	0.034	74.1	33100	3.69	53.9	1146	287420	0.191	54843	0.361	265	1.995	4.200	0.10	47	234	55155	130100	Mitigated
100c	Ethylene oxide*	298	22680	0.036	0.077	44.1	27650	46.20	37.6	21071	139178	0.082	11347										
	w/ Aniline	298	9.4	0.013	0.026	93.1	34830	3.90	38.9	1532	151928	0.092	13907	0.250	163	1.994	4.199	0.09	52	262	20867	130100	Mitigated
	w/ Phenol	298	9.3	0.017	0.029	94.1	31170	3.65	38.7	1274	148666	0.089	13228	0.249	160	1.992	4.195	0.07	48	238	20106	130100	Mitigated
50c	Propylene oxide*	298	45360	0.021	0.050	58.1	30230	62.29	53.2	44188	319110	0.212	67530										
	w/ Isopropanol	298	28.3	0.023	0.044	60.1	30150	5.41	57.9	8252	378549	0.248	93953	0.397	323	2.000	4.213	0.20	88	438	81940	156228	Mitigated
	w/ Methyl alcohol	298	36.8	0.060	0.122	32.0	19580	5.25	59.0	10315	367358	0.242	88733	0.404	315	1.998	4.207	0.19	82	408	77931	157303	Mitigated
	w/ Butyl alcohol	298	7.4	0.014	0.034	74.1	33100	3.69	53.9	1146	328174	0.217	71345	0.370	294	1.997	4.205	0.11	47	234	67887	156228	Mitigated
100c	Propylene oxide*	298	22680	0.021	0.050	58.1	30230	49.56	37.6	22094	159555	0.097	15556										
	w/ Phenol	298	9.3	0.017	0.029	94.1	31170	3.65	38.7	1274	169043	0.105	17727	0.256	180	1.997	4.206	0.08	48	238	25447	156228	Mitigated
	w/ Aniline	298	9.4	0.013	0.026	93.1	34830	3.90	38.9	1532	172305	0.107	18504	0.257	183	1.996	4.204	0.09	52	262	26302	156228	Mitigated
50c	Aniline	298	0.6	0.013	0.026	93.1	34830	1.57	1.1	19	156	0.000	0										
	w/ Methyl chloride*	298	45360	0.107	0.122	50.5	12680	43.00	53.3	33905	102858	0.053	5463	0.318	94	2.006	4.226	0.13	105	525	6940	24606	Mitigated
	w/ Vinyl chloride*	298	45360	0.036	0.077	63.5	18490	51.49	53.3	42141	186298	0.118	22008	0.356	182	1.994	4.200	0.22	128	641	26016	71631	Mitigated
100c	Aniline	298	9.4	0.013	0.026	93.1	34830	3.90	9.8	1532	12750	0.001	9										
	w/ Chloroprene*	298	22680	0.040	0.050	88.5	30000	38.77	38.9	20787	161728	0.099	16041	0.249	173	1.992	4.194	0.16	119	595	23506	6362	17144
	w/ Acrylonitrile*	298	22680	0.030	0.053	53.1	33200	47.62	38.9	21495	183228	0.116	21215	0.253	193	2.001	4.214	0.21	124	622	29255	154	29101
	w/ Sodium (H2)*	298	3944	0.040	0.295	2.0	119780	56.68	18.5	3615	116187	0.063	7375	0.080	145	1.993	4.198	0.20	105	527	16513	0	16513
	w/ Maleic Anhydride	298	5.6	0.014	0.065	98.1	14200	2.75	11.6	620	14854	0.001	15										
	w/ Acetic Anhydride	298	44.1	0.027	0.050	102	16420	5.03	28.1	11091	56254	0.020	1101	0.169	59	1.980	4.169	0.08	79	395	2734	0	2734

Unconfined Vapor Cloud Explosions

07/28/88

Case	Chemical Name	Amb. Temp K	Release Rate kg/sec or kg*	LFL	Stoic Conc	Mole Wt.	Heat Combust kJ/kg	Cloud Rad. (m)	Virt. Dist. m	Vapor > LFL kg	Max TNT Equiv kg TNT	Max Expl Effc	TNT Equiv kg TNT	Expl Prob	Dist m	Pso psi	Pref psi	Dur sec	TNO Dist. Heavy Damage m	TNO Dist. Glass Damage m	Area Covered sq.m.	Unmixed Area sq.m.	Net Area sq.m.
100c	HexaCH3 Diamine	298	0.6	0.007	0.021	116	28400	1.69	1.2	24	162	0.000	0										
	w/ Acetic Anhydride	298	44.1	0.027	0.050	102	16420	5.03	26.4	11091	43665	0.012	529	0.153	42	1.974	4.155	0.07	79	395	1385	0	1385
	w/ Chloroprene*	298	22680	0.040	0.050	88.5	30000	38.77	37.7	20787	149140	0.089	13326	0.238	161	2.000	4.211	0.15	119	595	20358	6362	13996
	w/ Acrylonitrile*	298	22680	0.030	0.053	53.1	33200	47.62	37.7	21495	170640	0.106	18105	0.243	182	2.005	4.222	0.20	124	622	26016	154	25862
	w/ Maleic Anhydride	298	5.6	0.014	0.065	98.1	14200	2.75	6.3	620	2266	0.000	0										
50c	Sodium (H2)*	298	3944	0.040	0.295	2.0	119780	56.68	15.7	3615	103438	0.054	5540	0.056	133	1.991	4.193	0.19	105	527	13893		
	w/ HCN*	298	45360	0.056	0.143	27.0	24530	57.31	55.5	39400	334320	0.221	73977	0.360	296	2.002	4.216	0.30	138	688	68813	99538	Mitigated
	w/ Styrene	298	5.7	0.011	0.021	104	41980	3.42	17.1	712	110574	0.059	6534	0.067	140	1.992	4.195	0.06	43	216	15394	0	15394
100c	Sodium (H2)*	298	3944	0.040	0.295	2.0	119780	56.68	15.7	3615	103438	0.054	5540										
	w/ Acetone*	298	22680	0.021	0.050	58.1	28500	49.51	40.8	22094	253862	0.168	42583	0.271	252	1.998	4.208	0.24	119	597	49876	16742	33134
	w/ Acrylonitrile*	298	22680	0.030	0.053	53.1	33200	47.51	40.8	21460	273638	0.181	49655	0.267	267	2.002	4.216	0.24	124	622	55990	154	55836
	w/ Aniline	298	9.4	0.013	0.026	93.1	34830	3.90	18.5	1532	116187	0.063	7375	0.080	145	1.993	4.196	0.08	52	262	16513	0	16513
	w/ Butyl Acrylate	298	26.4	0.014	0.023	128	32240	5.00	25.3	6313	152060	0.092	13935	0.140	176	2.004	4.222	0.12	82	410	24328	0	24328
	w/ Butyl Alcohol*	298	22680	0.014	0.034	74.1	33100	52.06	40.8	22466	281082	0.187	52431	0.273	273	1.998	4.208	0.27	126	631	58535	0	58535
	w/ Ethyl Acetate*	298	22680	0.022	0.040	88.1	23510	44.43	40.8	22032	227176	0.149	33766	0.271	230	2.000	4.213	0.21	112	559	41548	227	41321
	w/ Ethyl Alcohol*	298	22680	0.033	0.065	46.1	26880	47.46	40.8	21283	240106	0.158	37931	0.266	241	1.997	4.206	0.23	116	578	45617	0	45617
	w/ Formaldehyde	298	1.5	0.070	0.173	30.0	19035	1.72	15.8	58	103703	0.054	5576	0.057	133	1.995	4.202	0.02	14	72	13893	0	13893
	w/ HexaCH3 Diamine	298	0.6	0.007	0.021	116	28400	1.69	15.7	24	103599	0.054	5562	0.057	133	1.994	4.199	0.02	12	61	13893	0	13893
	w/ Isopropanol*	298	22680	0.023	0.044	60.1	30150	49.25	40.8	21968	261666	0.173	45320	0.270	258	1.999	4.211	0.25	121	607	52279	0	52279
	w/ Methyl Alcohol*	298	22680	0.060	0.122	32.0	19580	43.75	40.8	19444	194388	0.124	24158	0.254	202	1.993	4.197	0.19	101	505	32047	1075	30972
	w/ Vinyl Acetate*	298	22680	0.026	0.044	86.1	22690	42.87	40.8	21770	221442	0.144	31986	0.269	225	2.002	4.217	0.20	110	550	39761	11347	28414
	w/ MEK	298	22680	0.018	0.037	72.1	31360	49.70	40.8	22269	270267	0.179	48419	0.272	265	1.996	4.204	0.25	124	618	55155	1662	53493
	w/ Ethyl Acrylate*	298	22680	0.018	0.034	100	27630	45.24	40.8	22269	250424	0.165	41399	0.272	249	2.001	4.214	0.22	118	592	48695	0	48695
	w/ Methylmethacryla	298	22680	0.021	0.034	100	26400	44.10	40.8	22094	242778	0.160	38816	0.271	243	1.999	4.210	0.21	116	582	46377	0	46377
	w/ Chloroprene*	298	22680	0.040	0.050	88.5	30000	38.77	40.8	20787	252415	0.167	42083	0.263	251	1.996	4.204	0.19	119	595	49481	6362	43119
100c	Phenol	298	9.3	0.017	0.029	94.1	31170	3.65	8.9	1274	9488	0.000	3										
	w/ Butadiene*	298	22680	0.020	0.037	54.1	44600	53.70	38.7	22154	245531	0.162	39738	0.256	247	2.002	4.217	0.26	139	693	47916	255176	Mitigated
	w/ Acrylonitrile*	298	22680	0.030	0.053	53.1	33200	47.51	38.7	21460	179688	0.113	20318	0.251	190	1.999	4.211	0.20	124	622	28353	154	28199

Case	Chemical Name	Amb. Temp K	Release Rate kg/sec or kg*	LFL	Stoic Conc	Mole Wt.	Heat Combust kJ/kg	Cloud Rad. (m)	Virt. Dist. m	Vapor > LFL kg	Max TNT Equiv kg TNT	Max Expl Effc	TNT Equiv kg TNT	Expl Prob	Dist m	Pso psi	Pref psi	Dur sec	TNO Dist. Heavy Damage m	TNO Dist. Glass Damage m	Area Covered sq.m.	Unmixed Area sq.m.	Net Area sq.m.
100c	TDI	298	1.2	0.009	0.022	174	23900	1.77	1.7	49	278	0.000	0										
	w/ Ethyl Alcohol*	298	22680	0.033	0.065	46.1	26880	47.46	37.7	21283	136947	0.080	10925	0.242	148	2.004	4.220	0.18	116	578	17203	0	17203
	w/ Butyl Alcohol*	298	22680	0.014	0.034	74.1	33100	52.06	37.7	22466	177923	0.112	19877	0.250	189	2.004	4.220	0.23	126	631	28055	0	28055
	w/ HexaCH3 Diamine	298	0.8	0.007	0.021	116	28400	1.69	2.1	24	440	0.000	0										
	w/ Isopropanol*	298	22680	0.023	0.044	60.1	30150	49.25	37.7	21968	158506	0.097	15324	0.246	170	2.006	4.226	0.20	121	607	22698	0	22698
	w/ Methyl Alcohol*	298	22680	0.060	0.122	32.0	19580	43.75	37.7	19444	91228	0.044	4035	0.228	96	1.993	4.198	0.13	101	505	7238	1075	6163
	w/ Aniline	298	9.4	0.013	0.026	93.1	34830	3.90	9.9	1532	13028	0.001	9	0.022	8	1.965	4.135	0.02	52	262	50	0	50
50c	Alcoholic Bev.	298	0.3	0.033	0.065	46.1	26880	1.17	0.1	5	35	0.000	0										
	w/ Acetaldehyde*	298	45360	0.040	0.077	44.1	24640	57.07	53.2	41575	244755	0.161	39478	0.354	232	2.000	4.213	0.27	140	702	42273	108103	Mitigated
	w/ Butyraldehyde*	298	45360	0.025	0.037	72.1	35380	59.25	53.2	43675	369171	0.243	89571	0.363	322	1.997	4.208	0.33	161	805	81433	5675	75758
	w/ Ethylene oxide*	298	45360	0.036	0.077	44.1	27650	58.07	53.2	42141	278391	0.185	51421	0.356	258	2.003	4.219	0.29	147	733	52279	130100	Mitigated
	w/ Propylene oxide*	298	45360	0.021	0.050	58.1	30230	62.29	53.2	44188	319145	0.212	67544	0.365	288	2.000	4.212	0.33	153	767	65144	156228	Mitigated
	w/ Sodium (H2)*	298	3944	0.040	0.295	2.0	119780	56.68	15.7	3615	103472	0.054	5545	0.056	133	1.992	4.194	0.19	105	527	13893	0	13893
100c	Alcoholic Bev.	298	0.8	0.033	0.065	46.1	26880	1.61	0.2	26	166	0.000	0										
	w/ TDI	298	1.2	0.009	0.022	174	23900	1.77	2.2	49	445	0.000	0										

Case	Chemical Name	Amb. Temp K	Release Rate kg/sec* or kg	LFL	Stoic Conc	Mole Wt.	Heat Combust kJ/kg	Cloud Rad. (m)	Virt. Dist. m	Vapor > LFL kg	Max TNT Equiv kg TNT	Max Expl Effc	TNT Equiv kg TNT	Expl Prob	Dist m	Pso psi	Pref psi	Dur sec	TNO Dist. Heavy Damage m	TNO Dist. Glass Damage m	Area Covered sq.m.	Unmixed Area sq.m.	Net Area sq.m.
1	Hydrogen	298	3944	0.040	0.295	2.0	119780	56.68	15.7	3615	103438	0.054	5540	0.056	133	1.991	4.193	0.19	105	527	13893	0	13893
2	Methyl amine	298	55738	0.049	0.085	31.1	31400																
"	Ammonia	298	60154	0.15	0.218	17	18610																
"	Average	298	115892	0.089	0.143	21.7	24761	77.77	85.1	90972	538118	0.332	178922	0.502	387	2.000	4.213	0.45	183	913	117628	87816	30012
3	Ethane	298	17040	0.03	0.057	30.1	47510																
"	Ammonia	298	81064	0.15	0.218	17	18610																
"	Average	298	98104	0.105	0.167	18.4	23630	73.72	78.3	73714	416114	0.270	112249	0.461	326	1.999	4.210	0.39	168	838	83469	42273	41196
4	Ethane	298	14940	0.03	0.057	30.1	47510	49.45	30.8	14159	160703	0.098	15811	0.183	180	1.996	4.204	0.20	122	610	25447	0	25447
5	Ethane	298	34080	0.03	0.057	30.1	47510																
"	HCN	298	60048	0.056	0.143	27	24530																
"	Average	298	94128	0.043	0.094	28	32850	80.66	76.7	85399	670179	0.390	261340	0.490	459	2.000	4.212	0.51	196	982	165468	99538	65930
6	Hydrogen	298	534	0.04	0.295	2	119780																
"	Ammonia	298	81648	0.15	0.218	17	18610																
"	Average	298	82182	0.131	0.221	16.2	19267	66.76	71.7	57891	266455	0.177	47035	0.415	231	1.998	4.207	0.30	144	722	41910	42273	Mitigated
7	Vinyl chloride	298	45360	0.036	0.077	63.5	18490	51.49	53.2	42141	186142	0.118	21967	0.356	181	2.005	4.224	0.22	128	641	25730		
"	Acetylene	298	3715	0.025	0.077	26.0	48240	32.15	55.4	3577	227363	0.149	33825	0.371	216	1.998	4.202	0.15	78	388	36644	71631	Mitigated
8	Ammonia	298	45360	0.150	0.218	17.0	18610	52.93	76.8	30615	363468	0.239	86944	0.468	294	2.003	4.219	0.26	115	577	67887	136572	Mitigated
9	HexaCH3 Diamine*	298	0.2	0.007	0.021	116	28400	1.18	55.4	4	227391	0.149	33834	0.371	216	1.998	4.203	0.02	7	34	36644	71631	Mitigated
10	Aniline*	298	0.6	0.013	0.026	93.1	34830	1.58	55.4	19	227519	0.149	33874	0.371	216	1.997	4.205	0.02	12	60	36644	71631	Mitigated
11	Ethyl ether	298	14578	0.018	0.034	74.1	33840	43.03	30.2	14314	115713												
"	Ethyl Alcohol	298	9072	0.033	0.065	46.1	26880	35.07	38.4	8513	170380	0.106	18043	0.124	181	2.004	4.222	0.15	85	426	25730	0	25730
12	Ethyl ether	298	72970	0.018	0.034	74.1	33840	73.22	67.5	71647	579199												
"	Ethyl Alcohol	298	22680	0.033	0.065	46.1	26880	47.46	77.3	21283	715867	0.408	291892	0.241	479	1.997	4.206	0.31	116	578	180203	0	180203
13	Butene	298	6856	0.016	0.034	56.1	45330	37.67	20.7	6763	73240												
"	Butyl Alcohol	298	22680	0.014	0.034	74.1	33100	52.08	43.0	22466	250884	0.166	41557	0.250	247	2.003	4.218	0.26	126	631	47916	0	47916
14	Propene	298	31700	0.111	0.044	42.1	45790	47.63	44.5	23451	256524												
"	Isopropanol	298	22680	0.023	0.044	60.1	30150	49.25	58.3	21968	414752	0.269	111566	0.246	345	2.000	4.213	0.28	121	607	93482	0	93482
15	Methyl ether	298	65205	0.034	0.065	46.1	28710	66.91	63.8	60986	418276												
"	Methyl Alcohol	298	22680	0.060	0.122	32.0	19580	43.75	74.1	19444	509226	0.319	162222	0.228	383	1.999	4.210	0.26	101	505	115209	1075	114134
16	Ethyl ether	298	36485	0.018	0.034	74.1	33840	58.25	47.8	35823	289599												
"	Ethyl Alcohol	298	9072	0.033	0.065	46.1	26880	35.07	53.4	8513	344267	0.227	78314	0.124	305	2.001	4.214	0.19	85	426	73062	0	73062

Unconfined Vapor Cloud Explosions

07/28/88

Case	Chemical Name	Amb. Temp K	Release Rate kg/sec* or kg	LFL	Stoic Conc	Mole Wt.	Heat Combust kJ/kg	Cloud Rad. (m)	Virt. Dist. m	Vapor > LFL kg	Max TNT Equiv kg TNT	Max Expl Effc	TNT Equiv kg TNT	Expl Prob	Dist m	Pso psi	Pref psi	Dur sec	TNO Dist. Heavy Damage m	TNO Dist. Glass Damage m	Area Covered sq.m.	Unmixed Area sq.m.	Net Area sq.m.
17	Ethyl ether	298	7289	0.018	0.034	74.1	33840	34.23	21.3	7157	57856												
*	Ethyl Alcohol	298	22680	0.033	0.065	46.1	26880	47.46	43.3	21283	194525	0.124	24195	0.241	199	2.001	4.214	0.21	116	578	31103	0	31103
18	Methyl ether	298	32603	0.034	0.065	46.1	28710	53.23	45.1	30493	209141												
*	Methyl Alcohol	298	22680	0.060	0.122	32.0	19580	43.75	58.8	19444	300091	0.199	59791	0.228	269	1.999	4.209	0.22	101	505	56832	1075	55757
19	Chloroethane	298	24410	0.062	0.065	99.0	7700	34.06	39.1	20793	38247												
*	Ethyl Alcohol	298	9072	0.033	0.065	46.1	26880	35.07	45.7	8513	92915	0.046	4228	0.124	90	1.994	4.200	0.11	85	426	6362	0	6362
20	Chloroethane	298	32117	0.062	0.065	99.0	7700	37.29	44.8	27358	50323												
*	Ethyl Alcohol	298	45360	0.033	0.065	46.1	26880	59.65	69.6	42567	323661	0.215	69435	0.358	275	1.998	4.208	0.32	146	728	59396	0	59396
21	Chloromethane	298	25114	0.107	0.122	50.5	12680	35.38	39.8	18772	56862												
*	Methyl alcohol*	298	36.8	0.060	0.122	32.0	19580	5.25	47.1	10315	105109	0.055	5766	0.145	103	2.004	4.220	0.12	82	408	8332	1075	7257
22	Isopropylchlor.	298	19536	0.028	0.044	78.6	25000	41.47	34.9	18635	111292												
*	Isopropanol*	298	28.3	0.023	0.044	60.1	30150	5.41	41.7	8252	170730	0.106	18127	0.121	179	1.992	4.195	0.15	88	438	25165	0	25165
23	Phosphine	298	497	0.01	0.095	34	32000	17.02	5.8	495	3787	0.000											
24	Phosphine	298	558	0.01	0.095	34	32000	17.69	5.9	556	4251	0.000											

Case 1 = Sodium metal / Alkaline Liquid, Ammonium Nitrate Solution, Ferric Chloride Solution, Hydrochloric Acid, Hydrofluorosilicic Acid, Hydrogen Peroxide, Hydroiodic Acid, Phosphoric Acid, Potassium Hydroxide Liq., Pulp Mill Liquid, Sulfuric Acid Spent, Toluene Diisocyanate

Case 2 = Anhydrous Ammonia / Methyl Chloride

Case 3 = Anhydrous Ammonia / Motor Fuel Antiknock Compound

Case 4 = Motor Fuel Antiknock Compound / Hydrochloric Acid, Hydroiodic Acid, Hydrofluorosilicic Acid, Phosphoric Acid, Sulfuric Acid Spent, Aniline Oil

Case 5 = Motor Fuel Antiknock Compound / Hydrocyanic Acid

Case 6 = Anhydrous Ammonia / Sodium Metal

Case 7 = Vinyl Chloride / Alkaline Liquid, Potassium Hydroxide Liq., Sodium Hydroxide Liq.

Case 8 = Vinyl Chloride / Anhydrous Ammonia

Case 9 = Vinyl Chloride / Hexamethylene Diamine Solution

Case 10 = Vinyl Chloride / Aniline Oil

Case 11 = Alcoholic Beverage / Nitric Acid Fuming, Oleum, Sulfuric Acid

Case 12 = Ethyl Alcohol or Denatured Alcohol / Nitric Acid Fuming, Oleum, Sulfuric Acid

Case 13 = Butyl Alcohol / Nitric Acid Fuming, Oleum

Case 14 = Isopropanol / Nitric Acid Fuming, Oleum

Case 15 = Methyl Alcohol / Nitric Acid Fuming, Oleum, Sulfuric Acid

Case 16 = Sulfuric Acid, Spent / Ethyl Alcohol, Denatured Alcohol
Case 17 = Sulfuric Acid, Spent / Alcoholic Beverage
Case 18 = Sulfuric Acid, Spent / Methyl Alcohol
Case 19 = Hydrochloric Acid / Alcoholic Beverage
Case 20 = Hydrochloric Acid / Ethyl Alcohol, Denatured Alcohol
Case 21 = Hydrochloric Acid / Methyl Alcohol
Case 22 = Hydrochloric Acid / Isopropanol
Case 23 = Phosphorus / Alkaline Liquid, Potassium Hydroxide Liq., Sodium Hydroxide Liq.
Case 24 = Phosphorus / Hydrochloric Acid, Hydroiodic Acid

Table I5. Explosions

Case	Chemical Name	Heat of Decomp. kcal/mol	Weight lb	Mol. Wt.	TNT Equiv lb TNT	Distance to (m) Side-on Glass Damage .15 psig	Side-on Severe Damage 2 psig	Refl. Glass Damage .15 psig	Refl. Severe Damage 2 psig	Area Covered sq.m.
1	Polyethylidene Peroxide	97.2	2000	60.0	3234.4	811	122	1623	243	46534
2	Hydrogen Peroxide	23.1	1900	34.0	1292.0	598	90	1195	179	25239
3	Hydrogen Peroxide	23.1	950	34.0	646.0	474	71	949	142	15900
4	Ethyl Hypochlorite	89.3	1000	80.5	1107.8	568	85	1135	170	22780
5	Ethyl Hypochlorite	89.3	2000	80.5	2215.6	715	107	1430	215	36161
6	Dinitrotoluene	157.3	2000	183.0	1717.8	657	99	1314	197	30516
7	Ammonium Nitrate	88.1	2000	80.0	2199.2	713	107	1427	214	35982
8	Butyl Hypochlorite	79.5	2000	108.5	1463.2	623	93	1246	187	27423
9	Isopropyl Hypochlorite	103.2	2000	94.5	2181.8	712	107	1423	213	35792
10	Methyl Hypochlorite	94.2	2000	66.5	2831.0	776	116	1552	233	42580
11	Octyl Hypochlorite	59.7	2000	164.5	724.8	493	74	986	148	17168
12	Nitrogen trichloride	54.972	2000	120.4	912.5	532	80	1064	160	20017
13	DNT and H202		2000		1849	673	101	1347	202	32053
14	Acetyl Nitrate	130.08	2000	105	2475.5	742	111	1484	223	38936
15	Ethyl Nitrate	74.28	2000	91	1631.1	646	97	1292	194	29482
16	Ethyl Nitrate	74.28	1000	91	815.5	513	77	1025	154	18573
17	Butyl Nitrate	161.6	2000	119	2713.6	765	115	1530	230	41394
18	Enol Nitrate	139.85	2000	89	3139.9	803	121	1607	241	45623
19	Isopropyl Nitrate	165.17	2000	105	3143.3	804	121	1607	241	45656
20	Methyl Nitrate	134.63	2000	77	3493.8	833	125	1665	250	48990
21	Octyl Nitrate	142.17	2000	175	1623.4	645	97	1290	193	29389
22	Nitrobenzene	186.05	2000	123	3022.5	793	119	1587	238	44479
23	Maleyl Dinitrate	148.09	2000	206	1436.5	619	93	1238	186	27088
24	3-nitroacrylonitrile	67.74	2000	98	1381.2	611	92	1222	183	26389

Table I5. (Cont.)

Case	1st Chemical Name	2nd Chemical Name
1	Acetaldehyde	Hydrogen Peroxide
2	Hydrogen Peroxide	Acetic Acid
"	Hydrogen Peroxide	Acetic Anhydride
"	Hydrogen Peroxide	Acetone
"	Hydrogen Peroxide	Acrylic Acid
"	Hydrogen Peroxide	Acrylonitrile
"	Hydrogen Peroxide	Aniline Oil
"	Hydrogen Peroxide	Benzene
"	Hydrogen Peroxide	Butyl Acrylate
"	Hydrogen Peroxide	Butyl Alcohol
"	Hydrogen Peroxide	Butyraldehyde
"	Hydrogen Peroxide	Carbon Disulfide
"	Hydrogen Peroxide	Chloroprene
"	Hydrogen Peroxide	Denatured Alcohol
"	Hydrogen Peroxide	Ethyl Acetate
"	Hydrogen Peroxide	Ethyl Acrylate
"	Hydrogen Peroxide	Ethyl Alcohol
"	Hydrogen Peroxide	Ethylene Oxide
"	Hydrogen Peroxide	Isopropanol
"	Hydrogen Peroxide	Maleic Anhydride
"	Hydrogen Peroxide	Methyl Alcohol
"	Hydrogen Peroxide	Methyl Ethyl Ketone
"	Hydrogen Peroxide	Methyl Methacrylate
"	Hydrogen Peroxide	Motor Fuel Antiknock Comp
"	Hydrogen Peroxide	Nitric Acid, Fuming
"	Hydrogen Peroxide	Octyl Alcohol
"	Hydrogen Peroxide	Oleum
"	Hydrogen Peroxide	Phenol
"	Hydrogen Peroxide	Phosphorus
"	Hydrogen Peroxide	Propylene Oxide
"	Hydrogen Peroxide	Sodium Metal
"	Hydrogen Peroxide	Styrene Monomer
"	Hydrogen Peroxide	Toluene
"	Hydrogen Peroxide	Toluene Diisocyanate
"	Hydrogen Peroxide	Vinyl Acetate
"	Hydrogen Peroxide	Vinyl Chloride
"	Hydrogen Peroxide	Xylene
3	Hydrogen Peroxide	Alcoholic Beverage
"	Hydrogen Peroxide	Butadiene
"	Hydrogen Peroxide	Coal Tar Distillate
"	Hydrogen Peroxide	Combustible Liquid
"	Hydrogen Peroxide	Compound, Cleaning
"	Hydrogen Peroxide	Crude Oil
"	Hydrogen Peroxide	Distillate Fuel Oil
"	Hydrogen Peroxide	Ferric Chloride Solution
"	Hydrogen Peroxide	Flammable Liquid
"	Hydrogen Peroxide	Formaldehyde Soln.
"	Hydrogen Peroxide	Fuel Oil
"	Hydrogen Peroxide	Fuel, Aviation
"	Hydrogen Peroxide	Gasoline

Table I5. (Cont.)

Case	1st Chemical Name	2nd Chemical Name
"	Hydrogen Peroxide	Gasoline, nec
"	Hydrogen Peroxide	Hexamethylene Diamine Sol
"	Hydrogen Peroxide	Hydrochloric Acid
"	Hydrogen Peroxide	Hydrocyanic Acid
"	Hydrogen Peroxide	LPG-Butene
"	Hydrogen Peroxide	LPG-Butylene
"	Hydrogen Peroxide	LPG-Isobutylene
"	Hydrogen Peroxide	LPG-Propylene
"	Hydrogen Peroxide	Methyl Chloride
"	Hydrogen Peroxide	Oil
"	Hydrogen Peroxide	Petroleum Naphtha
"	Hydrogen Peroxide	Petroleum Residual Fuel
"	Hydrogen Peroxide	Petroleum, Partially Refi
"	Hydrogen Peroxide	Pulp Mill Liquid
4	Chlorine	Alcoholic Beverage
5	Chlorine	Denatured Alcohol
"	Chlorine	Ethyl Alcohol
6	Dinitrotoluene	Acetaldehyde
"	Dinitrotoluene	Alkaline Liquid
"	Dinitrotoluene	Butyraldehyde
"	Dinitrotoluene	Chlorine
"	Dinitrotoluene	Oleum
"	Dinitrotoluene	Phosphorus
"	Dinitrotoluene	Potassium Hydroxide
"	Dinitrotoluene	Sodium Hydroxide
"	Dinitrotoluene	Sodium Metal
"	Dinitrotoluene	Sulfuric Acid
"	Dinitrotoluene	Sulfuric Acid, Spent
7	Ammonium Nitrate Soln.	Chlorine
"	Ammonium Nitrate Soln.	Oleum
"	Ammonium Nitrate Soln.	Phosphorus
"	Ammonium Nitrate Soln.	Sodium Metal
"	Ammonium Nitrate Soln.	Sulfuric Acid
8	Butyl Alcohol	Chlorine
9	Isopropanol	Chlorine
10	Methyl Alcohol	Chlorine
11	Octyl Alcohol	Chlorine
12	Anhydrous Ammonia	Chlorine
13	Dinitrotoluene	Hydrogen Peroxide
14	Nitric Acid	Acetic Acid
"	Nitric Acid	Acetic Anhydride
15	Nitric Acid	Denatured Alcohol
"	Nitric Acid	Ethyl Alcohol
"	Nitric Acid	Glycol Ethers
16	Nitric Acid	Alcoholic Beverage
17	Nitric Acid	Butyl Alcohol
18	Nitric Acid	Acetaldehyde
"	Nitric Acid	Acetone
"	Nitric Acid	Butyraldehyde
19	Nitric Acid	Isopropanol

Table I5. (Cont.)

Case	1st Chemical Name	2nd Chemical Name
20	Nitric Acid	Methyl Alcohol
21	Nitric Acid	Octyl Alcohol
22	Nitric Acid	Benzene
23	Nitric Acid	Maleic Anhydride
24	Nitric Acid	Acrylonitrile

Table I6. Tank Car Explosions during Pool Fires

Chemical Name	Crit Temp C	SLT Temp. C	Boil Temp C	Flash Fract @ SLT	Spec. Heat Ratio	Vapor Ratio	Liq Dens @ bp	Vap Dens @ bp	Flsh Temp. C	Flsh Frct	Vapor Dens. #/cuft	Liquid Dens. #/cuft	Press @ SLT psia	Pres psia	Tank Burst Press psig	lbs of TNT Equiv	Side on Glass Damage m	Side on Severe Damage m	Refl. Glass Damage m	Refl. Severe Damage m	Area Covered sq.m.
Acetic Acid	322	253	118	0.63	1.15	0.99	64.90	0.118	150	0.15	1.5913	83.27	305	30	240	18	143	22	287	43	1453
Acetone	236	174	56	0.53	1.12	0.76	49.30	0.130	150	0.39	1.6783	62.99	260	175	240	582	458	69	916	137	14838
Acrylonitrile	263	216	77	0.12	1.15	0.62	49.92	0.113	150	0.25	0.3737	55.98	330	109	240	683	483	72	966	145	16506
Ammonia	132	83	-33	0.45	1.31	0.53	42.43	0.045	67	0.34	0.8293	56.10	640	500	500	2392	734	110	1467	220	38054
Aniline	426	262	184	0.33	1.08	1.09	63.65	0.005	150	-0.2	0.0127	69.61	80								
Benzene	289	225	80	0.66	1.10	1.00	46.11	0.178	150	0.31	3.0475	60.54	310	82	240	98	253	38	506	76	4531
Butadiene	152	104	-4	0.59	1.12	0.82	38.69	0.156	104	0.54	2.6402	50.74	275	275	750	785	506	76	1012	152	18109
Butane	152	105	-1	0.63	1.11	0.91	36.19	0.159	105	0.58	2.7016	47.48	245	245	750	677	482	72	963	144	16398
Carbon Dioxide	31	-6	-79	0.38	1.30	0.47	73.63	0.154	-6	0.34	2.1046	94.60	375	375	240	1188	581	87	1162	174	23873
Carbon Disulfide	279	168	46	0.37	1.21	0.66	80.50	0.181	150	0.29	1.0717	95.46	255	193	240	983	546	82	1091	164	21039
Chlorine	144	93	-35	0.50	1.35	0.60	97.34	0.220	93	0.45	4.4782	129.93	500	500	750	1324	602	90	1205	181	25649
Cyclohexane	280	220	81	0.66	1.08	0.97	48.05	0.170	150	0.32	3.0209	63.30	265	80	240	103	257	39	514	77	4665
Ethyl Alcohol	243	189	78	0.46	1.13	0.61	48.67	0.092	150	0.27	1.3428	62.93	330	132	240	342	384	58	768	115	10414
Ethylene Oxide	196	140	10	0.51	1.21	0.66	55.54	0.116	140	0.47	2.0684	73.19	435	435	500	1787	666	100	1332	200	31334
Hexane	234	184	69	0.74	1.08	1.24	40.56	0.190	150	0.52	3.3357	53.38	205	116	240	217	330	49	659	99	7677
Hydrogen Cyanide	184	128	26	0.30	1.30	0.37	43.06	0.070	128	0.27	0.8438	54.66	270	270	1250	899	530	79	1059	159	19820
Hydrogen Fluoride	188	132	20	0.69	1.11	1.15	60.53	0.050	132	0.64	0.6983	77.93	350	350	1000	6728	1036	155	2071	311	75829
Isopropanol	235	200	82	0.55	1.10	0.60	48.67	0.128	150	0.27	4.4127	68.33	355	122	240	130	278	42	556	83	5461
LPG-Butene	146	98	-6	0.61	1.10	0.88	37.44	0.158	98	0.56	2.5125	48.81	250	250	750	752	499	75	998	150	17587
LPG-Isobutane	135	88	-12	0.62	1.09	0.91	34.94	0.166	88	0.57	2.5623	45.42	230	230	750	643	474	71	947	142	15855
LPG-Isobutylene	145	96	-7		1.10		36.82	0.162	96	0.00	2.4517	47.77		0	750						
LPG-Propane	97	53	-42	0.57	1.13	0.79	36.19	0.150	53	0.52	2.3718	47.15	270	270	850	749	498	75	997	149	17553
LPG-Propylene	92	52	-48	0.56	1.15	0.71	38.06	0.138	52	0.51	2.7902	50.78	315	315	850	794	508	76	1016	152	18240
Methyl Alcohol	240	186	65	0.35	1.20	0.40	46.80	0.073	150	0.21	1.2271	61.33	425	195	240	437	416	62	832	125	12247
Sulfur Dioxide	158	50	-10	0.22	1.29	0.58	91.10	0.190	50	0.21	0.5486	100.85	115	115	500	630	470	71	941	141	15633
Vinyl Acetate	252	189	73	0.63	1.10	1.01	58.03	0.180	150	0.40	2.2065	73.79	230	143	240	425	413	62	825	124	12031
Xylene	346	235	139	0.40	1.07	0.87	53.66	0.150	150	0.05	0.6693	61.93	110	22	240	5	94	14	188	28	625

Table I6. Tank Car Explosions during Pool Fires

Chemical Name	Crit Temp C	SLT Temp. C	Boil Temp C	Flash Fract @ SLT	Spec. Heat Ratio	Vapor Ratio	Liq Dens @ bp	Vap Dens @ bp	Flsh Temp. C	Frct	Vapor Dens. #/cuft	Liquid Dens. #/cuft	Press @ SLT psia	Pres psia	Tank Burst Press psig	lbs of TNT Equiv	Side on Glass Damage m	Side on Severe Damage m	Refl. Glass Damage m	Refl. Severe Damage m	Area Covered sq.m.
Acetaldehyde	188		20.4		1.182		48.5	0.117							240	80	236	35	472	71	3944
Acrylic Acid	342		141		1.121										240	89	245	37	491	74	4256
Butyl Acrylate	327		149		1.08										240	97	252	38	505	76	4500
Chloroprene					1.12										240	90	246	37	491	74	4262
Ethyl Acrylate	279		99.6		1.08			0.222							240	97	252	38	505	76	4500
Methyl Methacryla	294		101		1.059			0.19							240	102	256	38	512	77	4637
Propylene Oxide	209		34.3		1.133		50.5	0.14							240	87	243	37	487	73	4191
Styrene	373		145		1.074			0.18							240	98	253	38	507	76	4536
Vinyl Chloride	158		13.8		1.186			0.47							750	305	369	55	738	111	9633
Tetraethyl Lead					1.161										750	321	376	56	752	113	9984
Ammonium Nitrate																24978	1604	241	3208	481	181000
Dinitrotoluene																83626	2399	360	4798	720	406882
Tetraethyl Lead																12.4	127	19	254	38	1140
Hydrogen Peroxide																67341	2232	335	4464	670	352176

Volume of Tank car = 20000 gallons Z (0.15 psig) = 180
Liquid fraction @ Rupture = 0.4 Z (2 psig) = 27

APPENDIX J

CONSEQUENCE AND RISK RANKINGS OF INCOMPATIBLE CHEMICAL COMBINATIONS

APPENDIX J

Consequence and Risk Rankings of Incompatible Chemical Combinations

Appendix J contains the following Tables:

- Table J1 - Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Pages J2-J30);
- Table J2 - Summary of Consequences (Net Area Above the Lethal Limit) from Spills of Single Chemicals (Pages J31-J33);
- Table J3 - Consequnce Rankings by Binary Combinations (Sort by Area Above Lethal Limit) (Pages J34-J47);
- Table J4 - Consequence Rankings Based on ASTM Groups (Sort by Total Area Above the Lethal Limit) (Pages J48-J50)
- Table J5 - Risk Rankings by Binary Combinations (Pages J51-J64);
- Table J6 - Risk by Specific Chemical (Pages J65-J66);
- Table J7 - Risk by ASTM Group (Page J67)

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
5	Acetaldehyde	27	Dinitrotoluene, Liquid	Explosions	30516
5	Acetaldehyde	104	Hydrogen Peroxide	Explosions	46534
5	Acetaldehyde	104	Hydrogen Peroxide	Toxic Emission	37699
5	Acetaldehyde	21	Sodium Metal	Fire Ball	34309
3	Acetic Acid, Glacial	5	Acetaldehyde	Toxic Emission	37699
3	Acetic Acid, Glacial	107	Acetic Anhydride	Fire Ball	18004
3	Acetic Acid, Glacial	107	Acetic Anhydride	Toxic Emission	131947
3	Acetic Acid, Glacial	107	Acetic Anhydride	Vapor Cloud Explosion	8659
3	Acetic Acid, Glacial	26	Acrylonitrile	Fire Ball	17414
3	Acetic Acid, Glacial	26	Acrylonitrile	Toxic Emission	3927
3	Acetic Acid, Glacial	26	Acrylonitrile	Vapor Cloud Explosion	13119
3	Acetic Acid, Glacial	10	Alkaline Liquid	Fire Ball	11433
3	Acetic Acid, Glacial	10	Alkaline Liquid	Toxic Emission	131947
3	Acetic Acid, Glacial	10	Alkaline Liquid	Vapor Cloud Explosion	2552
3	Acetic Acid, Glacial	106	Ammonium Nitrate Soln.	Fire Ball	821
3	Acetic Acid, Glacial	106	Ammonium Nitrate Soln.	Toxic Emission	6283
3	Acetic Acid, Glacial	7	Aniline Oil, Liquid	Fire Ball	1592
3	Acetic Acid, Glacial	7	Aniline Oil, Liquid	Toxic Emission	62832
3	Acetic Acid, Glacial	5	Butyraldehyde	Fire Ball	25385
3	Acetic Acid, Glacial	5	Butyraldehyde	Toxic Emission	131947
3	Acetic Acid, Glacial	5	Butyraldehyde	Vapor Cloud Explosion	37330
3	Acetic Acid, Glacial	17	Chloroprene, Inhibited	Fire Ball	23833
3	Acetic Acid, Glacial	17	Chloroprene, Inhibited	Toxic Emission	176715
3	Acetic Acid, Glacial	17	Chloroprene, Inhibited	Vapor Cloud Explosion	26323
3	Acetic Acid, Glacial	5	Formaldehyde Solution	Fire Ball	13661
3	Acetic Acid, Glacial	5	Formaldehyde Solution	Toxic Emission	131947
3	Acetic Acid, Glacial	5	Formaldehyde Solution	Vapor Cloud Explosion	2642
3	Acetic Acid, Glacial	7	Hexamethylene Diamine Soln.	Fire Ball	1417
3	Acetic Acid, Glacial	7	Hexamethylene Diamine Soln.	Toxic Emission	62832
3	Acetic Acid, Glacial	104	Hydrogen Peroxide	Explosions	25239
3	Acetic Acid, Glacial	104	Hydrogen Peroxide	Fire Ball	11433
3	Acetic Acid, Glacial	104	Hydrogen Peroxide	Toxic Emission	129591
3	Acetic Acid, Glacial	104	Hydrogen Peroxide	Vapor Cloud Explosion	2552
3	Acetic Acid, Glacial	10	Potassium Hydroxide, Liq	Fire Ball	11433
3	Acetic Acid, Glacial	10	Potassium Hydroxide, Liq	Toxic Emission	131947
3	Acetic Acid, Glacial	10	Potassium Hydroxide, Liq	Vapor Cloud Explosion	2552
3	Acetic Acid, Glacial	10	Sodium Hydroxide, Liq.	Fire Ball	11433
3	Acetic Acid, Glacial	10	Sodium Hydroxide, Liq.	Toxic Emission	131947
3	Acetic Acid, Glacial	10	Sodium Hydroxide, Liq.	Vapor Cloud Explosion	2552
3	Acetic Acid, Glacial	21	Sodium Metal	Fire Ball	47910
3	Acetic Acid, Glacial	21	Sodium Metal	Toxic Emission	131947
3	Acetic Acid, Glacial	21	Sodium Metal	Vapor Cloud Explosion	23779
3	Acetic Acid, Glacial	18	Toluene Diisocyanate	Fire Ball	19150
3	Acetic Acid, Glacial	18	Toluene Diisocyanate	Toxic Emission	131947
3	Acetic Acid, Glacial	18	Toluene Diisocyanate	Vapor Cloud Explosion	2642

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
19	Acetone	104	Hydrogen Peroxide	Explosions	25239
19	Acetone	104	Hydrogen Peroxide	Fire Ball	1867
19	Acetone	104	Hydrogen Peroxide	Toxic Emission	129591
19	Acetone	104	Hydrogen Peroxide	Vapor Cloud Explosion	3870
19	Acetone	21	Sodium Metal	Fire Ball	4307
19	Acetone	21	Sodium Metal	Toxic Emission	18850
19	Acetone	21	Sodium Metal	Vapor Cloud Explosion	33134
3	Acrylic Acid	107	Acetic Anhydride	Fire Ball	19018
3	Acrylic Acid	107	Acetic Anhydride	Toxic Emission	12566
3	Acrylic Acid	107	Acetic Anhydride	Vapor Cloud Explosion	16742
3	Acrylic Acid	26	Acrylonitrile	Fire Ball	16875
3	Acrylic Acid	26	Acrylonitrile	Toxic Emission	3927
3	Acrylic Acid	26	Acrylonitrile	Vapor Cloud Explosion	13119
3	Acrylic Acid	10	Alkaline Liquid	Fire Ball	14739
3	Acrylic Acid	10	Alkaline Liquid	Toxic Emission	?
3	Acrylic Acid	10	Alkaline Liquid	Vapor Cloud Explosion	8659
3	Acrylic Acid	106	Ammonium Nitrate Soln.	Fire Ball	441
3	Acrylic Acid	106	Ammonium Nitrate Soln.	Toxic Emission	?
3	Acrylic Acid	7	Aniline Oil, Liquid	Fire Ball	27516
3	Acrylic Acid	7	Aniline Oil, Liquid	Toxic Emission	37699
3	Acrylic Acid	7	Aniline Oil, Liquid	Vapor Cloud Explosion	11122
3	Acrylic Acid	5	Butyraldehyde	Fire Ball	26867
3	Acrylic Acid	5	Butyraldehyde	Toxic Emission	?
3	Acrylic Acid	5	Butyraldehyde	Vapor Cloud Explosion	48238
3	Acrylic Acid	17	Chloroprene, Inhibited	Fire Ball	25564
3	Acrylic Acid	17	Chloroprene, Inhibited	Toxic Emission	176715
3	Acrylic Acid	17	Chloroprene, Inhibited	Vapor Cloud Explosion	36643
3	Acrylic Acid	5	Formaldehyde Solution	Fire Ball	14843
3	Acrylic Acid	5	Formaldehyde Solution	Toxic Emission	18850
3	Acrylic Acid	5	Formaldehyde Solution	Vapor Cloud Explosion	8659
3	Acrylic Acid	7	Hexamethylene Diamine Soln.	Fire Ball	23015
3	Acrylic Acid	7	Hexamethylene Diamine Soln.	Toxic Emission	?
3	Acrylic Acid	7	Hexamethylene Diamine Soln.	Vapor Cloud Explosion	8659
3	Acrylic Acid	104	Hydrogen Peroxide	Explosions	25239
3	Acrylic Acid	104	Hydrogen Peroxide	Fire Ball	14739
3	Acrylic Acid	104	Hydrogen Peroxide	Toxic Emission	129591
3	Acrylic Acid	104	Hydrogen Peroxide	Vapor Cloud Explosion	8659
3	Acrylic Acid	10	Potassium Hydroxide, Liq	Fire Ball	14739
3	Acrylic Acid	10	Potassium Hydroxide, Liq	Toxic Emission	?
3	Acrylic Acid	10	Potassium Hydroxide, Liq	Vapor Cloud Explosion	8659
3	Acrylic Acid	10	Sodium Hydroxide, Liq.	Fire Ball	14739
3	Acrylic Acid	10	Sodium Hydroxide, Liq.	Toxic Emission	?
3	Acrylic Acid	10	Sodium Hydroxide, Liq.	Vapor Cloud Explosion	8659
3	Acrylic Acid	21	Sodium Metal	Fire Ball	51580
3	Acrylic Acid	21	Sodium Metal	Toxic Emission	?

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
3	Acrylic Acid	21	Sodium Metal	Vapor Cloud Explosion	33979
3	Acrylic Acid	18	Toluene Diisocyanate	Fire Ball	20828
3	Acrylic Acid	18	Toluene Diisocyanate	Toxic Emission	28274
3	Acrylic Acid	18	Toluene Diisocyanate	Vapor Cloud Explosion	8659
26	Acrylonitrile	104	Ferric Chloride Solution	Fire Ball	16427
26	Acrylonitrile	104	Ferric Chloride Solution	Toxic Emission	3927
26	Acrylonitrile	104	Ferric Chloride Solution	Vapor Cloud Explosion	12714
26	Acrylonitrile	104	Hydrogen Peroxide	Explosions	25239
26	Acrylonitrile	104	Hydrogen Peroxide	Fire Ball	8902
26	Acrylonitrile	104	Hydrogen Peroxide	Toxic Emission	129591
26	Acrylonitrile	104	Hydrogen Peroxide	Vapor Cloud Explosion	25862
26	Acrylonitrile	31	Phenol	Fire Ball	41571
26	Acrylonitrile	31	Phenol	Toxic Emission	60476
26	Acrylonitrile	31	Phenol	Vapor Cloud Explosion	28199
4	Alcoholic Beverage	5	Butyraldehyde	Fire Ball	26934
4	Alcoholic Beverage	5	Butyraldehyde	Vapor Cloud Explosion	75758
4	Alcoholic Beverage	104	Chlorine	Explosions	22780
4	Alcoholic Beverage	104	Hydrogen Peroxide	Explosions	15900
4	Alcoholic Beverage	104	Hydrogen Peroxide	Toxic Emission	9425
4	Alcoholic Beverage	21	Sodium Metal	Fire Ball	9839
4	Alcoholic Beverage	21	Sodium Metal	Vapor Cloud Explosion	13893
4	Alcoholic Beverage	18	Toluene Diisocyanate	Fire Ball	226
4	Alcoholic Beverage	18	Toluene Diisocyanate	Toxic Emission	28274
10	Alkaline Liquid	107	Acetic Anhydride	Fire Ball	8050
10	Alkaline Liquid	107	Acetic Anhydride	Toxic Emission	12566
10	Alkaline Liquid	107	Acetic Anhydride	Vapor Cloud Explosion	1320
10	Alkaline Liquid	19	Acetone	Fire Ball	15865
10	Alkaline Liquid	19	Acetone	Toxic Emission	27489
10	Alkaline Liquid	19	Acetone	Vapor Cloud Explosion	42654
10	Alkaline Liquid	26	Acrylonitrile	Fire Ball	8902
10	Alkaline Liquid	26	Acrylonitrile	Toxic Emission	60476
10	Alkaline Liquid	17	Carbon Tetrachloride	Toxic Emission	318086
10	Alkaline Liquid	17	Chloroprene, Inhibited	Fire Ball	11471
10	Alkaline Liquid	17	Chloroprene, Inhibited	Toxic Emission	176715
10	Alkaline Liquid	17	Chloroprene, Inhibited	Vapor Cloud Explosion	13996
10	Alkaline Liquid	27	Dinitrotoluene, Liquid	Explosions	30516
10	Alkaline Liquid	13	Ethyl Acetate	Fire Ball	12469
10	Alkaline Liquid	13	Ethyl Acetate	Toxic Emission	18850
10	Alkaline Liquid	13	Ethyl Acetate	Vapor Cloud Explosion	13876
10	Alkaline Liquid	107	Maleic Anhydride	Fire Ball	1092
10	Alkaline Liquid	107	Maleic Anhydride	Toxic Emission	?
10	Alkaline Liquid	19	Methyl Ethyl Ketone	Fire Ball	13550
10	Alkaline Liquid	19	Methyl Ethyl Ketone	Toxic Emission	3927
10	Alkaline Liquid	19	Methyl Ethyl Ketone	Vapor Cloud Explosion	24354
10	Alkaline Liquid	105	Phosphorus	Fire Ball	1162

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
10	Alkaline Liquid	105	Phosphorus	Toxic Emission	50265
10	Alkaline Liquid	21	Sodium Metal	Fire Ball	9835
10	Alkaline Liquid	21	Sodium Metal	Vapor Cloud Explosion	13893
10	Alkaline Liquid	16	Styrene Monomer	Fire Ball	26658
10	Alkaline Liquid	16	Styrene Monomer	Toxic Emission	3142
10	Alkaline Liquid	16	Styrene Monomer	Vapor Cloud Explosion	25165
10	Alkaline Liquid	18	Toluene Diisocyanate	Fire Ball	190
10	Alkaline Liquid	18	Toluene Diisocyanate	Toxic Emission	28274
10	Alkaline Liquid	13	Vinyl Acetate	Fire Ball	9096
10	Alkaline Liquid	13	Vinyl Acetate	Toxic Emission	63617
10	Alkaline Liquid	13	Vinyl Acetate	Vapor Cloud Explosion	11347
10	Alkaline Liquid	17	Vinyl Chloride	Fire Ball	8390
106	Ammonium Nitrate Soln.	107	Acetic Anhydride	Fire Ball	554
106	Ammonium Nitrate Soln.	107	Acetic Anhydride	Toxic Emission	3142
10	Anhydrous Ammonia	104	Chlorine	Explosions	20017
10	Anhydrous Ammonia	13	Ethyl Acetate	Vapor Cloud Explosion	6981
10	Anhydrous Ammonia	17	Methyl Chloride	Toxic Emission	489303
10	Anhydrous Ammonia	17	Methyl Chloride	Vapor Cloud Explosion	30012
10	Anhydrous Ammonia	19	Methyl Ethyl Ketone	Vapor Cloud Explosion	12055
10	Anhydrous Ammonia	24	Motor Fuel Antiknock Compound	Fire Ball	17738
10	Anhydrous Ammonia	24	Motor Fuel Antiknock Compound	Vapor Cloud Explosion	41196
10	Anhydrous Ammonia	13	Vinyl Acetate	Vapor Cloud Explosion	9777
7	Aniline Oil, Liquid	107	Acetic Anhydride	Fire Ball	8894
7	Aniline Oil, Liquid	107	Acetic Anhydride	Toxic Emission	37699
7	Aniline Oil, Liquid	107	Acetic Anhydride	Vapor Cloud Explosion	2734
7	Aniline Oil, Liquid	26	Acrylonitrile	Fire Ball	27120
7	Aniline Oil, Liquid	26	Acrylonitrile	Toxic Emission	60476
7	Aniline Oil, Liquid	26	Acrylonitrile	Vapor Cloud Explosion	29101
7	Aniline Oil, Liquid	17	Carbon Tetrachloride	Toxic Emission	148440
7	Aniline Oil, Liquid	17	Chloroprene, Inhibited	Fire Ball	13112
7	Aniline Oil, Liquid	17	Chloroprene, Inhibited	Toxic Emission	176715
7	Aniline Oil, Liquid	17	Chloroprene, Inhibited	Vapor Cloud Explosion	17144
7	Aniline Oil, Liquid	104	Ferric Chloride Solution	Toxic Emission	2356
7	Aniline Oil, Liquid	104	Hydrogen Peroxide	Explosions	25239
7	Aniline Oil, Liquid	104	Hydrogen Peroxide	Fire Ball	3452
7	Aniline Oil, Liquid	104	Hydrogen Peroxide	Toxic Emission	129591
7	Aniline Oil, Liquid	107	Maleic Anhydride	Fire Ball	2133
7	Aniline Oil, Liquid	107	Maleic Anhydride	Toxic Emission	37699
7	Aniline Oil, Liquid	24	Motor Fuel Antiknock Compound	Fire Ball	26670
7	Aniline Oil, Liquid	24	Motor Fuel Antiknock Compound	Toxic Emission	2356
7	Aniline Oil, Liquid	24	Motor Fuel Antiknock Compound	Vapor Cloud Explosion	25447
7	Aniline Oil, Liquid	21	Sodium Metal	Fire Ball	17466
7	Aniline Oil, Liquid	21	Sodium Metal	Toxic Emission	37699
7	Aniline Oil, Liquid	21	Sodium Metal	Vapor Cloud Explosion	16513
7	Aniline Oil, Liquid	18	Toluene Diisocyanate	Fire Ball	3540

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
7	Aniline Oil, Liquid	18	Toluene Diisocyanate	Toxic Emission	37699
16	Benzene	104	Hydrogen Peroxide	Explosions	25239
16	Benzene	104	Hydrogen Peroxide	Fire Ball	26041
16	Benzene	104	Hydrogen Peroxide	Toxic Emission	129591
16	Benzene	104	Hydrogen Peroxide	Vapor Cloud Explosion	37909
28	Butadiene	104	Hydrogen Peroxide	Explosions	15900
13	Butyl Acrylate	104	Ferric Chloride Solution	Fire Ball	965
13	Butyl Acrylate	104	Ferric Chloride Solution	Toxic Emission	?
13	Butyl Acrylate	104	Hydrogen Peroxide	Explosions	25239
13	Butyl Acrylate	104	Hydrogen Peroxide	Fire Ball	7046
13	Butyl Acrylate	104	Hydrogen Peroxide	Toxic Emission	129591
13	Butyl Acrylate	104	Hydrogen Peroxide	Vapor Cloud Explosion	2463
13	Butyl Acrylate	21	Sodium Metal	Fire Ball	10215
13	Butyl Acrylate	21	Sodium Metal	Toxic Emission	?
13	Butyl Acrylate	21	Sodium Metal	Vapor Cloud Explosion	24328
4	Butyl Alcohol	5	Butyraldehyde	Fire Ball	25805
4	Butyl Alcohol	5	Butyraldehyde	Vapor Cloud Explosion	73249
4	Butyl Alcohol	104	Chlorine	Explosions	27423
4	Butyl Alcohol	104	Hydrogen Peroxide	Explosions	25239
4	Butyl Alcohol	104	Hydrogen Peroxide	Fire Ball	20262
4	Butyl Alcohol	104	Hydrogen Peroxide	Toxic Emission	129591
4	Butyl Alcohol	104	Hydrogen Peroxide	Vapor Cloud Explosion	28055
4	Butyl Alcohol	21	Sodium Metal	Fire Ball	22900
4	Butyl Alcohol	21	Sodium Metal	Toxic Emission	19635
4	Butyl Alcohol	21	Sodium Metal	Vapor Cloud Explosion	58535
4	Butyl Alcohol	18	Toluene Diisocyanate	Fire Ball	20296
4	Butyl Alcohol	18	Toluene Diisocyanate	Toxic Emission	28274
4	Butyl Alcohol	18	Toluene Diisocyanate	Vapor Cloud Explosion	28055
5	Butyraldehyde	107	Acetic Anhydride	Fire Ball	14506
5	Butyraldehyde	107	Acetic Anhydride	Toxic Emission	3142
5	Butyraldehyde	107	Acetic Anhydride	Vapor Cloud Explosion	75758
5	Butyraldehyde	10	Alkaline Liquid	Fire Ball	11096
5	Butyraldehyde	10	Alkaline Liquid	Vapor Cloud Explosion	24497
5	Butyraldehyde	7	Aniline Oil, Liquid	Fire Ball	17962
5	Butyraldehyde	7	Aniline Oil, Liquid	Toxic Emission	2356
5	Butyraldehyde	7	Aniline Oil, Liquid	Vapor Cloud Explosion	75758
5	Butyraldehyde	27	Dinitrotoluene, Liquid	Explosions	30516
5	Butyraldehyde	104	Ferric Chloride Solution	Fire Ball	26940
5	Butyraldehyde	104	Ferric Chloride Solution	Vapor Cloud Explosion	24497
5	Butyraldehyde	7	Hexamethylene Diamine Soln.	Fire Ball	31277
5	Butyraldehyde	7	Hexamethylene Diamine Soln.	Vapor Cloud Explosion	75758
5	Butyraldehyde	104	Hydrogen Peroxide	Explosions	25239
5	Butyraldehyde	104	Hydrogen Peroxide	Fire Ball	11096
5	Butyraldehyde	104	Hydrogen Peroxide	Toxic Emission	129591
5	Butyraldehyde	104	Hydrogen Peroxide	Vapor Cloud Explosion	75758

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
5	Butyraldehyde	31	Phenol	Fire Ball	10574
5	Butyraldehyde	31	Phenol	Toxic Emission	38485
5	Butyraldehyde	31	Phenol	Vapor Cloud Explosion	26690
5	Butyraldehyde	10	Potassium Hydroxide, Liq	Fire Ball	11096
5	Butyraldehyde	10	Potassium Hydroxide, Liq	Vapor Cloud Explosion	24497
5	Butyraldehyde	10	Sodium Hydroxide, Liq.	Fire Ball	11096
5	Butyraldehyde	10	Sodium Hydroxide, Liq.	Vapor Cloud Explosion	24497
5	Butyraldehyde	21	Sodium Metal	Fire Ball	26940
5	Butyraldehyde	21	Sodium Metal	Vapor Cloud Explosion	75758
5	Butyraldehyde	18	Toluene Diisocyanate	Fire Ball	11288
5	Butyraldehyde	18	Toluene Diisocyanate	Toxic Emission	28274
5	Butyraldehyde	18	Toluene Diisocyanate	Vapor Cloud Explosion	24497
20	Carbon Disulfide	104	Ferric Chloride Solution	Toxic Emission	388772
20	Carbon Disulfide	104	Hydrogen Peroxide	Explosions	25239
20	Carbon Disulfide	104	Hydrogen Peroxide	Toxic Emission	643241
20	Carbon Disulfide	34	Propylene Oxide	Toxic Emission	225409
20	Carbon Disulfide	21	Sodium Metal	Fire Ball	2060
20	Carbon Disulfide	21	Sodium Metal	Toxic Emission	250542
17	Carbon Tetrachloride	20	Carbon Disulfide	Toxic Emission	250542
17	Carbon Tetrachloride	21	Sodium Metal	Toxic Emission	148440
104	Chlorine	106	Ammonium Nitrate Soln.	Explosions	35982
17	Chloroprene, Inhibited	104	Ferric Chloride Solution	Fire Ball	32945
17	Chloroprene, Inhibited	104	Ferric Chloride Solution	Toxic Emission	176715
17	Chloroprene, Inhibited	104	Ferric Chloride Solution	Vapor Cloud Explosion	52173
17	Chloroprene, Inhibited	104	Hydrogen Peroxide	Explosions	25239
17	Chloroprene, Inhibited	104	Hydrogen Peroxide	Fire Ball	11471
17	Chloroprene, Inhibited	104	Hydrogen Peroxide	Toxic Emission	176715
17	Chloroprene, Inhibited	104	Hydrogen Peroxide	Vapor Cloud Explosion	13996
17	Chloroprene, Inhibited	24	Motor Fuel Antiknock Compound	Fire Ball	32945
17	Chloroprene, Inhibited	24	Motor Fuel Antiknock Compound	Toxic Emission	176715
17	Chloroprene, Inhibited	24	Motor Fuel Antiknock Compound	Vapor Cloud Explosion	52173
17	Chloroprene, Inhibited	21	Sodium Metal	Fire Ball	11471
17	Chloroprene, Inhibited	21	Sodium Metal	Toxic Emission	176715
17	Chloroprene, Inhibited	21	Sodium Metal	Vapor Cloud Explosion	43119
101	Coal Tar Distillate	104	Hydrogen Peroxide	Explosions	15900
101	Coal Tar Distillate	104	Hydrogen Peroxide	Fire Ball	597
101	Coal Tar Distillate	104	Hydrogen Peroxide	Toxic Emission	9425
101	Combustible Liquid	104	Hydrogen Peroxide	Explosions	15900
101	Combustible Liquid	104	Hydrogen Peroxide	Toxic Emission	9425
101	Compound, Cleaning	104	Hydrogen Peroxide	Explosions	15900
101	Compound, Cleaning	104	Hydrogen Peroxide	Toxic Emission	9425
101	Crude Oil Petroleum	104	Hydrogen Peroxide	Explosions	15900
101	Crude Oil Petroleum	104	Hydrogen Peroxide	Fire Ball	230
101	Crude Oil Petroleum	104	Hydrogen Peroxide	Toxic Emission	9425
4	Denatured Alcohol	5	Butyraldehyde	Fire Ball	19498

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
4	Denatured Alcohol	5	Butyraldehyde	Vapor Cloud Explosion	59922
4	Denatured Alcohol	104	Chlorine	Explosions	36161
4	Denatured Alcohol	104	Hydrogen Peroxide	Explosions	25239
4	Denatured Alcohol	104	Hydrogen Peroxide	Fire Ball	15658
4	Denatured Alcohol	104	Hydrogen Peroxide	Toxic Emission	129591
4	Denatured Alcohol	104	Hydrogen Peroxide	Vapor Cloud Explosion	17203
4	Denatured Alcohol	21	Sodium Metal	Fire Ball	18011
4	Denatured Alcohol	21	Sodium Metal	Vapor Cloud Explosion	45617
4	Denatured Alcohol	18	Toluene Diisocyanate	Fire Ball	15688
4	Denatured Alcohol	18	Toluene Diisocyanate	Toxic Emission	28274
4	Denatured Alcohol	18	Toluene Diisocyanate	Vapor Cloud Explosion	17203
27	Dinitrotoluene, Liquid	107	Acetic Anhydride	Fire Ball	8050
27	Dinitrotoluene, Liquid	107	Acetic Anhydride	Toxic Emission	12566
27	Dinitrotoluene, Liquid	107	Acetic Anhydride	Vapor Cloud Explosion	1320
27	Dinitrotoluene, Liquid	104	Chlorine	Explosions	30516
27	Dinitrotoluene, Liquid	104	Hydrogen Peroxide	Explosions	32053
27	Dinitrotoluene, Liquid	104	Hydrogen Peroxide	Toxic Emission	129591
27	Dinitrotoluene, Liquid	107	Maleic Anhydride	Fire Ball	1092
27	Dinitrotoluene, Liquid	107	Maleic Anhydride	Toxic Emission	?
27	Dinitrotoluene, Liquid	105	Phosphorus	Explosions	30516
101	Distillate Fuel Oil	104	Hydrogen Peroxide	Explosions	15900
101	Distillate Fuel Oil	104	Hydrogen Peroxide	Toxic Emission	9425
13	Ethyl Acetate	104	Hydrogen Peroxide	Explosions	25239
13	Ethyl Acetate	104	Hydrogen Peroxide	Fire Ball	12469
13	Ethyl Acetate	104	Hydrogen Peroxide	Toxic Emission	129591
13	Ethyl Acetate	104	Hydrogen Peroxide	Vapor Cloud Explosion	13876
13	Ethyl Acetate	21	Sodium Metal	Fire Ball	14635
13	Ethyl Acetate	21	Sodium Metal	Toxic Emission	18850
13	Ethyl Acetate	21	Sodium Metal	Vapor Cloud Explosion	41321
13	Ethyl Acrylate	104	Ferric Chloride Solution	Fire Ball	5929
13	Ethyl Acrylate	104	Ferric Chloride Solution	Toxic Emission	6283
13	Ethyl Acrylate	104	Hydrogen Peroxide	Explosions	25239
13	Ethyl Acrylate	104	Hydrogen Peroxide	Fire Ball	16922
13	Ethyl Acrylate	104	Hydrogen Peroxide	Toxic Emission	129591
13	Ethyl Acrylate	104	Hydrogen Peroxide	Vapor Cloud Explosion	19856
13	Ethyl Acrylate	21	Sodium Metal	Fire Ball	19294
13	Ethyl Acrylate	21	Sodium Metal	Toxic Emission	62832
13	Ethyl Acrylate	21	Sodium Metal	Vapor Cloud Explosion	48695
4	Ethyl Alcohol	5	Butyraldehyde	Fire Ball	19498
4	Ethyl Alcohol	5	Butyraldehyde	Vapor Cloud Explosion	59922
4	Ethyl Alcohol	104	Chlorine	Explosions	36161
4	Ethyl Alcohol	104	Hydrogen Peroxide	Explosions	25239
4	Ethyl Alcohol	104	Hydrogen Peroxide	Fire Ball	15658
4	Ethyl Alcohol	104	Hydrogen Peroxide	Toxic Emission	129591
4	Ethyl Alcohol	104	Hydrogen Peroxide	Vapor Cloud Explosion	17203

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
4	Ethyl Alcohol	21	Sodium Metal	Fire Ball	18011
4	Ethyl Alcohol	21	Sodium Metal	Vapor Cloud Explosion	45617
4	Ethyl Alcohol	18	Toluene Diisocyanate	Fire Ball	15688
4	Ethyl Alcohol	18	Toluene Diisocyanate	Toxic Emission	28274
4	Ethyl Alcohol	18	Toluene Diisocyanate	Vapor Cloud Explosion	17203
34	Ethylene Oxide	104	Hydrogen Peroxide	Explosions	25239
104	Ferric Chloride Solution	107	Acetic Anhydride	Fire Ball	554
104	Ferric Chloride Solution	107	Acetic Anhydride	Toxic Emission	3142
104	Ferric Chloride Solution	104	Hydrogen Peroxide	Explosions	15900
104	Ferric Chloride Solution	104	Hydrogen Peroxide	Toxic Emission	129591
104	Ferric Chloride Solution	107	Maleic Anhydride	Toxic Emission	?
101	Flammable Liquid	104	Hydrogen Peroxide	Explosions	15900
101	Flammable Liquid	104	Hydrogen Peroxide	Toxic Emission	9425
5	Formaldehyde Solution	107	Acetic Anhydride	Fire Ball	554
5	Formaldehyde Solution	107	Acetic Anhydride	Toxic Emission	2356
5	Formaldehyde Solution	10	Alkaline Liquid	Toxic Emission	2356
5	Formaldehyde Solution	7	Aniline Oil, Liquid	Fire Ball	3038
5	Formaldehyde Solution	7	Aniline Oil, Liquid	Toxic Emission	49480
5	Formaldehyde Solution	104	Ferric Chloride Solution	Toxic Emission	2356
5	Formaldehyde Solution	7	Hexamethylene Diamine Soln.	Fire Ball	265
5	Formaldehyde Solution	7	Hexamethylene Diamine Soln.	Toxic Emission	18850
5	Formaldehyde Solution	104	Hydrogen Peroxide	Explosions	15900
5	Formaldehyde Solution	104	Hydrogen Peroxide	Toxic Emission	9425
5	Formaldehyde Solution	10	Potassium Hydroxide, Liq	Toxic Emission	2356
5	Formaldehyde Solution	10	Sodium Hydroxide, Liq.	Toxic Emission	2356
5	Formaldehyde Solution	21	Sodium Metal	Fire Ball	3670
5	Formaldehyde Solution	21	Sodium Metal	Toxic Emission	2356
5	Formaldehyde Solution	21	Sodium Metal	Vapor Cloud Explosion	13893
5	Formaldehyde Solution	18	Toluene Diisocyanate	Fire Ball	307
5	Formaldehyde Solution	18	Toluene Diisocyanate	Toxic Emission	27489
101	Fuel Oil	104	Hydrogen Peroxide	Explosions	15900
101	Fuel Oil	104	Hydrogen Peroxide	Fire Ball	565
101	Fuel Oil	104	Hydrogen Peroxide	Toxic Emission	9425
101	Fuel, Aviation	104	Hydrogen Peroxide	Explosions	15900
101	Fuel, Aviation	104	Hydrogen Peroxide	Fire Ball	552
101	Fuel, Aviation	104	Hydrogen Peroxide	Toxic Emission	9425
101	Gasoline	104	Hydrogen Peroxide	Explosions	15900
101	Gasoline	104	Hydrogen Peroxide	Toxic Emission	9425
101	Gasoline, nec	104	Hydrogen Peroxide	Explosions	15900
101	Gasoline, nec	104	Hydrogen Peroxide	Toxic Emission	9425
14	Glycol Ethers	104	Ferric Chloride Solution	Fire Ball	1266
14	Glycol Ethers	104	Ferric Chloride Solution	Toxic Emission	785
7	Hexamethylene Diamine Soln.	107	Acetic Anhydride	Fire Ball	8062
7	Hexamethylene Diamine Soln.	107	Acetic Anhydride	Toxic Emission	12566
7	Hexamethylene Diamine Soln.	107	Acetic Anhydride	Vapor Cloud Explosion	1385

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
7	Hexamethylene Diamine Soln.	26	Acrylonitrile	Fire Ball	25392
7	Hexamethylene Diamine Soln.	26	Acrylonitrile	Toxic Emission	60476
7	Hexamethylene Diamine Soln.	26	Acrylonitrile	Vapor Cloud Explosion	25862
7	Hexamethylene Diamine Soln.	17	Carbon Tetrachloride	Toxic Emission	148440
7	Hexamethylene Diamine Soln.	17	Chloroprene, Inhibited	Fire Ball	11492
7	Hexamethylene Diamine Soln.	17	Chloroprene, Inhibited	Toxic Emission	176715
7	Hexamethylene Diamine Soln.	17	Chloroprene, Inhibited	Vapor Cloud Explosion	13996
7	Hexamethylene Diamine Soln.	104	Hydrogen Peroxide	Explosions	15900
7	Hexamethylene Diamine Soln.	104	Hydrogen Peroxide	Fire Ball	362
7	Hexamethylene Diamine Soln.	104	Hydrogen Peroxide	Toxic Emission	129591
7	Hexamethylene Diamine Soln.	107	Maleic Anhydride	Fire Ball	896
7	Hexamethylene Diamine Soln.	107	Maleic Anhydride	Toxic Emission	?
7	Hexamethylene Diamine Soln.	21	Sodium Metal	Fire Ball	5357
7	Hexamethylene Diamine Soln.	21	Sodium Metal	Vapor Cloud Explosion	13893
7	Hexamethylene Diamine Soln.	18	Toluene Diisocyanate	Fire Ball	272
7	Hexamethylene Diamine Soln.	18	Toluene Diisocyanate	Toxic Emission	28274
1	Hydrochloric Acid	3	Acetic Acid, Glacial	Fire Ball	821
1	Hydrochloric Acid	3	Acetic Acid, Glacial	Toxic Emission	6283
1	Hydrochloric Acid	107	Acetic Anhydride	Fire Ball	8050
1	Hydrochloric Acid	107	Acetic Anhydride	Toxic Emission	19635
1	Hydrochloric Acid	107	Acetic Anhydride	Vapor Cloud Explosion	1320
1	Hydrochloric Acid	19	Acetone	Fire Ball	15865
1	Hydrochloric Acid	19	Acetone	Toxic Emission	27489
1	Hydrochloric Acid	19	Acetone	Vapor Cloud Explosion	42654
1	Hydrochloric Acid	3	Acrylic Acid	Fire Ball	441
1	Hydrochloric Acid	3	Acrylic Acid	Toxic Emission	785
1	Hydrochloric Acid	26	Acrylonitrile	Fire Ball	8902
1	Hydrochloric Acid	26	Acrylonitrile	Toxic Emission	60476
1	Hydrochloric Acid	26	Acrylonitrile	Vapor Cloud Explosion	25862
1	Hydrochloric Acid	4	Alcoholic Beverage	Fire Ball	26672
1	Hydrochloric Acid	4	Alcoholic Beverage	Toxic Emission	12566
1	Hydrochloric Acid	4	Alcoholic Beverage	Vapor Cloud Explosion	6362
1	Hydrochloric Acid	10	Alkaline Liquid	Toxic Emission	19635
1	Hydrochloric Acid	7	Aniline Oil, Liquid	Toxic Emission	2356
1	Hydrochloric Acid	13	Butyl Acrylate	Fire Ball	7046
1	Hydrochloric Acid	13	Butyl Acrylate	Toxic Emission	19635
1	Hydrochloric Acid	13	Butyl Acrylate	Vapor Cloud Explosion	2463
1	Hydrochloric Acid	4	Butyl Alcohol	Fire Ball	1749
1	Hydrochloric Acid	4	Butyl Alcohol	Toxic Emission	785
1	Hydrochloric Acid	5	Butyraldehyde	Fire Ball	26940
1	Hydrochloric Acid	5	Butyraldehyde	Toxic Emission	785
1	Hydrochloric Acid	5	Butyraldehyde	Vapor Cloud Explosion	75758
1	Hydrochloric Acid	17	Chloroprene, Inhibited	Fire Ball	11471
1	Hydrochloric Acid	17	Chloroprene, Inhibited	Toxic Emission	176715
1	Hydrochloric Acid	17	Chloroprene, Inhibited	Vapor Cloud Explosion	13996

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
1	Hydrochloric Acid	101	Coal Tar Distillate	Fire Ball	597
1	Hydrochloric Acid	101	Crude Oil Petroleum	Fire Ball	230
1	Hydrochloric Acid	4	Denatured Alcohol	Fire Ball	56667
1	Hydrochloric Acid	4	Denatured Alcohol	Toxic Emission	12566
1	Hydrochloric Acid	4	Denatured Alcohol	Vapor Cloud Explosion	59396
1	Hydrochloric Acid	13	Ethyl Acetate	Fire Ball	15323
1	Hydrochloric Acid	13	Ethyl Acetate	Toxic Emission	6283
1	Hydrochloric Acid	13	Ethyl Acetate	Vapor Cloud Explosion	19879
1	Hydrochloric Acid	13	Ethyl Acrylate	Fire Ball	16922
1	Hydrochloric Acid	13	Ethyl Acrylate	Toxic Emission	62832
1	Hydrochloric Acid	13	Ethyl Acrylate	Vapor Cloud Explosion	19856
1	Hydrochloric Acid	4	Ethyl Alcohol	Fire Ball	56667
1	Hydrochloric Acid	4	Ethyl Alcohol	Toxic Emission	12566
1	Hydrochloric Acid	4	Ethyl Alcohol	Vapor Cloud Explosion	59396
1	Hydrochloric Acid	5	Formaldehyde Solution	Toxic Emission	2356
1	Hydrochloric Acid	101	Fuel Oil	Fire Ball	565
1	Hydrochloric Acid	101	Fuel, Aviation	Fire Ball	552
1	Hydrochloric Acid	14	Glycol Ethers	Fire Ball	1266
1	Hydrochloric Acid	14	Glycol Ethers	Toxic Emission	7069
1	Hydrochloric Acid	7	Hexamethylene Diamine Soln.	Toxic Emission	785
1	Hydrochloric Acid	104	Hydrogen Peroxide	Explosions	15900
1	Hydrochloric Acid	104	Hydrogen Peroxide	Toxic Emission	751626
1	Hydrochloric Acid	4	Isopropanol	Fire Ball	27155
1	Hydrochloric Acid	4	Isopropanol	Toxic Emission	785
1	Hydrochloric Acid	4	Isopropanol	Vapor Cloud Explosion	25165
1	Hydrochloric Acid	107	Maleic Anhydride	Fire Ball	1092
1	Hydrochloric Acid	107	Maleic Anhydride	Toxic Emission	19635
1	Hydrochloric Acid	4	Methyl Alcohol	Fire Ball	16633
1	Hydrochloric Acid	4	Methyl Alcohol	Toxic Emission	18850
1	Hydrochloric Acid	4	Methyl Alcohol	Vapor Cloud Explosion	7257
1	Hydrochloric Acid	19	Methyl Ethyl Ketone	Fire Ball	13550
1	Hydrochloric Acid	19	Methyl Ethyl Ketone	Toxic Emission	3927
1	Hydrochloric Acid	19	Methyl Ethyl Ketone	Vapor Cloud Explosion	24354
1	Hydrochloric Acid	13	Methyl Methacrylate	Fire Ball	16214
1	Hydrochloric Acid	13	Methyl Methacrylate	Toxic Emission	37699
1	Hydrochloric Acid	13	Methyl Methacrylate	Vapor Cloud Explosion	17908
1	Hydrochloric Acid	24	Motor Fuel Antiknock Compound	Fire Ball	26670
1	Hydrochloric Acid	24	Motor Fuel Antiknock Compound	Vapor Cloud Explosion	25447
1	Hydrochloric Acid	2	Nitric Acid, Fuming	Toxic Emission	508938
1	Hydrochloric Acid	2	Oleum	Toxic Emission	289812
1	Hydrochloric Acid	101	Petroleum Naphtha	Fire Ball	527
1	Hydrochloric Acid	105	Phosphorus	Fire Ball	1273
1	Hydrochloric Acid	105	Phosphorus	Toxic Emission	50265
1	Hydrochloric Acid	10	Potassium Hydroxide, Liq	Toxic Emission	19635
1	Hydrochloric Acid	10	Sodium Hydroxide, Liq.	Toxic Emission	19635

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
1	Hydrochloric Acid	21	Sodium Metal	Fire Ball	9835
1	Hydrochloric Acid	21	Sodium Metal	Toxic Emission	19635
1	Hydrochloric Acid	21	Sodium Metal	Vapor Cloud Explosion	13893
1	Hydrochloric Acid	16	Styrene Monomer	Fire Ball	26658
1	Hydrochloric Acid	16	Styrene Monomer	Toxic Emission	19635
1	Hydrochloric Acid	16	Styrene Monomer	Vapor Cloud Explosion	25165
1	Hydrochloric Acid	2	Sulfuric Acid	Toxic Emission	490874
1	Hydrochloric Acid	2	Sulfuric Acid, Spent	Toxic Emission	490874
1	Hydrochloric Acid	18	Toluene Diisocyanate	Fire Ball	190
1	Hydrochloric Acid	18	Toluene Diisocyanate	Toxic Emission	28274
1	Hydrochloric Acid	13	Vinyl Acetate	Fire Ball	9096
1	Hydrochloric Acid	13	Vinyl Acetate	Toxic Emission	63617
1	Hydrochloric Acid	13	Vinyl Acetate	Vapor Cloud Explosion	11347
1	Hydrochloric Acid	17	Vinyl Chloride	Toxic Emission	19635
1	Hydrocyanic Acid	19	Acetone	Vapor Cloud Explosion	5024
1	Hydrocyanic Acid	104	Chlorine	Toxic Emission	565487
1	Hydrocyanic Acid	104	Hydrogen Peroxide	Explosions	15900
1	Hydrocyanic Acid	24	Motor Fuel Antiknock Compound	Fire Ball	22052
1	Hydrocyanic Acid	24	Motor Fuel Antiknock Compound	Vapor Cloud Explosion	65930
1	Hydrofluorosilicic Acid	3	Acetic Acid, Glacial	Fire Ball	821
1	Hydrofluorosilicic Acid	3	Acetic Acid, Glacial	Toxic Emission	6283
1	Hydrofluorosilicic Acid	107	Acetic Anhydride	Fire Ball	8050
1	Hydrofluorosilicic Acid	107	Acetic Anhydride	Toxic Emission	50265
1	Hydrofluorosilicic Acid	107	Acetic Anhydride	Vapor Cloud Explosion	1320
1	Hydrofluorosilicic Acid	19	Acetone	Fire Ball	15865
1	Hydrofluorosilicic Acid	19	Acetone	Toxic Emission	27489
1	Hydrofluorosilicic Acid	19	Acetone	Vapor Cloud Explosion	42654
1	Hydrofluorosilicic Acid	3	Acrylic Acid	Fire Ball	441
1	Hydrofluorosilicic Acid	3	Acrylic Acid	Toxic Emission	785
1	Hydrofluorosilicic Acid	26	Acrylonitrile	Fire Ball	8902
1	Hydrofluorosilicic Acid	26	Acrylonitrile	Toxic Emission	47124
1	Hydrofluorosilicic Acid	26	Acrylonitrile	Vapor Cloud Explosion	25862
1	Hydrofluorosilicic Acid	4	Alcoholic Beverage	Fire Ball	26672
1	Hydrofluorosilicic Acid	4	Alcoholic Beverage	Toxic Emission	785
1	Hydrofluorosilicic Acid	4	Alcoholic Beverage	Vapor Cloud Explosion	6362
1	Hydrofluorosilicic Acid	10	Alkaline Liquid	Toxic Emission	50265
1	Hydrofluorosilicic Acid	7	Aniline Oil, Liquid	Toxic Emission	2356
1	Hydrofluorosilicic Acid	13	Butyl Acrylate	Fire Ball	7046
1	Hydrofluorosilicic Acid	13	Butyl Acrylate	Toxic Emission	50265
1	Hydrofluorosilicic Acid	13	Butyl Acrylate	Vapor Cloud Explosion	2463
1	Hydrofluorosilicic Acid	4	Butyl Alcohol	Fire Ball	1749
1	Hydrofluorosilicic Acid	4	Butyl Alcohol	Toxic Emission	785
1	Hydrofluorosilicic Acid	5	Butyraldehyde	Fire Ball	11096
1	Hydrofluorosilicic Acid	5	Butyraldehyde	Toxic Emission	50265
1	Hydrofluorosilicic Acid	5	Butyraldehyde	Vapor Cloud Explosion	24497

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
1	Hydrofluorosilicic Acid	17	Carbon Tetrachloride	Toxic Emission	66759
1	Hydrofluorosilicic Acid	17	Chloroprene, Inhibited	Fire Ball	11471
1	Hydrofluorosilicic Acid	17	Chloroprene, Inhibited	Toxic Emission	176715
1	Hydrofluorosilicic Acid	17	Chloroprene, Inhibited	Vapor Cloud Explosion	13996
1	Hydrofluorosilicic Acid	101	Coal Tar Distillate	Fire Ball	597
1	Hydrofluorosilicic Acid	101	Crude Oil Petroleum	Fire Ball	230
1	Hydrofluorosilicic Acid	4	Denatured Alcohol	Fire Ball	56667
1	Hydrofluorosilicic Acid	4	Denatured Alcohol	Toxic Emission	785
1	Hydrofluorosilicic Acid	4	Denatured Alcohol	Vapor Cloud Explosion	59396
1	Hydrofluorosilicic Acid	13	Ethyl Acetate	Fire Ball	15323
1	Hydrofluorosilicic Acid	13	Ethyl Acetate	Toxic Emission	2356
1	Hydrofluorosilicic Acid	13	Ethyl Acetate	Vapor Cloud Explosion	19879
1	Hydrofluorosilicic Acid	13	Ethyl Acrylate	Fire Ball	16922
1	Hydrofluorosilicic Acid	13	Ethyl Acrylate	Toxic Emission	49480
1	Hydrofluorosilicic Acid	13	Ethyl Acrylate	Vapor Cloud Explosion	19856
1	Hydrofluorosilicic Acid	4	Ethyl Alcohol	Fire Ball	56667
1	Hydrofluorosilicic Acid	4	Ethyl Alcohol	Toxic Emission	785
1	Hydrofluorosilicic Acid	4	Ethyl Alcohol	Vapor Cloud Explosion	59396
1	Hydrofluorosilicic Acid	5	Formaldehyde Solution	Toxic Emission	2356
1	Hydrofluorosilicic Acid	101	Fuel Oil	Fire Ball	565
1	Hydrofluorosilicic Acid	101	Fuel, Aviation	Fire Ball	552
1	Hydrofluorosilicic Acid	14	Glycol Ethers	Fire Ball	1266
1	Hydrofluorosilicic Acid	14	Glycol Ethers	Toxic Emission	785
1	Hydrofluorosilicic Acid	7	Hexamethylene Diamine Soln.	Toxic Emission	785
1	Hydrofluorosilicic Acid	104	Hydrogen Peroxide	Toxic Emission	9425
1	Hydrofluorosilicic Acid	4	Isopropanol	Fire Ball	27155
1	Hydrofluorosilicic Acid	4	Isopropanol	Toxic Emission	785
1	Hydrofluorosilicic Acid	4	Isopropanol	Vapor Cloud Explosion	25165
1	Hydrofluorosilicic Acid	107	Maleic Anhydride	Fire Ball	1092
1	Hydrofluorosilicic Acid	107	Maleic Anhydride	Toxic Emission	50265
1	Hydrofluorosilicic Acid	4	Methyl Alcohol	Fire Ball	16633
1	Hydrofluorosilicic Acid	4	Methyl Alcohol	Vapor Cloud Explosion	7257
1	Hydrofluorosilicic Acid	17	Methyl Chloride	Toxic Emission	301593
1	Hydrofluorosilicic Acid	19	Methyl Ethyl Ketone	Fire Ball	13550
1	Hydrofluorosilicic Acid	19	Methyl Ethyl Ketone	Toxic Emission	3927
1	Hydrofluorosilicic Acid	19	Methyl Ethyl Ketone	Vapor Cloud Explosion	24354
1	Hydrofluorosilicic Acid	13	Methyl Methacrylate	Fire Ball	16214
1	Hydrofluorosilicic Acid	13	Methyl Methacrylate	Toxic Emission	49480
1	Hydrofluorosilicic Acid	13	Methyl Methacrylate	Vapor Cloud Explosion	17908
1	Hydrofluorosilicic Acid	24	Motor Fuel Antiknock Compound	Fire Ball	26670
1	Hydrofluorosilicic Acid	24	Motor Fuel Antiknock Compound	Vapor Cloud Explosion	25447
1	Hydrofluorosilicic Acid	2	Nitric Acid, Fuming	Toxic Emission	844303
1	Hydrofluorosilicic Acid	2	Oleum	Toxic Emission	706858
1	Hydrofluorosilicic Acid	101	Petroleum Naphtha	Fire Ball	527
1	Hydrofluorosilicic Acid	31	Phenol	Toxic Emission	3142

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
1	Hydrofluorosilicic Acid	105	Phosphorus	Toxic Emission	785
1	Hydrofluorosilicic Acid	10	Potassium Hydroxide, Liq	Toxic Emission	50265
1	Hydrofluorosilicic Acid	10	Sodium Hydroxide, Liq.	Toxic Emission	50265
1	Hydrofluorosilicic Acid	21	Sodium Metal	Fire Ball	9835
1	Hydrofluorosilicic Acid	21	Sodium Metal	Toxic Emission	50265
1	Hydrofluorosilicic Acid	21	Sodium Metal	Vapor Cloud Explosion	13893
1	Hydrofluorosilicic Acid	16	Styrene Monomer	Fire Ball	26658
1	Hydrofluorosilicic Acid	16	Styrene Monomer	Toxic Emission	50265
1	Hydrofluorosilicic Acid	16	Styrene Monomer	Vapor Cloud Explosion	25165
1	Hydrofluorosilicic Acid	2	Sulfuric Acid	Toxic Emission	907920
1	Hydrofluorosilicic Acid	18	Toluene Diisocyanate	Fire Ball	190
1	Hydrofluorosilicic Acid	18	Toluene Diisocyanate	Toxic Emission	50265
1	Hydrofluorosilicic Acid	13	Vinyl Acetate	Fire Ball	9096
1	Hydrofluorosilicic Acid	13	Vinyl Acetate	Toxic Emission	50265
1	Hydrofluorosilicic Acid	13	Vinyl Acetate	Vapor Cloud Explosion	11347
104	Hydrogen Peroxide	107	Acetic Anhydride	Explosions	25239
104	Hydrogen Peroxide	107	Acetic Anhydride	Fire Ball	8050
104	Hydrogen Peroxide	107	Acetic Anhydride	Toxic Emission	129591
104	Hydrogen Peroxide	107	Acetic Anhydride	Vapor Cloud Explosion	1320
104	Hydrogen Peroxide	107	Maleic Anhydride	Explosions	25239
104	Hydrogen Peroxide	107	Maleic Anhydride	Fire Ball	1092
104	Hydrogen Peroxide	107	Maleic Anhydride	Toxic Emission	129591
104	Hydrogen Peroxide	105	Phosphorus	Explosions	25239
104	Hydrogen Peroxide	105	Phosphorus	Toxic Emission	9425
1	Hydroiodic Acid	3	Acetic Acid, Glacial	Fire Ball	821
1	Hydroiodic Acid	3	Acetic Acid, Glacial	Toxic Emission	6283
1	Hydroiodic Acid	107	Acetic Anhydride	Fire Ball	8050
1	Hydroiodic Acid	107	Acetic Anhydride	Toxic Emission	12566
1	Hydroiodic Acid	107	Acetic Anhydride	Vapor Cloud Explosion	1320
1	Hydroiodic Acid	19	Acetone	Fire Ball	15865
1	Hydroiodic Acid	19	Acetone	Toxic Emission	27489
1	Hydroiodic Acid	19	Acetone	Vapor Cloud Explosion	42654
1	Hydroiodic Acid	3	Acrylic Acid	Fire Ball	441
1	Hydroiodic Acid	3	Acrylic Acid	Toxic Emission	?
1	Hydroiodic Acid	26	Acrylonitrile	Fire Ball	8902
1	Hydroiodic Acid	26	Acrylonitrile	Toxic Emission	60476
1	Hydroiodic Acid	26	Acrylonitrile	Vapor Cloud Explosion	25862
1	Hydroiodic Acid	7	Aniline Oil, Liquid	Toxic Emission	2356
1	Hydroiodic Acid	13	Butyl Acrylate	Fire Ball	7046
1	Hydroiodic Acid	13	Butyl Acrylate	Toxic Emission	?
1	Hydroiodic Acid	13	Butyl Acrylate	Vapor Cloud Explosion	2463
1	Hydroiodic Acid	5	Butyraldehyde	Fire Ball	26940
1	Hydroiodic Acid	5	Butyraldehyde	Vapor Cloud Explosion	75758
1	Hydroiodic Acid	17	Carbon Tetrachloride	Toxic Emission	148440
1	Hydroiodic Acid	17	Chloroprene, Inhibited	Fire Ball	11471

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
1	Hydroiodic Acid	17	Chloroprene, Inhibited	Toxic Emission	176715
1	Hydroiodic Acid	17	Chloroprene, Inhibited	Vapor Cloud Explosion	13996
1	Hydroiodic Acid	101	Coal Tar Distillate	Fire Ball	597
1	Hydroiodic Acid	101	Crude Oil Petroleum	Fire Ball	230
1	Hydroiodic Acid	4	Denatured Alcohol	Toxic Emission	?
1	Hydroiodic Acid	13	Ethyl Acetate	Fire Ball	15323
1	Hydroiodic Acid	13	Ethyl Acetate	Toxic Emission	6283
1	Hydroiodic Acid	13	Ethyl Acetate	Vapor Cloud Explosion	19879
1	Hydroiodic Acid	13	Ethyl Acrylate	Fire Ball	16922
1	Hydroiodic Acid	13	Ethyl Acrylate	Toxic Emission	62832
1	Hydroiodic Acid	13	Ethyl Acrylate	Vapor Cloud Explosion	19856
1	Hydroiodic Acid	4	Ethyl Alcohol	Toxic Emission	?
1	Hydroiodic Acid	5	Formaldehyde Solution	Toxic Emission	2356
1	Hydroiodic Acid	101	Fuel Oil	Fire Ball	565
1	Hydroiodic Acid	101	Fuel, Aviation	Fire Ball	552
1	Hydroiodic Acid	14	Glycol Ethers	Fire Ball	1266
1	Hydroiodic Acid	14	Glycol Ethers	Toxic Emission	12566
1	Hydroiodic Acid	104	Hydrogen Peroxide	Toxic Emission	9425
1	Hydroiodic Acid	4	Isopropanol	Toxic Emission	?
1	Hydroiodic Acid	107	Maleic Anhydride	Fire Ball	1092
1	Hydroiodic Acid	107	Maleic Anhydride	Toxic Emission	?
1	Hydroiodic Acid	4	Methyl Alcohol	Fire Ball	1428
1	Hydroiodic Acid	4	Methyl Alcohol	Toxic Emission	112312
1	Hydroiodic Acid	19	Methyl Ethyl Ketone	Fire Ball	13550
1	Hydroiodic Acid	19	Methyl Ethyl Ketone	Toxic Emission	3927
1	Hydroiodic Acid	19	Methyl Ethyl Ketone	Vapor Cloud Explosion	24354
1	Hydroiodic Acid	13	Methyl Methacrylate	Fire Ball	16214
1	Hydroiodic Acid	13	Methyl Methacrylate	Toxic Emission	37699
1	Hydroiodic Acid	13	Methyl Methacrylate	Vapor Cloud Explosion	17908
1	Hydroiodic Acid	24	Motor Fuel Antiknock Compound	Fire Ball	26670
1	Hydroiodic Acid	24	Motor Fuel Antiknock Compound	Vapor Cloud Explosion	25447
1	Hydroiodic Acid	2	Nitric Acid, Fuming	Toxic Emission	552135
1	Hydroiodic Acid	2	Oleum	Toxic Emission	251327
1	Hydroiodic Acid	101	Petroleum Naphtha	Fire Ball	527
1	Hydroiodic Acid	105	Phosphorus	Fire Ball	1273
1	Hydroiodic Acid	105	Phosphorus	Toxic Emission	254469
1	Hydroiodic Acid	21	Sodium Metal	Fire Ball	9835
1	Hydroiodic Acid	21	Sodium Metal	Toxic Emission	785
1	Hydroiodic Acid	21	Sodium Metal	Vapor Cloud Explosion	13893
1	Hydroiodic Acid	16	Styrene Monomer	Fire Ball	26658
1	Hydroiodic Acid	16	Styrene Monomer	Toxic Emission	3142
1	Hydroiodic Acid	16	Styrene Monomer	Vapor Cloud Explosion	25165
1	Hydroiodic Acid	2	Sulfuric Acid	Toxic Emission	254469
1	Hydroiodic Acid	2	Sulfuric Acid, Spent	Toxic Emission	95033
1	Hydroiodic Acid	18	Toluene Diisocyanate	Fire Ball	190

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
1	Hydroiodic Acid	18	Toluene Diisocyanate	Toxic Emission	28274
1	Hydroiodic Acid	13	Vinyl Acetate	Fire Ball	9096
1	Hydroiodic Acid	13	Vinyl Acetate	Toxic Emission	63617
1	Hydroiodic Acid	13	Vinyl Acetate	Vapor Cloud Explosion	11347
4	Isopropanol	5	Butyraldehyde	Fire Ball	22542
4	Isopropanol	5	Butyraldehyde	Vapor Cloud Explosion	66908
4	Isopropanol	104	Chlorine	Explosions	35792
4	Isopropanol	104	Hydrogen Peroxide	Explosions	25239
4	Isopropanol	104	Hydrogen Peroxide	Fire Ball	17801
4	Isopropanol	104	Hydrogen Peroxide	Toxic Emission	129591
4	Isopropanol	104	Hydrogen Peroxide	Vapor Cloud Explosion	22698
4	Isopropanol	21	Sodium Metal	Fire Ball	20305
4	Isopropanol	21	Sodium Metal	Toxic Emission	19635
4	Isopropanol	21	Sodium Metal	Vapor Cloud Explosion	52279
4	Isopropanol	18	Toluene Diisocyanate	Fire Ball	17833
4	Isopropanol	18	Toluene Diisocyanate	Toxic Emission	28274
4	Isopropanol	18	Toluene Diisocyanate	Vapor Cloud Explosion	22698
28	LPG-Butene	104	Hydrogen Peroxide	Explosions	15900
28	LPG-Butylene	104	Hydrogen Peroxide	Explosions	15900
28	LPG-Isobutylene	104	Hydrogen Peroxide	Explosions	15900
28	LPG-Propylene	104	Hydrogen Peroxide	Explosions	15900
28	LPG-Propylene	104	Hydrogen Peroxide	Toxic Emission	9425
4	Methyl Alcohol	5	Butyraldehyde	Fire Ball	8601
4	Methyl Alcohol	5	Butyraldehyde	Vapor Cloud Explosion	44722
4	Methyl Alcohol	104	Chlorine	Explosions	42580
4	Methyl Alcohol	104	Ferric Chloride Solution	Toxic Emission	6283
4	Methyl Alcohol	104	Hydrogen Peroxide	Explosions	25239
4	Methyl Alcohol	104	Hydrogen Peroxide	Fire Ball	6861
4	Methyl Alcohol	104	Hydrogen Peroxide	Toxic Emission	129591
4	Methyl Alcohol	104	Hydrogen Peroxide	Vapor Cloud Explosion	6163
4	Methyl Alcohol	21	Sodium Metal	Fire Ball	8861
4	Methyl Alcohol	21	Sodium Metal	Toxic Emission	27489
4	Methyl Alcohol	21	Sodium Metal	Vapor Cloud Explosion	30972
4	Methyl Alcohol	18	Toluene Diisocyanate	Fire Ball	6886
4	Methyl Alcohol	18	Toluene Diisocyanate	Toxic Emission	27489
4	Methyl Alcohol	18	Toluene Diisocyanate	Vapor Cloud Explosion	6163
17	Methyl Chloride	104	Hydrogen Peroxide	Explosions	15900
19	Methyl Ethyl Ketone	104	Ferric Chloride Solution	Fire Ball	13550
19	Methyl Ethyl Ketone	104	Ferric Chloride Solution	Toxic Emission	3927
19	Methyl Ethyl Ketone	104	Ferric Chloride Solution	Vapor Cloud Explosion	24354
19	Methyl Ethyl Ketone	104	Hydrogen Peroxide	Explosions	25239
19	Methyl Ethyl Ketone	104	Hydrogen Peroxide	Fire Ball	13301
19	Methyl Ethyl Ketone	104	Hydrogen Peroxide	Toxic Emission	129591
19	Methyl Ethyl Ketone	104	Hydrogen Peroxide	Vapor Cloud Explosion	23503
19	Methyl Ethyl Ketone	21	Sodium Metal	Fire Ball	15859

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
19	Methyl Ethyl Ketone	21	Sodium Metal	Toxic Emission	60476
19	Methyl Ethyl Ketone	21	Sodium Metal	Vapor Cloud Explosion	53493
13	Methyl Methacrylate	104	Ferric Chloride Solution	Fire Ball	5103
13	Methyl Methacrylate	104	Ferric Chloride Solution	Toxic Emission	2356
13	Methyl Methacrylate	104	Ferric Chloride Solution	Vapor Cloud Explosion	1521
13	Methyl Methacrylate	104	Hydrogen Peroxide	Explosions	25239
13	Methyl Methacrylate	104	Hydrogen Peroxide	Fire Ball	16214
13	Methyl Methacrylate	104	Hydrogen Peroxide	Toxic Emission	129591
13	Methyl Methacrylate	104	Hydrogen Peroxide	Vapor Cloud Explosion	17908
13	Methyl Methacrylate	21	Sodium Metal	Fire Ball	18527
13	Methyl Methacrylate	21	Sodium Metal	Toxic Emission	37699
13	Methyl Methacrylate	21	Sodium Metal	Vapor Cloud Explosion	46377
24	Motor Fuel Antiknock Compound	104	Hydrogen Peroxide	Explosions	25239
24	Motor Fuel Antiknock Compound	104	Hydrogen Peroxide	Toxic Emission	129591
2	Nitric Acid, Fuming	5	Acetaldehyde	Explosions	45623
2	Nitric Acid, Fuming	5	Acetaldehyde	Toxic Emission	520719
2	Nitric Acid, Fuming	3	Acetic Acid, Glacial	Explosions	38936
2	Nitric Acid, Fuming	3	Acetic Acid, Glacial	Fire Ball	821
2	Nitric Acid, Fuming	3	Acetic Acid, Glacial	Toxic Emission	137445
2	Nitric Acid, Fuming	107	Acetic Anhydride	Explosions	38936
2	Nitric Acid, Fuming	107	Acetic Anhydride	Fire Ball	8050
2	Nitric Acid, Fuming	107	Acetic Anhydride	Toxic Emission	552135
2	Nitric Acid, Fuming	19	Acetone	Explosions	45623
2	Nitric Acid, Fuming	19	Acetone	Fire Ball	1867
2	Nitric Acid, Fuming	19	Acetone	Toxic Emission	552135
2	Nitric Acid, Fuming	19	Acetone	Vapor Cloud Explosion	3870
2	Nitric Acid, Fuming	3	Acrylic Acid	Fire Ball	441
2	Nitric Acid, Fuming	3	Acrylic Acid	Toxic Emission	137445
2	Nitric Acid, Fuming	26	Acrylonitrile	Explosions	26389
2	Nitric Acid, Fuming	26	Acrylonitrile	Fire Ball	8902
2	Nitric Acid, Fuming	26	Acrylonitrile	Toxic Emission	552135
2	Nitric Acid, Fuming	26	Acrylonitrile	Vapor Cloud Explosion	25862
2	Nitric Acid, Fuming	4	Alcoholic Beverage	Explosions	18573
2	Nitric Acid, Fuming	4	Alcoholic Beverage	Fire Ball	21389
2	Nitric Acid, Fuming	4	Alcoholic Beverage	Toxic Emission	552135
2	Nitric Acid, Fuming	4	Alcoholic Beverage	Vapor Cloud Explosion	25730
2	Nitric Acid, Fuming	10	Alkaline Liquid	Toxic Emission	552135
2	Nitric Acid, Fuming	106	Ammonium Nitrate Soln.	Toxic Emission	137445
2	Nitric Acid, Fuming	7	Aniline Oil, Liquid	Fire Ball	3452
2	Nitric Acid, Fuming	7	Aniline Oil, Liquid	Toxic Emission	552135
2	Nitric Acid, Fuming	16	Benzene	Explosions	44479
2	Nitric Acid, Fuming	16	Benzene	Fire Ball	26041
2	Nitric Acid, Fuming	16	Benzene	Toxic Emission	552135
2	Nitric Acid, Fuming	16	Benzene	Vapor Cloud Explosion	37909
2	Nitric Acid, Fuming	28	Butadiene	Toxic Emission	137445

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
2	Nitric Acid, Fuming	13	Butyl Acrylate	Fire Ball	7046
2	Nitric Acid, Fuming	13	Butyl Acrylate	Toxic Emission	552135
2	Nitric Acid, Fuming	13	Butyl Acrylate	Vapor Cloud Explosion	2463
2	Nitric Acid, Fuming	4	Butyl Alcohol	Explosions	41394
2	Nitric Acid, Fuming	4	Butyl Alcohol	Fire Ball	32060
2	Nitric Acid, Fuming	4	Butyl Alcohol	Toxic Emission	552135
2	Nitric Acid, Fuming	4	Butyl Alcohol	Vapor Cloud Explosion	47916
2	Nitric Acid, Fuming	5	Butyraldehyde	Explosions	45623
2	Nitric Acid, Fuming	5	Butyraldehyde	Fire Ball	11096
2	Nitric Acid, Fuming	5	Butyraldehyde	Toxic Emission	552135
2	Nitric Acid, Fuming	5	Butyraldehyde	Vapor Cloud Explosion	24497
2	Nitric Acid, Fuming	20	Carbon Disulfide	Toxic Emission	250542
2	Nitric Acid, Fuming	20	Carbon Disulfide	Vapor Cloud Explosion	2043
2	Nitric Acid, Fuming	17	Carbon Tetrachloride	Toxic Emission	?
2	Nitric Acid, Fuming	17	Chloroprene, Inhibited	Fire Ball	32945
2	Nitric Acid, Fuming	17	Chloroprene, Inhibited	Toxic Emission	552135
2	Nitric Acid, Fuming	17	Chloroprene, Inhibited	Vapor Cloud Explosion	13996
2	Nitric Acid, Fuming	101	Coal Tar Distillate	Fire Ball	597
2	Nitric Acid, Fuming	101	Coal Tar Distillate	Toxic Emission	137445
2	Nitric Acid, Fuming	101	Combustible Liquid	Toxic Emission	137445
2	Nitric Acid, Fuming	101	Compound, Cleaning	Toxic Emission	137445
2	Nitric Acid, Fuming	101	Crude Oil Petroleum	Fire Ball	230
2	Nitric Acid, Fuming	101	Crude Oil Petroleum	Toxic Emission	137445
2	Nitric Acid, Fuming	4	Denatured Alcohol	Explosions	29482
2	Nitric Acid, Fuming	4	Denatured Alcohol	Fire Ball	72304
2	Nitric Acid, Fuming	4	Denatured Alcohol	Toxic Emission	552135
2	Nitric Acid, Fuming	4	Denatured Alcohol	Vapor Cloud Explosion	180203
2	Nitric Acid, Fuming	27	Dinitrotoluene, Liquid	Toxic Emission	137445
2	Nitric Acid, Fuming	101	Distillate Fuel Oil	Toxic Emission	137445
2	Nitric Acid, Fuming	13	Ethyl Acetate	Fire Ball	12469
2	Nitric Acid, Fuming	13	Ethyl Acetate	Toxic Emission	137445
2	Nitric Acid, Fuming	13	Ethyl Acetate	Vapor Cloud Explosion	19879
2	Nitric Acid, Fuming	13	Ethyl Acrylate	Fire Ball	16922
2	Nitric Acid, Fuming	13	Ethyl Acrylate	Toxic Emission	552135
2	Nitric Acid, Fuming	13	Ethyl Acrylate	Vapor Cloud Explosion	19856
2	Nitric Acid, Fuming	4	Ethyl Alcohol	Explosions	29482
2	Nitric Acid, Fuming	4	Ethyl Alcohol	Fire Ball	72304
2	Nitric Acid, Fuming	4	Ethyl Alcohol	Toxic Emission	552135
2	Nitric Acid, Fuming	4	Ethyl Alcohol	Vapor Cloud Explosion	180203
2	Nitric Acid, Fuming	34	Ethylene Oxide	Toxic Emission	124878
2	Nitric Acid, Fuming	101	Flammable Liquid	Toxic Emission	137445
2	Nitric Acid, Fuming	5	Formaldehyde Solution	Fire Ball	157
2	Nitric Acid, Fuming	5	Formaldehyde Solution	Toxic Emission	552135
2	Nitric Acid, Fuming	101	Fuel Oil	Fire Ball	565
2	Nitric Acid, Fuming	101	Fuel Oil	Toxic Emission	137445

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
2	Nitric Acid, Fuming	101	Fuel, Aviation	Fire Ball	552
2	Nitric Acid, Fuming	101	Fuel, Aviation	Toxic Emission	137445
2	Nitric Acid, Fuming	101	Gasoline	Toxic Emission	137445
2	Nitric Acid, Fuming	101	Gasoline, nec	Toxic Emission	137445
2	Nitric Acid, Fuming	14	Glycol Ethers	Explosions	29482
2	Nitric Acid, Fuming	14	Glycol Ethers	Fire Ball	23147
2	Nitric Acid, Fuming	14	Glycol Ethers	Toxic Emission	552135
2	Nitric Acid, Fuming	14	Glycol Ethers	Vapor Cloud Explosion	12272
2	Nitric Acid, Fuming	7	Hexamethylene Diamine Soln.	Fire Ball	362
2	Nitric Acid, Fuming	7	Hexamethylene Diamine Soln.	Toxic Emission	552135
2	Nitric Acid, Fuming	104	Hydrogen Peroxide	Explosions	25239
2	Nitric Acid, Fuming	104	Hydrogen Peroxide	Toxic Emission	137445
2	Nitric Acid, Fuming	4	Isopropanol	Explosions	45656
2	Nitric Acid, Fuming	4	Isopropanol	Fire Ball	42615
2	Nitric Acid, Fuming	4	Isopropanol	Toxic Emission	552135
2	Nitric Acid, Fuming	4	Isopropanol	Vapor Cloud Explosion	93482
2	Nitric Acid, Fuming	28	LPG	Toxic Emission	137445
2	Nitric Acid, Fuming	28	LPG-Butene	Toxic Emission	137445
2	Nitric Acid, Fuming	28	LPG-Isobutylene	Toxic Emission	137445
2	Nitric Acid, Fuming	28	LPG-Propylene	Toxic Emission	137445
2	Nitric Acid, Fuming	107	Maleic Anhydride	Explosions	27088
2	Nitric Acid, Fuming	107	Maleic Anhydride	Toxic Emission	137445
2	Nitric Acid, Fuming	4	Methyl Alcohol	Explosions	48990
2	Nitric Acid, Fuming	4	Methyl Alcohol	Fire Ball	47189
2	Nitric Acid, Fuming	4	Methyl Alcohol	Toxic Emission	552135
2	Nitric Acid, Fuming	4	Methyl Alcohol	Vapor Cloud Explosion	114134
2	Nitric Acid, Fuming	17	Methyl Chloride	Toxic Emission	412334
2	Nitric Acid, Fuming	19	Methyl Ethyl Ketone	Fire Ball	13301
2	Nitric Acid, Fuming	19	Methyl Ethyl Ketone	Toxic Emission	552135
2	Nitric Acid, Fuming	19	Methyl Ethyl Ketone	Vapor Cloud Explosion	23503
2	Nitric Acid, Fuming	13	Methyl Methacrylate	Fire Ball	16214
2	Nitric Acid, Fuming	13	Methyl Methacrylate	Toxic Emission	552135
2	Nitric Acid, Fuming	13	Methyl Methacrylate	Vapor Cloud Explosion	17908
2	Nitric Acid, Fuming	24	Motor Fuel Antiknock Compound	Toxic Emission	552135
2	Nitric Acid, Fuming	4	Octyl Alcohol	Explosions	29389
2	Nitric Acid, Fuming	4	Octyl Alcohol	Toxic Emission	137445
2	Nitric Acid, Fuming	101	Oil	Toxic Emission	137445
2	Nitric Acid, Fuming	2	Oleum	Toxic Emission	251327
2	Nitric Acid, Fuming	101	Petroleum Naphtha	Fire Ball	527
2	Nitric Acid, Fuming	101	Petroleum Naphtha	Toxic Emission	137445
2	Nitric Acid, Fuming	101	Petroleum Residual Fuel	Toxic Emission	137445
2	Nitric Acid, Fuming	101	Petroleum, Refined	Toxic Emission	137445
2	Nitric Acid, Fuming	31	Phenol	Fire Ball	1991
2	Nitric Acid, Fuming	31	Phenol	Toxic Emission	552135
2	Nitric Acid, Fuming	105	Phosphorus	Toxic Emission	552135

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
2	Nitric Acid, Fuming	10	Potassium Hydroxide, Liq	Toxic Emission	552135
2	Nitric Acid, Fuming	101	Pulp Mill Liquid	Toxic Emission	137445
2	Nitric Acid, Fuming	10	Sodium Hydroxide, Liq.	Toxic Emission	552135
2	Nitric Acid, Fuming	21	Sodium Metal	Toxic Emission	552135
2	Nitric Acid, Fuming	16	Styrene Monomer	Fire Ball	26658
2	Nitric Acid, Fuming	16	Styrene Monomer	Toxic Emission	552135
2	Nitric Acid, Fuming	16	Styrene Monomer	Vapor Cloud Explosion	25165
2	Nitric Acid, Fuming	16	Toluene	Fire Ball	31952
2	Nitric Acid, Fuming	16	Toluene	Toxic Emission	552135
2	Nitric Acid, Fuming	16	Toluene	Vapor Cloud Explosion	34967
2	Nitric Acid, Fuming	18	Toluene Diisocyanate	Fire Ball	190
2	Nitric Acid, Fuming	18	Toluene Diisocyanate	Toxic Emission	552135
2	Nitric Acid, Fuming	13	Vinyl Acetate	Fire Ball	9096
2	Nitric Acid, Fuming	13	Vinyl Acetate	Toxic Emission	137445
2	Nitric Acid, Fuming	13	Vinyl Acetate	Vapor Cloud Explosion	22327
2	Nitric Acid, Fuming	17	Vinyl Chloride	Toxic Emission	137445
2	Nitric Acid, Fuming	16	Xylene	Fire Ball	35015
2	Nitric Acid, Fuming	16	Xylene	Toxic Emission	552135
2	Nitric Acid, Fuming	16	Xylene	Vapor Cloud Explosion	40828
4	Octyl Alcohol	104	Chlorine	Explosions	17168
4	Octyl Alcohol	104	Hydrogen Peroxide	Explosions	25239
4	Octyl Alcohol	104	Hydrogen Peroxide	Toxic Emission	129591
4	Octyl Alcohol	21	Sodium Metal	Fire Ball	9835
4	Octyl Alcohol	21	Sodium Metal	Vapor Cloud Explosion	13893
4	Octyl Alcohol	18	Toluene Diisocyanate	Toxic Emission	28274
101	Oil	104	Hydrogen Peroxide	Explosions	15900
101	Oil	104	Hydrogen Peroxide	Toxic Emission	9425
2	Oleum	5	Acetaldehyde	Toxic Emission	603186
2	Oleum	3	Acetic Acid, Glacial	Fire Ball	11433
2	Oleum	3	Acetic Acid, Glacial	Toxic Emission	603186
2	Oleum	3	Acetic Acid, Glacial	Vapor Cloud Explosion	2552
2	Oleum	107	Acetic Anhydride	Fire Ball	8050
2	Oleum	107	Acetic Anhydride	Toxic Emission	603186
2	Oleum	107	Acetic Anhydride	Vapor Cloud Explosion	1320
2	Oleum	19	Acetone	Fire Ball	1867
2	Oleum	19	Acetone	Toxic Emission	603186
2	Oleum	19	Acetone	Vapor Cloud Explosion	3870
2	Oleum	3	Acrylic Acid	Fire Ball	14739
2	Oleum	3	Acrylic Acid	Toxic Emission	603186
2	Oleum	3	Acrylic Acid	Vapor Cloud Explosion	8659
2	Oleum	26	Acrylonitrile	Fire Ball	8902
2	Oleum	26	Acrylonitrile	Toxic Emission	603186
2	Oleum	26	Acrylonitrile	Vapor Cloud Explosion	25862
2	Oleum	4	Alcoholic Beverage	Fire Ball	21389
2	Oleum	4	Alcoholic Beverage	Toxic Emission	603186

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
2	Oleum	4	Alcoholic Beverage	Vapor Cloud Explosion	25730
2	Oleum	10	Alkaline Liquid	Toxic Emission	603186
2	Oleum	106	Ammonium Nitrate Soln.	Explosions	35982
2	Oleum	106	Ammonium Nitrate Soln.	Toxic Emission	603186
2	Oleum	7	Aniline Oil, Liquid	Fire Ball	3452
2	Oleum	7	Aniline Oil, Liquid	Toxic Emission	603186
2	Oleum	16	Benzene	Fire Ball	26041
2	Oleum	16	Benzene	Toxic Emission	603186
2	Oleum	16	Benzene	Vapor Cloud Explosion	37909
2	Oleum	28	Butadiene	Toxic Emission	329867
2	Oleum	13	Butyl Acrylate	Fire Ball	7046
2	Oleum	13	Butyl Acrylate	Toxic Emission	603186
2	Oleum	13	Butyl Acrylate	Vapor Cloud Explosion	2463
2	Oleum	4	Butyl Alcohol	Fire Ball	32060
2	Oleum	4	Butyl Alcohol	Toxic Emission	603186
2	Oleum	4	Butyl Alcohol	Vapor Cloud Explosion	47916
2	Oleum	5	Butyraldehyde	Fire Ball	11096
2	Oleum	5	Butyraldehyde	Toxic Emission	603186
2	Oleum	5	Butyraldehyde	Vapor Cloud Explosion	24497
2	Oleum	17	Carbon Tetrachloride	Toxic Emission	603186
2	Oleum	17	Chloroprene, Inhibited	Fire Ball	32945
2	Oleum	17	Chloroprene, Inhibited	Toxic Emission	329867
2	Oleum	17	Chloroprene, Inhibited	Vapor Cloud Explosion	52173
2	Oleum	101	Coal Tar Distillate	Fire Ball	597
2	Oleum	101	Coal Tar Distillate	Toxic Emission	251327
2	Oleum	101	Combustible Liquid	Toxic Emission	251327
2	Oleum	101	Compound, Cleaning	Toxic Emission	251327
2	Oleum	101	Crude Oil Petroleum	Fire Ball	230
2	Oleum	101	Crude Oil Petroleum	Toxic Emission	251327
2	Oleum	4	Denatured Alcohol	Fire Ball	72304
2	Oleum	4	Denatured Alcohol	Toxic Emission	603186
2	Oleum	4	Denatured Alcohol	Vapor Cloud Explosion	180203
2	Oleum	27	Dinitrotoluene, Liquid	Explosions	30516
2	Oleum	27	Dinitrotoluene, Liquid	Toxic Emission	603186
2	Oleum	101	Distillate Fuel Oil	Toxic Emission	251327
2	Oleum	13	Ethyl Acetate	Fire Ball	12469
2	Oleum	13	Ethyl Acetate	Toxic Emission	603186
2	Oleum	13	Ethyl Acetate	Vapor Cloud Explosion	13876
2	Oleum	13	Ethyl Acrylate	Fire Ball	16922
2	Oleum	13	Ethyl Acrylate	Toxic Emission	603186
2	Oleum	13	Ethyl Acrylate	Vapor Cloud Explosion	19856
2	Oleum	4	Ethyl Alcohol	Fire Ball	72304
2	Oleum	4	Ethyl Alcohol	Toxic Emission	603186
2	Oleum	4	Ethyl Alcohol	Vapor Cloud Explosion	180203
2	Oleum	34	Ethylene Oxide	Toxic Emission	603186

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
2	Oleum	101	Flammable Liquid	Toxic Emission	251327
2	Oleum	5	Formaldehyde Solution	Fire Ball	157
2	Oleum	5	Formaldehyde Solution	Toxic Emission	329867
2	Oleum	101	Fuel Oil	Fire Ball	565
2	Oleum	101	Fuel Oil	Toxic Emission	251327
2	Oleum	101	Fuel, Aviation	Fire Ball	552
2	Oleum	101	Fuel, Aviation	Toxic Emission	251327
2	Oleum	101	Gasoline	Toxic Emission	251327
2	Oleum	101	Gasoline, nec	Toxic Emission	251327
2	Oleum	14	Glycol Ethers	Fire Ball	23147
2	Oleum	14	Glycol Ethers	Toxic Emission	603186
2	Oleum	14	Glycol Ethers	Vapor Cloud Explosion	12272
2	Oleum	7	Hexamethylene Diamine Soln.	Fire Ball	362
2	Oleum	7	Hexamethylene Diamine Soln.	Toxic Emission	329867
2	Oleum	104	Hydrogen Peroxide	Explosions	25239
2	Oleum	104	Hydrogen Peroxide	Toxic Emission	603186
2	Oleum	4	Isopropanol	Fire Ball	42615
2	Oleum	4	Isopropanol	Toxic Emission	603186
2	Oleum	4	Isopropanol	Vapor Cloud Explosion	93482
2	Oleum	28	LPG	Toxic Emission	329867
2	Oleum	28	LPG-Butene	Toxic Emission	329867
2	Oleum	28	LPG-Isobutylene	Toxic Emission	329867
2	Oleum	28	LPG-Propylene	Toxic Emission	329867
2	Oleum	107	Maleic Anhydride	Toxic Emission	603186
2	Oleum	4	Methyl Alcohol	Fire Ball	47189
2	Oleum	4	Methyl Alcohol	Toxic Emission	603186
2	Oleum	4	Methyl Alcohol	Vapor Cloud Explosion	114134
2	Oleum	17	Methyl Chloride	Toxic Emission	251327
2	Oleum	19	Methyl Ethyl Ketone	Fire Ball	13301
2	Oleum	19	Methyl Ethyl Ketone	Toxic Emission	603186
2	Oleum	19	Methyl Ethyl Ketone	Vapor Cloud Explosion	23503
2	Oleum	13	Methyl Methacrylate	Fire Ball	16214
2	Oleum	13	Methyl Methacrylate	Toxic Emission	603186
2	Oleum	13	Methyl Methacrylate	Vapor Cloud Explosion	17908
2	Oleum	24	Motor Fuel Antiknock Compound	Toxic Emission	603186
2	Oleum	4	Octyl Alcohol	Toxic Emission	603186
2	Oleum	101	Oil	Toxic Emission	251327
2	Oleum	101	Petroleum Naphtha	Fire Ball	527
2	Oleum	101	Petroleum Naphtha	Toxic Emission	251327
2	Oleum	101	Petroleum Residual Fuel	Toxic Emission	251327
2	Oleum	101	Petroleum, Refined	Toxic Emission	251327
2	Oleum	31	Phenol	Fire Ball	1991
2	Oleum	31	Phenol	Toxic Emission	603186
2	Oleum	105	Phosphorus	Toxic Emission	603186
2	Oleum	10	Potassium Hydroxide, Liq	Toxic Emission	603186

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
2	Oleum	34	Propylene Oxide	Toxic Emission	603186
2	Oleum	101	Pulp Mill Liquid	Toxic Emission	251327
2	Oleum	10	Sodium Hydroxide, Liq.	Toxic Emission	603186
2	Oleum	21	Sodium Metal	Toxic Emission	329867
2	Oleum	16	Styrene Monomer	Fire Ball	26658
2	Oleum	16	Styrene Monomer	Toxic Emission	603186
2	Oleum	16	Styrene Monomer	Vapor Cloud Explosion	25165
2	Oleum	16	Toluene	Fire Ball	31952
2	Oleum	16	Toluene	Toxic Emission	603186
2	Oleum	16	Toluene	Vapor Cloud Explosion	34967
2	Oleum	18	Toluene Diisocyanate	Fire Ball	190
2	Oleum	18	Toluene Diisocyanate	Toxic Emission	603186
2	Oleum	13	Vinyl Acetate	Fire Ball	9096
2	Oleum	13	Vinyl Acetate	Toxic Emission	603186
2	Oleum	13	Vinyl Acetate	Vapor Cloud Explosion	11347
2	Oleum	17	Vinyl Chloride	Toxic Emission	251327
2	Oleum	16	Xylene	Fire Ball	35015
2	Oleum	16	Xylene	Toxic Emission	603186
2	Oleum	16	Xylene	Vapor Cloud Explosion	40828
101	Petroleum Naphtha	104	Hydrogen Peroxide	Explosions	15900
101	Petroleum Naphtha	104	Hydrogen Peroxide	Fire Ball	527
101	Petroleum Naphtha	104	Hydrogen Peroxide	Toxic Emission	9425
101	Petroleum Refined	104	Hydrogen Peroxide	Explosions	15900
101	Petroleum Residual Fuel	104	Hydrogen Peroxide	Explosions	15900
101	Petroleum Residual Fuel	104	Hydrogen Peroxide	Toxic Emission	9425
101	Petroleum, Refined	104	Hydrogen Peroxide	Toxic Emission	9425
31	Phenol	104	Hydrogen Peroxide	Explosions	25239
31	Phenol	104	Hydrogen Peroxide	Fire Ball	1991
31	Phenol	104	Hydrogen Peroxide	Toxic Emission	129591
31	Phenol	105	Phosphorus	Fire Ball	106
31	Phenol	105	Phosphorus	Toxic Emission	3142
1	Phosphoric Acid	3	Acetic Acid, Glacial	Fire Ball	821
1	Phosphoric Acid	3	Acetic Acid, Glacial	Toxic Emission	6283
1	Phosphoric Acid	107	Acetic Anhydride	Fire Ball	8050
1	Phosphoric Acid	107	Acetic Anhydride	Toxic Emission	12566
1	Phosphoric Acid	107	Acetic Anhydride	Vapor Cloud Explosion	1320
1	Phosphoric Acid	19	Acetone	Fire Ball	15865
1	Phosphoric Acid	19	Acetone	Toxic Emission	27489
1	Phosphoric Acid	19	Acetone	Vapor Cloud Explosion	42654
1	Phosphoric Acid	3	Acrylic Acid	Fire Ball	441
1	Phosphoric Acid	3	Acrylic Acid	Toxic Emission	?
1	Phosphoric Acid	26	Acrylonitrile	Fire Ball	8902
1	Phosphoric Acid	26	Acrylonitrile	Toxic Emission	60476
1	Phosphoric Acid	26	Acrylonitrile	Vapor Cloud Explosion	25862
1	Phosphoric Acid	7	Aniline Oil, Liquid	Toxic Emission	2356

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
1	Phosphoric Acid	5	Butyraldehyde	Fire Ball	26940
1	Phosphoric Acid	5	Butyraldehyde	Vapor Cloud Explosion	75758
1	Phosphoric Acid	17	Chloroprene, Inhibited	Fire Ball	11471
1	Phosphoric Acid	17	Chloroprene, Inhibited	Toxic Emission	176715
1	Phosphoric Acid	17	Chloroprene, Inhibited	Vapor Cloud Explosion	13996
1	Phosphoric Acid	101	Coal Tar Distillate	Fire Ball	597
1	Phosphoric Acid	101	Crude Oil Petroleum	Fire Ball	230
1	Phosphoric Acid	5	Formaldehyde Solution	Toxic Emission	2356
1	Phosphoric Acid	101	Fuel Oil	Fire Ball	565
1	Phosphoric Acid	101	Fuel, Aviation	Fire Ball	552
1	Phosphoric Acid	104	Hydrogen Peroxide	Toxic Emission	9425
1	Phosphoric Acid	107	Maleic Anhydride	Fire Ball	1092
1	Phosphoric Acid	107	Maleic Anhydride	Toxic Emission	?
1	Phosphoric Acid	19	Methyl Ethyl Ketone	Fire Ball	13550
1	Phosphoric Acid	19	Methyl Ethyl Ketone	Toxic Emission	3927
1	Phosphoric Acid	19	Methyl Ethyl Ketone	Vapor Cloud Explosion	24354
1	Phosphoric Acid	24	Motor Fuel Antiknock Compound	Fire Ball	26670
1	Phosphoric Acid	24	Motor Fuel Antiknock Compound	Vapor Cloud Explosion	25447
1	Phosphoric Acid	101	Petroleum Naphtha	Fire Ball	527
1	Phosphoric Acid	21	Sodium Metal	Fire Ball	9835
1	Phosphoric Acid	21	Sodium Metal	Toxic Emission	785
1	Phosphoric Acid	21	Sodium Metal	Vapor Cloud Explosion	13893
1	Phosphoric Acid	16	Styrene Monomer	Fire Ball	26658
1	Phosphoric Acid	16	Styrene Monomer	Toxic Emission	3142
1	Phosphoric Acid	16	Styrene Monomer	Vapor Cloud Explosion	25165
1	Phosphoric Acid	18	Toluene Diisocyanate	Fire Ball	190
1	Phosphoric Acid	18	Toluene Diisocyanate	Toxic Emission	28274
105	Phosphorus	106	Ammonium Nitrate Soln.	Explosions	35982
105	Phosphorus	107	Maleic Anhydride	Toxic Emission	?
10	Potassium Hydroxide, Liq	107	Acetic Anhydride	Fire Ball	8050
10	Potassium Hydroxide, Liq	107	Acetic Anhydride	Toxic Emission	12566
10	Potassium Hydroxide, Liq	107	Acetic Anhydride	Vapor Cloud Explosion	1320
10	Potassium Hydroxide, Liq	19	Acetone	Fire Ball	15865
10	Potassium Hydroxide, Liq	19	Acetone	Toxic Emission	27489
10	Potassium Hydroxide, Liq	19	Acetone	Vapor Cloud Explosion	42654
10	Potassium Hydroxide, Liq	26	Acrylonitrile	Fire Ball	8902
10	Potassium Hydroxide, Liq	26	Acrylonitrile	Toxic Emission	60476
10	Potassium Hydroxide, Liq	17	Carbon Tetrachloride	Toxic Emission	318086
10	Potassium Hydroxide, Liq	17	Chloroprene, Inhibited	Fire Ball	11471
10	Potassium Hydroxide, Liq	17	Chloroprene, Inhibited	Toxic Emission	176715
10	Potassium Hydroxide, Liq	17	Chloroprene, Inhibited	Vapor Cloud Explosion	13996
10	Potassium Hydroxide, Liq	27	Dinitrotoluene, Liquid	Explosions	30516
10	Potassium Hydroxide, Liq	13	Ethyl Acetate	Fire Ball	12469
10	Potassium Hydroxide, Liq	13	Ethyl Acetate	Toxic Emission	18850
10	Potassium Hydroxide, Liq	13	Ethyl Acetate	Vapor Cloud Explosion	13876

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
10	Potassium Hydroxide, Liq	107	Maleic Anhydride	Fire Ball	1092
10	Potassium Hydroxide, Liq	107	Maleic Anhydride	Toxic Emission	?
10	Potassium Hydroxide, Liq	19	Methyl Ethyl Ketone	Fire Ball	13550
10	Potassium Hydroxide, Liq	19	Methyl Ethyl Ketone	Toxic Emission	3927
10	Potassium Hydroxide, Liq	19	Methyl Ethyl Ketone	Vapor Cloud Explosion	24354
10	Potassium Hydroxide, Liq	105	Phosphorus	Fire Ball	1162
10	Potassium Hydroxide, Liq	105	Phosphorus	Toxic Emission	50265
10	Potassium Hydroxide, Liq	21	Sodium Metal	Fire Ball	9835
10	Potassium Hydroxide, Liq	21	Sodium Metal	Vapor Cloud Explosion	13893
10	Potassium Hydroxide, Liq	16	Styrene Monomer	Fire Ball	26658
10	Potassium Hydroxide, Liq	16	Styrene Monomer	Toxic Emission	3142
10	Potassium Hydroxide, Liq	16	Styrene Monomer	Vapor Cloud Explosion	25165
10	Potassium Hydroxide, Liq	18	Toluene Diisocyanate	Fire Ball	190
10	Potassium Hydroxide, Liq	18	Toluene Diisocyanate	Toxic Emission	28274
10	Potassium Hydroxide, Liq	13	Vinyl Acetate	Fire Ball	9096
10	Potassium Hydroxide, Liq	13	Vinyl Acetate	Toxic Emission	63617
10	Potassium Hydroxide, Liq	13	Vinyl Acetate	Vapor Cloud Explosion	11347
10	Potassium Hydroxide, Liq	17	Vinyl Chloride	Fire Ball	8390
34	Propylene Oxide	104	Hydrogen Peroxide	Explosions	25239
101	Pulp Mill Liquid	104	Hydrogen Peroxide	Explosions	15900
101	Pulp Mill Liquid	104	Hydrogen Peroxide	Toxic Emission	9425
10	Sodium Hydroxide, Liq.	107	Acetic Anhydride	Fire Ball	8050
10	Sodium Hydroxide, Liq.	107	Acetic Anhydride	Toxic Emission	12566
10	Sodium Hydroxide, Liq.	107	Acetic Anhydride	Vapor Cloud Explosion	1320
10	Sodium Hydroxide, Liq.	19	Acetone	Fire Ball	15865
10	Sodium Hydroxide, Liq.	19	Acetone	Toxic Emission	27489
10	Sodium Hydroxide, Liq.	19	Acetone	Vapor Cloud Explosion	42654
10	Sodium Hydroxide, Liq.	26	Acrylonitrile	Fire Ball	8902
10	Sodium Hydroxide, Liq.	26	Acrylonitrile	Toxic Emission	60476
10	Sodium Hydroxide, Liq.	17	Carbon Tetrachloride	Toxic Emission	318086
10	Sodium Hydroxide, Liq.	17	Chloroprene, Inhibited	Fire Ball	11471
10	Sodium Hydroxide, Liq.	17	Chloroprene, Inhibited	Toxic Emission	176715
10	Sodium Hydroxide, Liq.	17	Chloroprene, Inhibited	Vapor Cloud Explosion	13996
10	Sodium Hydroxide, Liq.	27	Dinitrotoluene, Liquid	Explosions	30516
10	Sodium Hydroxide, Liq.	13	Ethyl Acetate	Fire Ball	12469
10	Sodium Hydroxide, Liq.	13	Ethyl Acetate	Toxic Emission	18850
10	Sodium Hydroxide, Liq.	13	Ethyl Acetate	Vapor Cloud Explosion	13876
10	Sodium Hydroxide, Liq.	107	Maleic Anhydride	Fire Ball	1092
10	Sodium Hydroxide, Liq.	107	Maleic Anhydride	Toxic Emission	?
10	Sodium Hydroxide, Liq.	19	Methyl Ethyl Ketone	Fire Ball	13550
10	Sodium Hydroxide, Liq.	19	Methyl Ethyl Ketone	Toxic Emission	3927
10	Sodium Hydroxide, Liq.	19	Methyl Ethyl Ketone	Vapor Cloud Explosion	24354
10	Sodium Hydroxide, Liq.	105	Phosphorus	Fire Ball	1162
10	Sodium Hydroxide, Liq.	105	Phosphorus	Toxic Emission	50265
10	Sodium Hydroxide, Liq.	16	Styrene Monomer	Fire Ball	26658

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
10	Sodium Hydroxide, Liq.	16	Styrene Monomer	Toxic Emission	3142
10	Sodium Hydroxide, Liq.	16	Styrene Monomer	Vapor Cloud Explosion	25165
10	Sodium Hydroxide, Liq.	18	Toluene Diisocyanate	Fire Ball	190
10	Sodium Hydroxide, Liq.	18	Toluene Diisocyanate	Toxic Emission	28274
10	Sodium Hydroxide, Liq.	13	Vinyl Acetate	Fire Ball	9096
10	Sodium Hydroxide, Liq.	13	Vinyl Acetate	Toxic Emission	63617
10	Sodium Hydroxide, Liq.	13	Vinyl Acetate	Vapor Cloud Explosion	11347
10	Sodium Hydroxide, Liq.	17	Vinyl Chloride	Fire Ball	8390
21	Sodium Metal	107	Acetic Anhydride	Fire Ball	8050
21	Sodium Metal	107	Acetic Anhydride	Toxic Emission	12566
21	Sodium Metal	107	Acetic Anhydride	Vapor Cloud Explosion	1320
21	Sodium Metal	26	Acrylonitrile	Fire Ball	29538
21	Sodium Metal	26	Acrylonitrile	Toxic Emission	80476
21	Sodium Metal	26	Acrylonitrile	Vapor Cloud Explosion	55836
21	Sodium Metal	106	Ammonium Nitrate Soln.	Explosions	35982
21	Sodium Metal	106	Ammonium Nitrate Soln.	Fire Ball	9835
21	Sodium Metal	106	Ammonium Nitrate Soln.	Vapor Cloud Explosion	13893
21	Sodium Metal	27	Dinitrotoluene, Liquid	Explosions	30516
21	Sodium Metal	104	Ferric Chloride Solution	Fire Ball	9835
21	Sodium Metal	104	Ferric Chloride Solution	Vapor Cloud Explosion	13893
21	Sodium Metal	104	Hydrogen Peroxide	Explosions	25239
21	Sodium Metal	104	Hydrogen Peroxide	Fire Ball	9835
21	Sodium Metal	104	Hydrogen Peroxide	Toxic Emission	129591
21	Sodium Metal	104	Hydrogen Peroxide	Vapor Cloud Explosion	13893
21	Sodium Metal	107	Maleic Anhydride	Fire Ball	1092
21	Sodium Metal	107	Maleic Anhydride	Toxic Emission	?
21	Sodium Metal	101	Pulp Mill Liquid	Fire Ball	9835
21	Sodium Metal	101	Pulp Mill Liquid	Vapor Cloud Explosion	13893
16	Styrene Monomer	104	Ferric Chloride Solution	Fire Ball	1758
16	Styrene Monomer	104	Hydrogen Peroxide	Explosions	25239
16	Styrene Monomer	104	Hydrogen Peroxide	Fire Ball	26658
16	Styrene Monomer	104	Hydrogen Peroxide	Toxic Emission	129591
16	Styrene Monomer	104	Hydrogen Peroxide	Vapor Cloud Explosion	25165
16	Styrene Monomer	21	Sodium Metal	Fire Ball	7358
16	Styrene Monomer	21	Sodium Metal	Vapor Cloud Explosion	15394
2	Sulfuric Acid	3	Acetic Acid, Glacial	Fire Ball	11433
2	Sulfuric Acid	3	Acetic Acid, Glacial	Toxic Emission	131947
2	Sulfuric Acid	3	Acetic Acid, Glacial	Vapor Cloud Explosion	2552
2	Sulfuric Acid	107	Acetic Anhydride	Fire Ball	8050
2	Sulfuric Acid	107	Acetic Anhydride	Toxic Emission	12566
2	Sulfuric Acid	107	Acetic Anhydride	Vapor Cloud Explosion	1320
2	Sulfuric Acid	19	Acetone	Fire Ball	1867
2	Sulfuric Acid	19	Acetone	Toxic Emission	18850
2	Sulfuric Acid	19	Acetone	Vapor Cloud Explosion	3870
2	Sulfuric Acid	3	Acrylic Acid	Fire Ball	14739

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
2	Sulfuric Acid	3	Acrylic Acid	Toxic Emission	?
2	Sulfuric Acid	3	Acrylic Acid	Vapor Cloud Explosion	8659
2	Sulfuric Acid	26	Acrylonitrile	Fire Ball	8902
2	Sulfuric Acid	26	Acrylonitrile	Toxic Emission	91892
2	Sulfuric Acid	26	Acrylonitrile	Vapor Cloud Explosion	25862
2	Sulfuric Acid	4	Alcoholic Beverage	Fire Ball	21389
2	Sulfuric Acid	4	Alcoholic Beverage	Vapor Cloud Explosion	25730
2	Sulfuric Acid	108	Ammonium Nitrate Soln.	Explosions	35982
2	Sulfuric Acid	7	Aniline Oil, Liquid	Fire Ball	3452
2	Sulfuric Acid	7	Aniline Oil, Liquid	Toxic Emission	94248
2	Sulfuric Acid	16	Benzene	Fire Ball	26041
2	Sulfuric Acid	16	Benzene	Toxic Emission	75398
2	Sulfuric Acid	16	Benzene	Vapor Cloud Explosion	37909
2	Sulfuric Acid	13	Butyl Acrylate	Fire Ball	7046
2	Sulfuric Acid	13	Butyl Acrylate	Toxic Emission	?
2	Sulfuric Acid	13	Butyl Acrylate	Vapor Cloud Explosion	2463
2	Sulfuric Acid	4	Butyl Alcohol	Fire Ball	20262
2	Sulfuric Acid	4	Butyl Alcohol	Toxic Emission	28274
2	Sulfuric Acid	4	Butyl Alcohol	Vapor Cloud Explosion	28055
2	Sulfuric Acid	5	Butyraldehyde	Fire Ball	11096
2	Sulfuric Acid	5	Butyraldehyde	Vapor Cloud Explosion	24497
2	Sulfuric Acid	17	Carbon Tetrachloride	Toxic Emission	544281
2	Sulfuric Acid	17	Chloroprene, Inhibited	Fire Ball	32945
2	Sulfuric Acid	17	Chloroprene, Inhibited	Toxic Emission	480664
2	Sulfuric Acid	17	Chloroprene, Inhibited	Vapor Cloud Explosion	52173
2	Sulfuric Acid	4	Denatured Alcohol	Fire Ball	72304
2	Sulfuric Acid	4	Denatured Alcohol	Vapor Cloud Explosion	180203
2	Sulfuric Acid	27	Dinitrotoluene, Liquid	Explosions	30516
2	Sulfuric Acid	13	Ethyl Acetate	Fire Ball	15361
2	Sulfuric Acid	13	Ethyl Acetate	Toxic Emission	2356
2	Sulfuric Acid	13	Ethyl Acetate	Vapor Cloud Explosion	19879
2	Sulfuric Acid	13	Ethyl Acrylate	Fire Ball	16922
2	Sulfuric Acid	13	Ethyl Acrylate	Toxic Emission	62832
2	Sulfuric Acid	13	Ethyl Acrylate	Vapor Cloud Explosion	19856
2	Sulfuric Acid	4	Ethyl Alcohol	Fire Ball	72304
2	Sulfuric Acid	4	Ethyl Alcohol	Vapor Cloud Explosion	180203
2	Sulfuric Acid	5	Formaldehyde Solution	Fire Ball	157
2	Sulfuric Acid	5	Formaldehyde Solution	Toxic Emission	18850
2	Sulfuric Acid	14	Glycol Ethers	Fire Ball	23147
2	Sulfuric Acid	14	Glycol Ethers	Toxic Emission	12566
2	Sulfuric Acid	14	Glycol Ethers	Vapor Cloud Explosion	12272
2	Sulfuric Acid	7	Hexamethylene Diamine Soln.	Fire Ball	362
2	Sulfuric Acid	104	Hydrogen Peroxide	Toxic Emission	129591
2	Sulfuric Acid	4	Isopropanol	Fire Ball	17801
2	Sulfuric Acid	4	Isopropanol	Toxic Emission	19635

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
2	Sulfuric Acid	4	Isopropanol	Vapor Cloud Explosion	22698
2	Sulfuric Acid	107	Maleic Anhydride	Toxic Emission	?
2	Sulfuric Acid	4	Methyl Alcohol	Fire Ball	47189
2	Sulfuric Acid	4	Methyl Alcohol	Toxic Emission	28274
2	Sulfuric Acid	4	Methyl Alcohol	Vapor Cloud Explosion	114134
2	Sulfuric Acid	17	Methyl Chloride	Toxic Emission	16493
2	Sulfuric Acid	19	Methyl Ethyl Ketone	Fire Ball	13301
2	Sulfuric Acid	19	Methyl Ethyl Ketone	Toxic Emission	60476
2	Sulfuric Acid	19	Methyl Ethyl Ketone	Vapor Cloud Explosion	23503
2	Sulfuric Acid	13	Methyl Methacrylate	Fire Ball	16214
2	Sulfuric Acid	13	Methyl Methacrylate	Toxic Emission	37699
2	Sulfuric Acid	13	Methyl Methacrylate	Vapor Cloud Explosion	17908
2	Sulfuric Acid	31	Phenol	Fire Ball	1991
2	Sulfuric Acid	31	Phenol	Toxic Emission	38485
2	Sulfuric Acid	105	Phosphorus	Toxic Emission	?
2	Sulfuric Acid	21	Sodium Metal	Toxic Emission	176715
2	Sulfuric Acid	16	Styrene Monomer	Fire Ball	26658
2	Sulfuric Acid	16	Styrene Monomer	Toxic Emission	3142
2	Sulfuric Acid	16	Styrene Monomer	Vapor Cloud Explosion	25165
2	Sulfuric Acid	16	Toluene	Fire Ball	31952
2	Sulfuric Acid	16	Toluene	Toxic Emission	62832
2	Sulfuric Acid	16	Toluene	Vapor Cloud Explosion	34967
2	Sulfuric Acid	18	Toluene Diisocyanate	Fire Ball	190
2	Sulfuric Acid	18	Toluene Diisocyanate	Toxic Emission	28274
2	Sulfuric Acid	13	Vinyl Acetate	Fire Ball	9096
2	Sulfuric Acid	13	Vinyl Acetate	Toxic Emission	?
2	Sulfuric Acid	13	Vinyl Acetate	Vapor Cloud Explosion	11347
2	Sulfuric Acid	17	Vinyl Chloride	Toxic Emission	95033
2	Sulfuric Acid	16	Xylene	Fire Ball	35015
2	Sulfuric Acid	16	Xylene	Toxic Emission	785
2	Sulfuric Acid	16	Xylene	Vapor Cloud Explosion	40828
2	Sulfuric Acid, Spent	3	Acetic Acid, Glacial	Fire Ball	11433
2	Sulfuric Acid, Spent	3	Acetic Acid, Glacial	Toxic Emission	131947
2	Sulfuric Acid, Spent	3	Acetic Acid, Glacial	Vapor Cloud Explosion	2552
2	Sulfuric Acid, Spent	107	Acetic Anhydride	Fire Ball	8050
2	Sulfuric Acid, Spent	107	Acetic Anhydride	Toxic Emission	12566
2	Sulfuric Acid, Spent	107	Acetic Anhydride	Vapor Cloud Explosion	1320
2	Sulfuric Acid, Spent	19	Acetone	Fire Ball	15865
2	Sulfuric Acid, Spent	19	Acetone	Toxic Emission	27489
2	Sulfuric Acid, Spent	19	Acetone	Vapor Cloud Explosion	42654
2	Sulfuric Acid, Spent	3	Acrylic Acid	Fire Ball	14739
2	Sulfuric Acid, Spent	3	Acrylic Acid	Toxic Emission	?
2	Sulfuric Acid, Spent	3	Acrylic Acid	Vapor Cloud Explosion	8659
2	Sulfuric Acid, Spent	26	Acrylonitrile	Fire Ball	8902
2	Sulfuric Acid, Spent	26	Acrylonitrile	Toxic Emission	75398

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
2	Sulfuric Acid, Spent	26	Acrylonitrile	Vapor Cloud Explosion	25862
2	Sulfuric Acid, Spent	4	Alcoholic Beverage	Fire Ball	25978
2	Sulfuric Acid, Spent	4	Alcoholic Beverage	Vapor Cloud Explosion	31103
2	Sulfuric Acid, Spent	7	Aniline Oil, Liquid	Fire Ball	3452
2	Sulfuric Acid, Spent	7	Aniline Oil, Liquid	Toxic Emission	37699
2	Sulfuric Acid, Spent	16	Benzene	Fire Ball	35623
2	Sulfuric Acid, Spent	16	Benzene	Toxic Emission	9425
2	Sulfuric Acid, Spent	16	Benzene	Vapor Cloud Explosion	58057
2	Sulfuric Acid, Spent	13	Butyl Acrylate	Fire Ball	965
2	Sulfuric Acid, Spent	13	Butyl Acrylate	Toxic Emission	?
2	Sulfuric Acid, Spent	4	Butyl Alcohol	Fire Ball	20262
2	Sulfuric Acid, Spent	4	Butyl Alcohol	Toxic Emission	28274
2	Sulfuric Acid, Spent	4	Butyl Alcohol	Vapor Cloud Explosion	28055
2	Sulfuric Acid, Spent	5	Butyraldehyde	Fire Ball	11096
2	Sulfuric Acid, Spent	5	Butyraldehyde	Vapor Cloud Explosion	24497
2	Sulfuric Acid, Spent	17	Carbon Tetrachloride	Toxic Emission	148440
2	Sulfuric Acid, Spent	17	Chloroprene, Inhibited	Fire Ball	11471
2	Sulfuric Acid, Spent	17	Chloroprene, Inhibited	Toxic Emission	176715
2	Sulfuric Acid, Spent	17	Chloroprene, Inhibited	Vapor Cloud Explosion	13996
2	Sulfuric Acid, Spent	4	Denatured Alcohol	Fire Ball	38266
2	Sulfuric Acid, Spent	4	Denatured Alcohol	Vapor Cloud Explosion	73062
2	Sulfuric Acid, Spent	27	Dinitrotoluene, Liquid	Explosions	30516
2	Sulfuric Acid, Spent	13	Ethyl Acetate	Fire Ball	15361
2	Sulfuric Acid, Spent	13	Ethyl Acetate	Toxic Emission	2356
2	Sulfuric Acid, Spent	13	Ethyl Acetate	Vapor Cloud Explosion	19879
2	Sulfuric Acid, Spent	13	Ethyl Acrylate	Fire Ball	5929
2	Sulfuric Acid, Spent	13	Ethyl Acrylate	Toxic Emission	6283
2	Sulfuric Acid, Spent	13	Ethyl Acrylate	Vapor Cloud Explosion	2124
2	Sulfuric Acid, Spent	4	Ethyl Alcohol	Fire Ball	38266
2	Sulfuric Acid, Spent	4	Ethyl Alcohol	Vapor Cloud Explosion	73062
2	Sulfuric Acid, Spent	5	Formaldehyde Solution	Toxic Emission	2356
2	Sulfuric Acid, Spent	14	Glycol Ethers	Fire Ball	1266
2	Sulfuric Acid, Spent	14	Glycol Ethers	Toxic Emission	785
2	Sulfuric Acid, Spent	7	Hexamethylene Diamine Soln.	Fire Ball	362
2	Sulfuric Acid, Spent	4	Isopropanol	Fire Ball	17801
2	Sulfuric Acid, Spent	4	Isopropanol	Toxic Emission	19635
2	Sulfuric Acid, Spent	4	Isopropanol	Vapor Cloud Explosion	22698
2	Sulfuric Acid, Spent	107	Maleic Anhydride	Toxic Emission	?
2	Sulfuric Acid, Spent	4	Methyl Alcohol	Fire Ball	29676
2	Sulfuric Acid, Spent	4	Methyl Alcohol	Toxic Emission	28274
2	Sulfuric Acid, Spent	4	Methyl Alcohol	Vapor Cloud Explosion	55757
2	Sulfuric Acid, Spent	19	Methyl Ethyl Ketone	Fire Ball	13550
2	Sulfuric Acid, Spent	19	Methyl Ethyl Ketone	Toxic Emission	3927
2	Sulfuric Acid, Spent	19	Methyl Ethyl Ketone	Vapor Cloud Explosion	24354
2	Sulfuric Acid, Spent	13	Methyl Methacrylate	Fire Ball	5103

Table J1. Summary of Consequences (Net Area Above the Lethal Limit) from Incompatible Binary Combinations (Cont.)

ASTM #	Chemical Name	ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
2	Sulfuric Acid, Spent	13	Methyl Methacrylate	Toxic Emission	2356
2	Sulfuric Acid, Spent	13	Methyl Methacrylate	Vapor Cloud Explosion	1521
2	Sulfuric Acid, Spent	24	Motor Fuel Antiknock Compound	Fire Ball	26670
2	Sulfuric Acid, Spent	24	Motor Fuel Antiknock Compound	Vapor Cloud Explosion	25447
2	Sulfuric Acid, Spent	31	Phenol	Fire Ball	100
2	Sulfuric Acid, Spent	31	Phenol	Toxic Emission	3142
2	Sulfuric Acid, Spent	21	Sodium Metal	Fire Ball	9835
2	Sulfuric Acid, Spent	21	Sodium Metal	Vapor Cloud Explosion	13893
2	Sulfuric Acid, Spent	16	Styrene Monomer	Fire Ball	1758
2	Sulfuric Acid, Spent	16	Toluene	Fire Ball	5856
2	Sulfuric Acid, Spent	16	Toluene	Toxic Emission	2356
2	Sulfuric Acid, Spent	16	Toluene	Vapor Cloud Explosion	962
2	Sulfuric Acid, Spent	18	Toluene Diisocyanate	Fire Ball	190
2	Sulfuric Acid, Spent	18	Toluene Diisocyanate	Toxic Emission	28274
2	Sulfuric Acid, Spent	13	Vinyl Acetate	Fire Ball	14405
2	Sulfuric Acid, Spent	13	Vinyl Acetate	Toxic Emission	?
2	Sulfuric Acid, Spent	13	Vinyl Acetate	Vapor Cloud Explosion	22258
2	Sulfuric Acid, Spent	16	Xylene	Fire Ball	2237
16	Toluene	104	Hydrogen Peroxide	Explosions	25239
16	Toluene	104	Hydrogen Peroxide	Fire Ball	31952
16	Toluene	104	Hydrogen Peroxide	Toxic Emission	129591
16	Toluene	104	Hydrogen Peroxide	Vapor Cloud Explosion	34967
18	Toluene Diisocyanate	106	Ammonium Nitrate Soln.	Toxic Emission	785
18	Toluene Diisocyanate	104	Hydrogen Peroxide	Explosions	25239
18	Toluene Diisocyanate	104	Hydrogen Peroxide	Fire Ball	190
18	Toluene Diisocyanate	104	Hydrogen Peroxide	Toxic Emission	129591
18	Toluene Diisocyanate	105	Phosphorus	Toxic Emission	785
18	Toluene Diisocyanate	21	Sodium Metal	Fire Ball	9835
18	Toluene Diisocyanate	21	Sodium Metal	Toxic Emission	785
18	Toluene Diisocyanate	21	Sodium Metal	Vapor Cloud Explosion	13893
13	Vinyl Acetate	104	Ferric Chloride Solution	Fire Ball	14404
13	Vinyl Acetate	104	Ferric Chloride Solution	Toxic Emission	?
13	Vinyl Acetate	104	Ferric Chloride Solution	Vapor Cloud Explosion	22327
13	Vinyl Acetate	104	Hydrogen Peroxide	Explosions	25239
13	Vinyl Acetate	104	Hydrogen Peroxide	Fire Ball	9096
13	Vinyl Acetate	104	Hydrogen Peroxide	Toxic Emission	129591
13	Vinyl Acetate	104	Hydrogen Peroxide	Vapor Cloud Explosion	11347
13	Vinyl Acetate	21	Sodium Metal	Fire Ball	11223
13	Vinyl Acetate	21	Sodium Metal	Toxic Emission	?
13	Vinyl Acetate	21	Sodium Metal	Vapor Cloud Explosion	28414
17	Vinyl Chloride	104	Hydrogen Peroxide	Explosions	25239
17	Vinyl Chloride	104	Hydrogen Peroxide	Toxic Emission	9425
16	Xylene	104	Hydrogen Peroxide	Explosions	25239
16	Xylene	104	Hydrogen Peroxide	Fire Ball	35015
16	Xylene	104	Hydrogen Peroxide	Toxic Emission	129591
16	Xylene	104	Hydrogen Peroxide	Vapor Cloud Explosion	40828

Table J2. Summary of Consequences (Net Area Above the Lethal Limit) from Spills of Single Chemicals

ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
5	Acetaldehyde	Fire Ball	50198
5	Acetaldehyde	Toxic Emission	95033
5	Acetaldehyde	Vapor Cloud Explosion	108103
3	Acetic Acid, Glacial	Fire Ball	167
3	Acetic Acid, Glacial	Toxic Emission	785
19	Acetone	Fire Ball	16644
19	Acetone	Toxic Emission	785
19	Acetone	Vapor Cloud Explosion	16742
3	Acrylic Acid	Fire Ball	118
26	Acrylonitrile	Fire Ball	4573
26	Acrylonitrile	Toxic Emission	3142
26	Acrylonitrile	Vapor Cloud Explosion	154
10	Anhydrous Ammonia	Fire Ball	49807
10	Anhydrous Ammonia	Toxic Emission	1320254
10	Anhydrous Ammonia	Vapor Cloud Explosion	42273
7	Aniline Oil, Liquid	Toxic Emission	785
16	Benzene	Fire Ball	9474
16	Benzene	Toxic Emission	3142
16	Benzene	Vapor Cloud Explosion	2206
28	Butadiene	Fire Ball	121871
28	Butadiene	Toxic Emission	50265
28	Butadiene	Vapor Cloud Explosion	255176
29	Butane	Fire Ball	124699
29	Butane	Vapor Cloud Explosion	265120
13	Butyl Acrylate	Fire Ball	171
4	Butyl Alcohol	Fire Ball	142
5	Butyraldehyde	Fire Ball	9607
5	Butyraldehyde	Vapor Cloud Explosion	5675
20	Carbon Disulfide	Fire Ball	30928
20	Carbon Disulfide	Toxic Emission	63617
20	Carbon Disulfide	Vapor Cloud Explosion	15394
17	Carbon Tetrachloride	Toxic Emission	28274
104	Chlorine	Toxic Emission	5026548
17	Chloroprene, Inhibited	Fire Ball	15824
17	Chloroprene, Inhibited	Toxic Emission	50265
17	Chloroprene, Inhibited	Vapor Cloud Explosion	6362
101	Coal Tar Distillate	Fire Ball	133
29	Cyclohexane	Fire Ball	14235
29	Cyclohexane	Toxic Emission	785
29	Cyclohexane	Vapor Cloud Explosion	6504
4	Denatured Alcohol	Fire Ball	1764
13	Ethyl Acetate	Fire Ball	4224
13	Ethyl Acetate	Toxic Emission	785
13	Ethyl Acetate	Vapor Cloud Explosion	254
13	Ethyl Acrylate	Fire Ball	1418

Table J2. Summary of Consequences (Net Area Above the Lethal Limit) from Spills of Single Chemicals (Cont.)

ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
13	Ethyl Acrylate	Toxic Emission	785
4	Ethyl Alcohol	Fire Ball	1764
34	Ethylene Oxide	Fire Ball	54260
34	Ethylene Oxide	Toxic Emission	490874
34	Ethylene Oxide	Vapor Cloud Explosion	130100
5	Formaldehyde Solution	Toxic Emission	785
101	Fuel Oil	Fire Ball	187
101	Fuel, Aviation	Fire Ball	183
14	Glycol Ethers	Fire Ball	356
29	Hexane	Fire Ball	22317
29	Hexane	Toxic Emission	3142
29	Hexane	Vapor Cloud Explosion	17671
1	Hydrocyanic Acid	Fire Ball	73186
1	Hydrocyanic Acid	Toxic Emission	6082123
1	Hydrocyanic Acid	Vapor Cloud Explosion	99538
1	Hydrogen Fluoride	Toxic Emission	5674502
104	Hydrogen Peroxide	Toxic Emission	3142
4	Isopropanol	Fire Ball	1221
28	LPG	Toxic Emission	28274
28	LPG-Butene	Fire Ball	124352
28	LPG-Butene	Toxic Emission	50265
28	LPG-Butene	Vapor Cloud Explosion	263298
28	LPG-Butylene	Toxic Emission	50265
29	LPG-Isobutane	Fire Ball	124502
29	LPG-Isobutane	Vapor Cloud Explosion	264208
28	LPG-Isobutylene	Fire Ball	123261
28	LPG-Isobutylene	Vapor Cloud Explosion	259672
29	LPG-Propane	Fire Ball	125027
29	LPG-Propane	Toxic Emission	63617
29	LPG-Propane	Vapor Cloud Explosion	266948
28	LPG-Propylene	Fire Ball	97827
28	LPG-Propylene	Vapor Cloud Explosion	187805
4	Methyl Alcohol	Fire Ball	6914
4	Methyl Alcohol	Toxic Emission	785
4	Methyl Alcohol	Vapor Cloud Explosion	1075
17	Methyl Chloride	Fire Ball	43200
17	Methyl Chloride	Toxic Emission	78540
17	Methyl Chloride	Vapor Cloud Explosion	24606
19	Methyl Ethyl Ketone	Fire Ball	6355
19	Methyl Ethyl Ketone	Toxic Emission	3142
19	Methyl Ethyl Ketone	Vapor Cloud Explosion	1662
13	Methyl Methacrylate	Fire Ball	1570
13	Methyl Methacrylate	Toxic Emission	785
24	Motor Fuel Antiknock Compound	Toxic Emission	785
2	Nitric Acid, Fuming	Toxic Emission	63617

Table J2. Summary of Consequences (Net Area Above the Lethal Limit) from Spills of Single Chemicals (Cont.)

ASTM #	Chemical Name	Consequence Type	Area Covered sq.m.
2	Oleum	Toxic Emission	201062
101	Petroleum Naphtha	Fire Ball	371
34	Propylene Oxide	Fire Ball	59482
34	Propylene Oxide	Toxic Emission	226980
34	Propylene Oxide	Vapor Cloud Explosion	156228
16	Styrene Monomer	Fire Ball	312
105	Sulfur Dioxide	Toxic Emission	1590431
16	Toluene	Fire Ball	1258
16	Toluene	Toxic Emission	785
13	Vinyl Acetate	Fire Ball	7138
13	Vinyl Acetate	Vapor Cloud Explosion	1521
17	Vinyl Chloride	Fire Ball	64672
17	Vinyl Chloride	Vapor Cloud Explosion	71631
16	Xylene	Fire Ball	699

Table J3. Consequence Rankings by Binary Combination
(Sort by Area Above the Lethal Limit)

ASTM #1	Chemical Name #1	ASTM #2	Chemical Name #2	Area Covered sq.m.
1	Hydrofluorosilicic Acid	2	Sulfuric Acid	907920
2	Oleum	4	Ethyl Alcohol	855693
2	Oleum	4	Denatured Alcohol	855693
1	Hydrofluorosilicic Acid	2	Nitric Acid, Fuming	844303
2	Nitric Acid, Fuming	4	Ethyl Alcohol	834124
2	Nitric Acid, Fuming	4	Denatured Alcohol	834124
1	Hydrochloric Acid	104	Hydrogen Peroxide	767526
2	Oleum	4	Methyl Alcohol	764509
2	Nitric Acid, Fuming	4	Methyl Alcohol	762448
2	Oleum	4	Isopropanol	739283
2	Nitric Acid, Fuming	4	Isopropanol	733888
1	Hydrofluorosilicic Acid	2	Oleum	706858
2	Oleum	4	Butyl Alcohol	683162
2	Oleum	16	Xylene	679029
2	Nitric Acid, Fuming	4	Butyl Alcohol	673505
2	Oleum	16	Toluene	670105
20	Carbon Disulfide	104	Hydrogen Peroxide	668480
2	Oleum	16	Benzene	667136
2	Nitric Acid, Fuming	16	Benzene	660564
2	Oleum	16	Styrene Monomer	655009
2	Oleum	4	Alcoholic Beverage	650305
2	Oleum	19	Methyl Ethyl Ketone	639990
2	Oleum	13	Ethyl Acrylate	639964
2	Oleum	106	Ammonium Nitrate Soln.	639168
2	Oleum	5	Butyraldehyde	638779
2	Oleum	14	Glycol Ethers	638605
2	Oleum	26	Acrylonitrile	637950
2	Oleum	13	Methyl Methacrylate	637308
2	Oleum	27	Dinitrotoluene, Liquid	633702
2	Nitric Acid, Fuming	5	Butyraldehyde	633351
2	Oleum	13	Ethyl Acetate	629531
2	Oleum	104	Hydrogen Peroxide	628425
2	Nitric Acid, Fuming	16	Xylene	627978
2	Oleum	3	Acrylic Acid	626584
2	Oleum	13	Vinyl Acetate	623629
2	Nitric Acid, Fuming	16	Toluene	619054
2	Nitric Acid, Fuming	4	Alcoholic Beverage	617827
2	Oleum	3	Acetic Acid, Glacial	617171
2	Nitric Acid, Fuming	14	Glycol Ethers	617036
2	Nitric Acid, Fuming	26	Acrylonitrile	613288
2	Oleum	13	Butyl Acrylate	612695
2	Oleum	107	Acetic Anhydride	612556
2	Oleum	19	Acetone	608923
2	Oleum	7	Aniline Oil, Liquid	606638
2	Oleum	31	Phenol	605177

Table J3. Consequence Rankings by Binary Combination
(Sort by Area Above the Lethal Limit) (Cont.)

ASTM #1	Chemical Name #1	ASTM #2	Chemical Name #2	Area Covered sq.m.
2	Nitric Acid, Fuming	16	Styrene Monomer	603958
2	Nitric Acid, Fuming	19	Acetone	603495
2	Oleum	18	Toluene Diisocyanate	603376
2	Oleum	24	Motor Fuel Antiknock Comp	603186
2	Oleum	17	Carbon Tetrachloride	603186
2	Oleum	10	Sodium Hydroxide, Liq.	603186
2	Oleum	107	Maleic Anhydride	603186
2	Oleum	10	Alkaline Liquid, n.o.s.	603186
2	Oleum	4	Octyl Alcohol	603186
2	Oleum	5	Acetaldehyde	603186
2	Oleum	10	Potassium Hydroxide, Liq	603186
2	Oleum	34	Propylene Oxide	603186
2	Oleum	34	Ethylene Oxide	603186
2	Oleum	105	Phosphorus	603186
2	Nitric Acid, Fuming	107	Acetic Anhydride	599121
2	Nitric Acid, Fuming	17	Chloroprene, Inhibited	599076
2	Nitric Acid, Fuming	19	Methyl Ethyl Ketone	588939
2	Nitric Acid, Fuming	13	Ethyl Acrylate	588913
2	Nitric Acid, Fuming	13	Methyl Methacrylate	586257
2	Nitric Acid, Fuming	5	Acetaldehyde	566342
2	Sulfuric Acid	17	Chloroprene, Inhibited	565782
1	Hydrocyanic Acid	104	Chlorine	565487
2	Nitric Acid, Fuming	13	Butyl Acrylate	561644
2	Nitric Acid, Fuming	7	Aniline Oil, Liquid	555587
2	Nitric Acid, Fuming	31	Phenol	554126
2	Nitric Acid, Fuming	7	Hexamethylene Diamine Sol	552497
2	Nitric Acid, Fuming	18	Toluene Diisocyanate	552325
2	Nitric Acid, Fuming	5	Formaldehyde Solution	552292
2	Nitric Acid, Fuming	10	Alkaline Liquid, n.o.s.	552135
2	Nitric Acid, Fuming	105	Phosphorus	552135
2	Nitric Acid, Fuming	21	Sodium Metal	552135
2	Nitric Acid, Fuming	24	Motor Fuel Antiknock Comp	552135
2	Nitric Acid, Fuming	10	Sodium Hydroxide, Liq.	552135
2	Nitric Acid, Fuming	10	Potassium Hydroxide, Liq	552135
1	Hydroiodic Acid	2	Nitric Acid, Fuming	552135
2	Sulfuric Acid	17	Carbon Tetrachloride	544281
10	Anhydrous Ammonia	17	Methyl Chloride	519315
1	Hydrochloric Acid	2	Nitric Acid, Fuming	508938
1	Hydrochloric Acid	2	Sulfuric Acid	490874
1	Hydrochloric Acid	2	Sulfuric Acid, Spent	490874
2	Oleum	17	Chloroprene, Inhibited	414985
2	Nitric Acid, Fuming	17	Methyl Chloride	412334
20	Carbon Disulfide	104	Ferric Chloride Solution	388772
2	Oleum	7	Hexamethylene Diamine Sol	330229
2	Oleum	5	Formaldehyde Solution	330024

Table J3. Consequence Rankings by Binary Combination
(Sort by Area Above the Lethal Limit) (Cont.)

ASTM #1	Chemical Name #1	ASTM #2	Chemical Name #2	Area Covered sq.m.
2	Oleum	28	Butadiene	329867
2	Oleum	21	Sodium Metal	329867
2	Oleum	28	LPG	329867
2	Oleum	28	LPG-Butene	329867
2	Oleum	28	LPG-Isobutylene	329867
2	Oleum	28	LPG-Propylene	329867
10	Sodium Hydroxide, Liq.	17	Carbon Tetrachloride	318086
10	Alkaline Liquid, n.o.s.	17	Carbon Tetrachloride	318086
10	Potassium Hydroxide, Liq	17	Carbon Tetrachloride	318086
1	Hydrofluorosilicic Acid	17	Methyl Chloride	301593
1	Hydrochloric Acid	2	Oleum	289812
17	Chloroprene, Inhibited	24	Motor Fuel Antiknock Comp	261833
17	Chloroprene, Inhibited	104	Ferric Chloride Solution	261833
1	Hydroiodic Acid	105	Phosphorus	255742
1	Hydroiodic Acid	2	Sulfuric Acid	254469
20	Carbon Disulfide	21	Sodium Metal	252602
2	Nitric Acid, Fuming	20	Carbon Disulfide	252585
2	Sulfuric Acid	4	Ethyl Alcohol	252507
2	Sulfuric Acid	4	Denatured Alcohol	252507
2	Oleum	101	Coal Tar Distillate	251924
2	Oleum	101	Fuel Oil	251892
2	Oleum	101	Fuel, Aviation	251879
2	Oleum	101	Petroleum Naphtha	251854
2	Oleum	101	Crude Oil Petroleum	251557
2	Oleum	101	Pulp Mill Liquid	251327
2	Oleum	101	Combustible Liquid	251327
2	Oleum	101	Compound, Cleaning	251327
2	Oleum	101	Gasoline, nec	251327
2	Oleum	101	Gasoline	251327
2	Nitric Acid, Fuming	2	Oleum	251327
1	Hydroiodic Acid	2	Oleum	251327
2	Oleum	101	Flammable Liquid	251327
2	Oleum	101	Distillate Fuel Oil	251327
2	Oleum	17	Methyl Chloride	251327
2	Oleum	101	Petroleum Residual Fuel	251327
2	Oleum	101	Petroleum, Refined	251327
2	Oleum	101	Oil	251327
2	Oleum	17	Vinyl Chloride	251327
17	Carbon Tetrachloride	20	Carbon Disulfide	250542
5	Butyraldehyde	104	Hydrogen Peroxide	241684
3	Acrylic Acid	17	Chloroprene, Inhibited	238922
17	Chloroprene, Inhibited	21	Sodium Metal	231305
16	Xylene	104	Hydrogen Peroxide	230673
17	Chloroprene, Inhibited	104	Hydrogen Peroxide	227421
3	Acetic Acid, Glacial	17	Chloroprene, Inhibited	226871

Table J3. Consequence Rankings by Binary Combination
(Sort by Area Above the Lethal Limit) (Cont.)

ASTM #1	Chemical Name #1	ASTM #2	Chemical Name #2	Area Covered sq.m.
20	Carbon Disulfide	34	Propylene Oxide	225409
16	Toluene	104	Hydrogen Peroxide	221749
16	Benzene	104	Hydrogen Peroxide	218780
7	Aniline Oil, Liquid	17	Chloroprene, Inhibited	206971
16	Styrene Monomer	104	Hydrogen Peroxide	206653
3	Acetic Acid, Glacial	21	Sodium Metal	203636
4	Butyl Alcohol	104	Hydrogen Peroxide	203147
7	Hexamethylene Diamine Sol	17	Chloroprene, Inhibited	202203
10	Potassium Hydroxide, Liq	17	Chloroprene, Inhibited	202182
2	Sulfuric Acid, Spent	17	Chloroprene, Inhibited	202182
10	Alkaline Liquid, n.o.s.	17	Chloroprene, Inhibited	202182
10	Sodium Hydroxide, Liq.	17	Chloroprene, Inhibited	202182
1	Hydroiodic Acid	17	Chloroprene, Inhibited	202182
1	Phosphoric Acid	17	Chloroprene, Inhibited	202182
1	Hydrofluorosilicic Acid	17	Chloroprene, Inhibited	202182
1	Hydrochloric Acid	17	Chloroprene, Inhibited	202182
4	Isopropanol	104	Hydrogen Peroxide	195329
3	Acetic Acid, Glacial	5	Butyraldehyde	194662
19	Methyl Ethyl Ketone	104	Hydrogen Peroxide	191634
13	Ethyl Acrylate	104	Hydrogen Peroxide	191608
2	Sulfuric Acid	4	Methyl Alcohol	189597
26	Acrylonitrile	104	Hydrogen Peroxide	189594
13	Methyl Methacrylate	104	Hydrogen Peroxide	188952
4	Ethyl Alcohol	104	Hydrogen Peroxide	187691
4	Denatured Alcohol	104	Hydrogen Peroxide	187691
13	Ethyl Acetate	104	Hydrogen Peroxide	181175
21	Sodium Metal	104	Hydrogen Peroxide	178558
3	Acrylic Acid	104	Hydrogen Peroxide	178228
2	Nitric Acid, Fuming	3	Acetic Acid, Glacial	177202
2	Sulfuric Acid	21	Sodium Metal	176715
13	Vinyl Acetate	104	Hydrogen Peroxide	175273
2	Nitric Acid, Fuming	13	Ethyl Acetate	169793
2	Nitric Acid, Fuming	13	Vinyl Acetate	168868
3	Acetic Acid, Glacial	104	Hydrogen Peroxide	168815
4	Methyl Alcohol	104	Hydrogen Peroxide	167854
2	Nitric Acid, Fuming	4	Octyl Alcohol	166834
2	Nitric Acid, Fuming	107	Maleic Anhydride	164533
13	Butyl Acrylate	104	Hydrogen Peroxide	164339
104	Hydrogen Peroxide	107	Acetic Anhydride	164200
2	Nitric Acid, Fuming	104	Hydrogen Peroxide	162684
27	Dinitrotoluene, Liquid	104	Hydrogen Peroxide	161644
19	Acetone	104	Hydrogen Peroxide	160567
3	Acetic Acid, Glacial	107	Acetic Anhydride	158610
7	Aniline Oil, Liquid	104	Hydrogen Peroxide	158282
31	Phenol	104	Hydrogen Peroxide	156821

Table J3. Consequence Rankings by Binary Combination
(Sort by Area Above the Lethal Limit) (Cont.)

ASTM #1	Chemical Name #1	ASTM #2	Chemical Name #2	Area Covered sq.m.
104	Hydrogen Peroxide	107	Maleic Anhydride	155922
18	Toluene Diisocyanate	104	Hydrogen Peroxide	155020
4	Octyl Alcohol	104	Hydrogen Peroxide	154830
24	Motor Fuel Antiknock Comp	104	Hydrogen Peroxide	154830
3	Acetic Acid, Glacial	18	Toluene Diisocyanate	153739
7	Hexamethylene Diamine Sol	17	Carbon Tetrachloride	148440
2	Sulfuric Acid, Spent	17	Carbon Tetrachloride	148440
17	Carbon Tetrachloride	21	Sodium Metal	148440
1	Hydroiodic Acid	17	Carbon Tetrachloride	148440
7	Aniline Oil, Liquid	17	Carbon Tetrachloride	148440
3	Acetic Acid, Glacial	5	Formaldehyde Solution	148250
2	Sulfuric Acid	3	Acetic Acid, Glacial	145932
3	Acetic Acid, Glacial	10	Alkaline Liquid, n.o.s.	145932
3	Acetic Acid, Glacial	10	Potassium Hydroxide, Liq	145932
3	Acetic Acid, Glacial	10	Sodium Hydroxide, Liq.	145932
2	Sulfuric Acid, Spent	3	Acetic Acid, Glacial	145932
7	Hexamethylene Diamine Sol	104	Hydrogen Peroxide	145853
21	Sodium Metal	26	Acrylonitrile	145850
104	Ferric Chloride Solution	104	Hydrogen Peroxide	145491
2	Sulfuric Acid	16	Benzene	139348
2	Nitric Acid, Fuming	101	Coal Tar Distillate	138042
2	Nitric Acid, Fuming	101	Fuel Oil	138010
2	Nitric Acid, Fuming	101	Fuel, Aviation	137997
2	Nitric Acid, Fuming	101	Petroleum Naphtha	137972
2	Nitric Acid, Fuming	3	Acrylic Acid	137886
2	Nitric Acid, Fuming	101	Crude Oil Petroleum	137675
2	Nitric Acid, Fuming	101	Flammable Liquid	137445
2	Nitric Acid, Fuming	101	Distillate Fuel Oil	137445
2	Nitric Acid, Fuming	101	Gasoline	137445
2	Nitric Acid, Fuming	28	LPG-Propylene	137445
2	Nitric Acid, Fuming	101	Combustible Liquid	137445
2	Nitric Acid, Fuming	27	Dinitrotoluene, Liquid	137445
2	Nitric Acid, Fuming	101	Petroleum Residual Fuel	137445
2	Nitric Acid, Fuming	28	LPG-Isobutylene	137445
2	Nitric Acid, Fuming	101	Gasoline, nec	137445
2	Nitric Acid, Fuming	106	Ammonium Nitrate Soln.	137445
2	Nitric Acid, Fuming	28	LPG-Butene	137445
2	Nitric Acid, Fuming	101	Pulp Mill Liquid	137445
2	Nitric Acid, Fuming	101	Oil	137445
2	Nitric Acid, Fuming	28	LPG	137445
2	Nitric Acid, Fuming	28	Butadiene	137445
2	Nitric Acid, Fuming	17	Vinyl Chloride	137445
2	Nitric Acid, Fuming	101	Petroleum, Refined	137445
2	Nitric Acid, Fuming	101	Compound, Cleaning	137445
13	Ethyl Acrylate	21	Sodium Metal	130821

Table J3. Consequence Rankings by Binary Combination
(Sort by Area Above the Lethal Limit) (Cont.)

ASTM #1	Chemical Name #1	ASTM #2	Chemical Name #2	Area Covered sq.m.
26	Acrylonitrile	31	Phenol	130246
19	Methyl Ethyl Ketone	21	Sodium Metal	129828
2	Sulfuric Acid	16	Toluene	129751
2	Sulfuric Acid	104	Hydrogen Peroxide	129591
1	Hydrochloric Acid	4	Ethyl Alcohol	128629
1	Hydrochloric Acid	4	Denatured Alcohol	128629
2	Sulfuric Acid	26	Acrylonitrile	126656
2	Nitric Acid, Fuming	34	Ethylene Oxide	124878
1	Hydrofluorosilicic Acid	4	Denatured Alcohol	116848
1	Hydrofluorosilicic Acid	4	Ethyl Alcohol	116848
7	Aniline Oil, Liquid	26	Acrylonitrile	116697
1	Hydroiodic Acid	4	Methyl Alcohol	113740
2	Sulfuric Acid, Spent	4	Methyl Alcohol	113707
7	Hexamethylene Diamine Sol	26	Acrylonitrile	111730
2	Sulfuric Acid, Spent	4	Denatured Alcohol	111328
2	Sulfuric Acid, Spent	4	Ethyl Alcohol	111328
2	Sulfuric Acid, Spent	26	Acrylonitrile	110162
5	Butyraldehyde	7	Hexamethylene Diamine Sol	107035
1	Hydrochloric Acid	5	Butyraldehyde	103483
2	Sulfuric Acid, Spent	16	Benzene	103105
1	Hydroiodic Acid	5	Butyraldehyde	102698
1	Phosphoric Acid	5	Butyraldehyde	102698
5	Butyraldehyde	21	Sodium Metal	102698
4	Alcoholic Beverage	5	Butyraldehyde	102692
13	Methyl Methacrylate	21	Sodium Metal	102603
1	Hydrofluorosilicic Acid	16	Styrene Monomer	102088
4	Butyl Alcohol	21	Sodium Metal	101070
1	Hydroiodic Acid	13	Ethyl Acrylate	99610
1	Hydrochloric Acid	13	Ethyl Acrylate	99610
2	Sulfuric Acid	13	Ethyl Acrylate	99610
4	Butyl Alcohol	5	Butyraldehyde	99054
2	Sulfuric Acid	7	Aniline Oil, Liquid	97700
2	Sulfuric Acid	19	Methyl Ethyl Ketone	97280
5	Butyraldehyde	7	Aniline Oil, Liquid	96076
1	Phosphoric Acid	26	Acrylonitrile	95240
1	Hydrochloric Acid	26	Acrylonitrile	95240
1	Hydroiodic Acid	26	Acrylonitrile	95240
1	Hydroiodic Acid	2	Sulfuric Acid, Spent	95033
2	Sulfuric Acid	17	Vinyl Chloride	95033
5	Butyraldehyde	107	Acetic Anhydride	93406
4	Isopropanol	21	Sodium Metal	92219
4	Isopropanol	5	Butyraldehyde	89450
1	Hydrocyanic Acid	24	Motor Fuel Antiknock Comp	87982
1	Hydrofluorosilicic Acid	13	Ethyl Acrylate	86258
2	Sulfuric Acid, Spent	19	Acetone	86008

Table J3. Consequence Rankings by Binary Combination
(Sort by Area Above the Lethal Limit) (Cont.)

ASTM #1	Chemical Name #1	ASTM #2	Chemical Name #2	Area Covered sq.m.
10	Alkaline Liquid, n.o.s.	19	Acetone	86008
10	Sodium Hydroxide, Liq.	19	Acetone	86008
10	Potassium Hydroxide, Liq	19	Acetone	86008
1	Hydrochloric Acid	19	Acetone	86008
1	Phosphoric Acid	19	Acetone	86008
1	Hydrofluorosilicic Acid	19	Acetone	86008
1	Hydroiodic Acid	19	Acetone	86008
1	Hydrofluorosilicic Acid	5	Butyraldehyde	85858
3	Acrylic Acid	21	Sodium Metal	85559
5	Acetaldehyde	104	Hydrogen Peroxide	84233
1	Hydroiodic Acid	13	Vinyl Acetate	84060
10	Alkaline Liquid, n.o.s.	13	Vinyl Acetate	84060
1	Hydrochloric Acid	13	Vinyl Acetate	84060
10	Potassium Hydroxide, Liq	13	Vinyl Acetate	84060
10	Sodium Hydroxide, Liq.	13	Vinyl Acetate	84060
1	Hydrofluorosilicic Acid	13	Methyl Methacrylate	83602
1	Hydrofluorosilicic Acid	26	Acrylonitrile	81888
4	Ethyl Alcohol	5	Butyraldehyde	79420
4	Denatured Alcohol	5	Butyraldehyde	79420
2	Sulfuric Acid	16	Xylene	76628
4	Butyl Alcohol	18	Toluene Diisocyanate	76625
2	Sulfuric Acid	4	Butyl Alcohol	76591
2	Sulfuric Acid, Spent	4	Butyl Alcohol	76591
3	Acrylic Acid	7	Aniline Oil, Liquid	76337
5	Butyraldehyde	31	Phenol	75749
3	Acrylic Acid	5	Butyraldehyde	75105
13	Ethyl Acetate	21	Sodium Metal	74806
1	Hydrofluorosilicic Acid	21	Sodium Metal	73993
1	Hydroiodic Acid	13	Methyl Methacrylate	71821
1	Hydrochloric Acid	13	Methyl Methacrylate	71821
2	Sulfuric Acid	13	Methyl Methacrylate	71821
7	Aniline Oil, Liquid	21	Sodium Metal	71678
1	Hydrochloric Acid	16	Styrene Monomer	71458
1	Hydrofluorosilicic Acid	13	Vinyl Acetate	70708
10	Alkaline Liquid, n.o.s.	26	Acrylonitrile	69378
10	Potassium Hydroxide, Liq	26	Acrylonitrile	69378
10	Sodium Hydroxide, Liq.	26	Acrylonitrile	69378
4	Isopropanol	18	Toluene Diisocyanate	68805
4	Methyl Alcohol	21	Sodium Metal	67322
1	Hydrofluorosilicic Acid	17	Carbon Tetrachloride	66759
3	Acetic Acid, Glacial	7	Aniline Oil, Liquid	64424
3	Acetic Acid, Glacial	7	Hexamethylene Diamine Sol	64249
5	Butyraldehyde	18	Toluene Diisocyanate	64059
4	Ethyl Alcohol	21	Sodium Metal	63628
4	Denatured Alcohol	21	Sodium Metal	63628

Table J3. Consequence Rankings by Binary Combination
(Sort by Area Above the Lethal Limit) (Cont.)

ASTM #1	Chemical Name #1	ASTM #2	Chemical Name #2	Area Covered sq.m.
4	Denatured Alcohol	18	Toluene Diisocyanate	61165
4	Ethyl Alcohol	18	Toluene Diisocyanate	61165
2	Sulfuric Acid, Spent	4	Isopropanol	60134
2	Sulfuric Acid	4	Isopropanol	60134
1	Hydrofluorosilicic Acid	13	Butyl Acrylate	59774
21	Sodium Metal	106	Ammonium Nitrate Soln.	59710
1	Hydrofluorosilicic Acid	107	Acetic Anhydride	59635
10	Anhydrous Ammonia	24	Motor Fuel Antiknock Comp	58934
3	Acrylic Acid	18	Toluene Diisocyanate	57761
2	Sulfuric Acid, Spent	4	Alcoholic Beverage	57081
19	Acetone	21	Sodium Metal	56291
10	Potassium Hydroxide, Liq	16	Styrene Monomer	54965
2	Sulfuric Acid	16	Styrene Monomer	54965
1	Phosphoric Acid	16	Styrene Monomer	54965
1	Hydroiodic Acid	16	Styrene Monomer	54965
10	Alkaline Liquid, n.o.s.	16	Styrene Monomer	54965
10	Sodium Hydroxide, Liq.	16	Styrene Monomer	54965
7	Aniline Oil, Liquid	24	Motor Fuel Antiknock Comp	54473
4	Methyl Alcohol	5	Butyraldehyde	53323
1	Hydrochloric Acid	4	Isopropanol	53105
1	Hydrofluorosilicic Acid	4	Isopropanol	53105
5	Formaldehyde Solution	7	Aniline Oil, Liquid	52518
1	Phosphoric Acid	24	Motor Fuel Antiknock Comp	52117
1	Hydroiodic Acid	24	Motor Fuel Antiknock Comp	52117
2	Sulfuric Acid, Spent	24	Motor Fuel Antiknock Comp	52117
1	Hydrochloric Acid	24	Motor Fuel Antiknock Comp	52117
1	Hydrofluorosilicic Acid	24	Motor Fuel Antiknock Comp	52117
1	Hydrochloric Acid	105	Phosphorus	51538
5	Butyraldehyde	104	Ferric Chloride Solution	51437
10	Potassium Hydroxide, Liq	105	Phosphorus	51427
10	Sodium Hydroxide, Liq.	105	Phosphorus	51427
10	Alkaline Liquid, n.o.s.	105	Phosphorus	51427
1	Hydrofluorosilicic Acid	107	Maleic Anhydride	51357
34	Propylene Oxide	104	Hydrogen Peroxide	50564
1	Hydrofluorosilicic Acid	18	Toluene Diisocyanate	50455
1	Hydrofluorosilicic Acid	10	Sodium Hydroxide, Liq.	50265
1	Hydrofluorosilicic Acid	10	Alkaline Liquid, n.o.s.	50265
1	Hydrofluorosilicic Acid	10	Potassium Hydroxide, Liq	50265
7	Aniline Oil, Liquid	107	Acetic Anhydride	49327
3	Acrylic Acid	107	Acetic Anhydride	48326
2	Sulfuric Acid	14	Glycol Ethers	47985
2	Sulfuric Acid	4	Alcoholic Beverage	47119
1	Hydrochloric Acid	4	Alcoholic Beverage	45600
10	Sodium Hydroxide, Liq.	13	Ethyl Acetate	45195
10	Potassium Hydroxide, Liq	13	Ethyl Acetate	45195

Table J3. Consequence Rankings by Binary Combination
(Sort by Area Above the Lethal Limit) (Cont.)

ASTM #1	Chemical Name #1	ASTM #2	Chemical Name #2	Area Covered sq.m.
10	Alkaline Liquid, n.o.s.	13	Ethyl Acetate	45195
1	Hydrochloric Acid	21	Sodium Metal	43363
1	Hydrochloric Acid	4	Methyl Alcohol	42740
4	Methyl Alcohol	104	Chlorine	42580
3	Acrylic Acid	5	Formaldehyde Solution	42352
19	Methyl Ethyl Ketone	104	Ferric Chloride Solution	41831
10	Sodium Hydroxide, Liq.	19	Methyl Ethyl Ketone	41831
2	Sulfuric Acid, Spent	19	Methyl Ethyl Ketone	41831
10	Potassium Hydroxide, Liq	19	Methyl Ethyl Ketone	41831
10	Alkaline Liquid, n.o.s.	19	Methyl Ethyl Ketone	41831
1	Hydroiodic Acid	19	Methyl Ethyl Ketone	41831
1	Phosphoric Acid	19	Methyl Ethyl Ketone	41831
1	Hydrofluorosilicic Acid	19	Methyl Ethyl Ketone	41831
1	Hydrochloric Acid	19	Methyl Ethyl Ketone	41831
1	Hydrochloric Acid	13	Ethyl Acetate	41485
1	Hydroiodic Acid	13	Ethyl Acetate	41485
7	Aniline Oil, Liquid	18	Toluene Diisocyanate	41239
2	Sulfuric Acid, Spent	7	Aniline Oil, Liquid	41151
4	Methyl Alcohol	18	Toluene Diisocyanate	40538
2	Sulfuric Acid	31	Phenol	40476
7	Aniline Oil, Liquid	107	Maleic Anhydride	39832
13	Vinyl Acetate	21	Sodium Metal	39637
3	Acetic Acid, Glacial	5	Acetaldehyde	37699
2	Sulfuric Acid, Spent	13	Ethyl Acetate	37596
2	Sulfuric Acid	13	Ethyl Acetate	37596
1	Hydrofluorosilicic Acid	13	Ethyl Acetate	37558
13	Vinyl Acetate	104	Ferric Chloride Solution	36731
2	Sulfuric Acid, Spent	13	Vinyl Acetate	36663
4	Ethyl Alcohol	104	Chlorine	36161
4	Denatured Alcohol	104	Chlorine	36161
104	Chlorine	106	Ammonium Nitrate Soln.	35982
105	Phosphorus	106	Ammonium Nitrate Soln.	35982
2	Sulfuric Acid	106	Ammonium Nitrate Soln.	35982
4	Isopropanol	104	Chlorine	35792
2	Sulfuric Acid, Spent	5	Butyraldehyde	35593
2	Sulfuric Acid	5	Butyraldehyde	35593
5	Butyraldehyde	10	Potassium Hydroxide, Liq	35593
5	Butyraldehyde	10	Alkaline Liquid, n.o.s.	35593
5	Butyraldehyde	10	Sodium Hydroxide, Liq.	35593
17	Vinyl Chloride	104	Hydrogen Peroxide	34664
104	Hydrogen Peroxide	105	Phosphorus	34664
13	Butyl Acrylate	21	Sodium Metal	34543
3	Acetic Acid, Glacial	26	Acrylonitrile	34460
5	Acetaldehyde	21	Sodium Metal	34309
3	Acrylic Acid	26	Acrylonitrile	33921

Table J3. Consequence Rankings by Binary Combination
(Sort by Area Above the Lethal Limit) (Cont.)

ASTM #1	Chemical Name #1	ASTM #2	Chemical Name #2	Area Covered sq.m.
1	Hydrofluorosilicic Acid	4	Alcoholic Beverage	33819
26	Acrylonitrile	104	Ferric Chloride Solution	33068
3	Acrylic Acid	7	Hexamethylene Diamine Sol	31674
2	Sulfuric Acid, Spent	27	Dinitrotoluene, Liquid	30516
10	Potassium Hydroxide, Liq	27	Dinitrotoluene, Liquid	30516
5	Butyraldehyde	27	Dinitrotoluene, Liquid	30516
27	Dinitrotoluene, Liquid	105	Phosphorus	30516
2	Sulfuric Acid	27	Dinitrotoluene, Liquid	30516
27	Dinitrotoluene, Liquid	104	Chlorine	30516
10	Alkaline Liquid, n.o.s.	27	Dinitrotoluene, Liquid	30516
5	Acetaldehyde	27	Dinitrotoluene, Liquid	30516
10	Sodium Hydroxide, Liq.	27	Dinitrotoluene, Liquid	30516
21	Sodium Metal	27	Dinitrotoluene, Liquid	30516
10	Anhydrous Ammonia	17	Methyl Chloride	30012
1	Hydrochloric Acid	13	Butyl Acrylate	29144
1	Hydrochloric Acid	107	Acetic Anhydride	29005
7	Hexamethylene Diamine Sol	18	Toluene Diisocyanate	28546
4	Alcoholic Beverage	18	Toluene Diisocyanate	28500
1	Phosphoric Acid	18	Toluene Diisocyanate	28464
1	Hydrochloric Acid	18	Toluene Diisocyanate	28464
1	Hydroiodic Acid	18	Toluene Diisocyanate	28464
2	Sulfuric Acid, Spent	18	Toluene Diisocyanate	28464
2	Sulfuric Acid	18	Toluene Diisocyanate	28464
10	Potassium Hydroxide, Liq	18	Toluene Diisocyanate	28464
10	Alkaline Liquid, n.o.s.	18	Toluene Diisocyanate	28464
10	Sodium Hydroxide, Liq.	18	Toluene Diisocyanate	28464
4	Octyl Alcohol	18	Toluene Diisocyanate	28274
5	Formaldehyde Solution	18	Toluene Diisocyanate	27796
4	Butyl Alcohol	104	Chlorine	27423
101	Coal Tar Distillate	104	Hydrogen Peroxide	25922
101	Fuel Oil	104	Hydrogen Peroxide	25890
101	Fuel, Aviation	104	Hydrogen Peroxide	25877
101	Petroleum Naphtha	104	Hydrogen Peroxide	25852
101	Crude Oil Petroleum	104	Hydrogen Peroxide	25555
101	Distillate Fuel Oil	104	Hydrogen Peroxide	25325
101	Flammable Liquid, n.o.s.	104	Hydrogen Peroxide	25325
101	Gasoline	104	Hydrogen Peroxide	25325
101	Combustible Liquid	104	Hydrogen Peroxide	25325
28	LPG-Propylene	104	Hydrogen Peroxide	25325
28	LPG-Butylene	104	Hydrogen Peroxide	25325
28	LPG-Butene	104	Hydrogen Peroxide	25325
28	LPG-Isobutylene	104	Hydrogen Peroxide	25325
4	Alcoholic Beverage	104	Hydrogen Peroxide	25325
101	Compound, Cleaning	104	Hydrogen Peroxide	25325
5	Formaldehyde Solution	104	Hydrogen Peroxide	25325

Table J3. Consequence Rankings by Binary Combination
(Sort by Area Above the Lethal Limit) (Cont.)

ASTM #1	Chemical Name #1	ASTM #2	Chemical Name #2	Area Covered sq.m.
101	Petroleum Residual Fuel	104	Hydrogen Peroxide	25325
101	Oil	104	Hydrogen Peroxide	25325
101	Petroleum Refined	104	Hydrogen Peroxide	25325
101	Gasoline, nec	104	Hydrogen Peroxide	25325
34	Ethylene Oxide	104	Hydrogen Peroxide	25239
2	Sulfuric Acid	19	Acetone	24587
1	Phosphoric Acid	21	Sodium Metal	24513
18	Toluene Diisocyanate	21	Sodium Metal	24513
1	Hydroiodic Acid	21	Sodium Metal	24513
1	Hydrofluorosilicic Acid	4	Methyl Alcohol	23890
4	Alcoholic Beverage	21	Sodium Metal	23732
21	Sodium Metal	101	Pulp Mill Liquid	23728
10	Alkaline Liquid, n.o.s.	21	Sodium Metal	23728
2	Sulfuric Acid, Spent	21	Sodium Metal	23728
4	Octyl Alcohol	21	Sodium Metal	23728
10	Potassium Hydroxide, Liq	21	Sodium Metal	23728
21	Sodium Metal	104	Ferric Chloride Solution	23728
3	Acrylic Acid	10	Alkaline Liquid, n.o.s.	23398
2	Sulfuric Acid, Spent	3	Acrylic Acid	23398
3	Acrylic Acid	10	Potassium Hydroxide, Liq	23398
3	Acrylic Acid	10	Sodium Hydroxide, Liq.	23398
2	Sulfuric Acid	3	Acrylic Acid	23398
4	Alcoholic Beverage	104	Chlorine	22780
16	Styrene Monomer	21	Sodium Metal	22752
7	Hexamethylene Diamine Sol	107	Acetic Anhydride	22013
21	Sodium Metal	107	Acetic Anhydride	21936
1	Hydroiodic Acid	107	Acetic Anhydride	21936
1	Phosphoric Acid	107	Acetic Anhydride	21936
27	Dinitrotoluene, Liquid	107	Acetic Anhydride	21936
10	Alkaline Liquid, n.o.s.	107	Acetic Anhydride	21936
2	Sulfuric Acid, Spent	107	Acetic Anhydride	21936
10	Sodium Hydroxide, Liq.	107	Acetic Anhydride	21936
2	Sulfuric Acid	107	Acetic Anhydride	21936
10	Potassium Hydroxide, Liq	107	Acetic Anhydride	21936
1	Hydrochloric Acid	107	Maleic Anhydride	20727
2	Sulfuric Acid	13	Vinyl Acetate	20443
10	Anhydrous Ammonia	104	Chlorine	20017
5	Formaldehyde Solution	21	Sodium Metal	19919
1	Hydrochloric Acid	17	Vinyl Chloride	19635
1	Hydrochloric Acid	10	Sodium Hydroxide, Liq.	19635
1	Hydrochloric Acid	10	Potassium Hydroxide, Liq	19635
1	Hydrochloric Acid	10	Alkaline Liquid, n.o.s.	19635
7	Hexamethylene Diamine Sol	21	Sodium Metal	19250
5	Formaldehyde Solution	7	Hexamethylene Diamine Sol	19115
2	Sulfuric Acid	5	Formaldehyde Solution	19007

Table J3. Consequence Rankings by Binary Combination
(Sort by Area Above the Lethal Limit) (Cont.)

ASTM #1	Chemical Name #1	ASTM #2	Chemical Name #2	Area Covered sq.m.
4	Octyl Alcohol	104	Chlorine	17168
2	Sulfuric Acid	17	Methyl Chloride	16493
101	Pulp Mill Liquid	104	Hydrogen Peroxide	15900
1	Hydrocyanic Acid	104	Hydrogen Peroxide	15900
17	Methyl Chloride	104	Hydrogen Peroxide	15900
28	Butadiene	104	Hydrogen Peroxide	15900
2	Sulfuric Acid, Spent	13	Ethyl Acrylate	14336
1	Hydroiodic Acid	14	Glycol Ethers	13832
13	Ethyl Acrylate	104	Ferric Chloride Solution	12212
10	Anhydrous Ammonia	19	Methyl Ethyl Ketone	12055
2	Sulfuric Acid, Spent	5	Butyraldehyde	11096
10	Anhydrous Ammonia	13	Vinyl Acetate	9777
1	Hydroiodic Acid	13	Butyl Acrylate	9509
2	Sulfuric Acid	13	Butyl Acrylate	9509
1	Phosphoric Acid	104	Hydrogen Peroxide	9425
1	Hydrofluorosilicic Acid	104	Hydrogen Peroxide	9425
1	Hydroiodic Acid	104	Hydrogen Peroxide	9425
2	Sulfuric Acid, Spent	16	Toluene	9174
2	Sulfuric Acid, Spent	13	Methyl Methacrylate	8980
13	Methyl Methacrylate	104	Ferric Chloride Solution	8980
10	Sodium Hydroxide, Liq.	17	Vinyl Chloride	8390
10	Alkaline Liquid, n.o.s.	17	Vinyl Chloride	8390
10	Potassium Hydroxide, Liq	17	Vinyl Chloride	8390
1	Hydrochloric Acid	14	Glycol Ethers	8335
1	Hydrofluorosilicic Acid	3	Acetic Acid, Glacial	7104
1	Hydrochloric Acid	3	Acetic Acid, Glacial	7104
3	Acetic Acid, Glacial	106	Ammonium Nitrate Soln.	7104
1	Phosphoric Acid	3	Acetic Acid, Glacial	7104
1	Hydroiodic Acid	3	Acetic Acid, Glacial	7104
10	Anhydrous Ammonia	13	Ethyl Acetate	6981
4	Methyl Alcohol	104	Ferric Chloride Solution	6283
1	Hydrocyanic Acid	19	Acetone	5024
104	Ferric Chloride Solution	107	Acetic Anhydride	3696
106	Ammonium Nitrate Soln.	107	Acetic Anhydride	3696
2	Sulfuric Acid, Spent	31	Phenol	3248
31	Phenol	105	Phosphorus	3248
1	Hydrofluorosilicic Acid	31	Phenol	3142
5	Formaldehyde Solution	107	Acetic Anhydride	2910
1	Hydrochloric Acid	4	Butyl Alcohol	2534
1	Hydrofluorosilicic Acid	4	Butyl Alcohol	2534
2	Sulfuric Acid, Spent	5	Formaldehyde Solution	2356
1	Phosphoric Acid	5	Formaldehyde Solution	2356
1	Hydrofluorosilicic Acid	5	Formaldehyde Solution	2356
1	Hydroiodic Acid	5	Formaldehyde Solution	2356
1	Hydrochloric Acid	5	Formaldehyde Solution	2356

Table J3. Consequence Rankings by Binary Combination
(Sort by Area Above the Lethal Limit) (Cont.)

ASTM #1	Chemical Name #1	ASTM #2	Chemical Name #2	Area Covered sq.m.
5	Formaldehyde Solution	10	Potassium Hydroxide, Liq	2356
5	Formaldehyde Solution	10	Sodium Hydroxide, Liq.	2356
1	Hydroiodic Acid	7	Aniline Oil, Liquid	2356
5	Formaldehyde Solution	10	Alkaline Liquid, n.o.s.	2356
1	Hydrochloric Acid	7	Aniline Oil, Liquid	2356
1	Hydrofluorosilicic Acid	7	Aniline Oil, Liquid	2356
1	Phosphoric Acid	7	Aniline Oil, Liquid	2356
7	Aniline Oil, Liquid	104	Ferric Chloride Solution	2356
5	Formaldehyde Solution	104	Ferric Chloride Solution	2356
2	Sulfuric Acid, Spent	16	Xylene	2237
14	Glycol Ethers	104	Ferric Chloride Solution	2051
2	Sulfuric Acid, Spent	14	Glycol Ethers	2051
1	Hydrofluorosilicic Acid	14	Glycol Ethers	2051
2	Sulfuric Acid, Spent	16	Styrene Monomer	1758
16	Styrene Monomer	104	Ferric Chloride Solution	1758
1	Hydrofluorosilicic Acid	3	Acrylic Acid	1226
1	Hydrochloric Acid	3	Acrylic Acid	1226
10	Sodium Hydroxide, Liq.	107	Maleic Anhydride	1092
10	Alkaline Liquid, n.o.s.	107	Maleic Anhydride	1092
1	Phosphoric Acid	107	Maleic Anhydride	1092
1	Hydroiodic Acid	107	Maleic Anhydride	1092
27	Dinitrotoluene, Liquid	107	Maleic Anhydride	1092
21	Sodium Metal	107	Maleic Anhydride	1092
10	Potassium Hydroxide, Liq	107	Maleic Anhydride	1092
13	Butyl Acrylate	104	Ferric Chloride Solution	965
2	Sulfuric Acid, Spent	13	Butyl Acrylate	965
7	Hexamethylene Diamine Sol	107	Maleic Anhydride	896
1	Hydrofluorosilicic Acid	7	Hexamethylene Diamine Sol	785
18	Toluene Diisocyanate	106	Ammonium Nitrate Soln.	785
18	Toluene Diisocyanate	105	Phosphorus	785
1	Hydrofluorosilicic Acid	105	Phosphorus	785
1	Hydrochloric Acid	7	Hexamethylene Diamine Sol	785
1	Hydrochloric Acid	101	Coal Tar Distillate	597
1	Hydroiodic Acid	101	Coal Tar Distillate	597
1	Phosphoric Acid	101	Coal Tar Distillate	597
1	Hydrofluorosilicic Acid	101	Coal Tar Distillate	597
1	Phosphoric Acid	101	Fuel Oil	565
1	Hydrofluorosilicic Acid	101	Fuel Oil	565
1	Hydrochloric Acid	101	Fuel Oil	565
1	Hydroiodic Acid	101	Fuel Oil	565
1	Phosphoric Acid	101	Fuel, Aviation	552
1	Hydroiodic Acid	101	Fuel, Aviation	552
1	Hydrochloric Acid	101	Fuel, Aviation	552
1	Hydrofluorosilicic Acid	101	Fuel, Aviation	552
1	Hydrochloric Acid	101	Petroleum Naphtha	527

Table J3. Consequence Rankings by Binary Combination
(Sort by Area Above the Lethal Limit) (Cont.)

ASTM #1	Chemical Name #1	ASTM #2	Chemical Name #2	Area Covered sq.m.
1	Hydrofluorosilicic Acid	101	Petroleum Naphtha	527
1	Phosphoric Acid	101	Petroleum Naphtha	527
1	Hydroiodic Acid	101	Petroleum Naphtha	527
3	Acrylic Acid	106	Ammonium Nitrate Soln.	441
1	Hydroiodic Acid	3	Acrylic Acid	441
1	Phosphoric Acid	3	Acrylic Acid	441
2	Sulfuric Acid, Spent	7	Hexamethylene Diamine Sol	362
2	Sulfuric Acid	7	Hexamethylene Diamine Sol	362
1	Hydrochloric Acid	101	Crude Oil Petroleum	230
1	Hydrofluorosilicic Acid	101	Crude Oil Petroleum	230
1	Phosphoric Acid	101	Crude Oil Petroleum	230
1	Hydroiodic Acid	101	Crude Oil Petroleum	230

Note: The "Area Covered" is the total area around the spill site that is above the lethal limit resulting from mixing of the chemicals. It is a sum of the lethal areas from toxic emissions, fireballs, condensed phase explosions, and unconfined vapor cloud explosions (where applicable).

Table J4. Consequence Rankings Based on ASTM Groups
(Sort by Total Area Above the Lethal Limit)

ASTM #	ASTM #	Total Area	% of Total	Cumul-ative %
2	4	5591603	11.469	11.469
2	101	2918261	5.985	17.454
2	16	2849900	5.845	23.299
2	13	2778061	5.698	28.997
1	2	2696272	5.530	34.527
2	17	2120946	4.350	38.877
2	10	1732982	3.554	42.432
2	5	1713810	3.515	45.947
2	19	1345527	2.760	48.706
2	28	1168280	2.396	51.103
2	7	1092263	2.240	53.343
10	17	1067651	2.190	55.533
2	107	1011634	2.075	57.608
2	3	948752	1.946	59.554
2	26	744028	1.526	61.080
1	104	688594	1.412	62.492
4	104	673108	1.381	63.872
1	17	672578	1.379	65.252
2	34	665625	1.365	66.617
2	14	652839	1.339	67.956
2	18	606315	1.244	69.200
2	24	603719	1.238	70.438
2	31	601514	1.234	71.672
2	105	577661	1.185	72.856
2	21	541223	1.110	73.966
20	104	528626	1.084	75.051
1	13	485253	0.995	76.046
13	104	480118	0.985	77.031
2	104	460350	0.944	77.975
16	104	439807	0.902	78.877
1	4	431011	0.884	79.761
2	27	416090	0.853	80.614
2	106	406298	0.833	81.448
7	17	353027	0.724	82.172
17	104	269909	0.554	82.725
1	19	258190	0.530	83.255
3	10	253995	0.521	83.776
4	5	251680	0.516	84.292
2	2	251327	0.515	84.808
3	5	249034	0.511	85.318
3	17	232897	0.478	85.796
4	21	217664	0.446	86.242
5	104	202518	0.415	86.658
10	13	202262	0.415	87.073
1	5	202081	0.414	87.487
10	19	197786	0.406	87.893

Table J4. Consequence Rankings Based on ASTM Groups (Sort by Area Above the Lethal Limit) (Cont.)

ASTM #	ASTM #	Total Area	% of Total	Cumul-ative %
19	104	197016	0.404	88.297
13	21	191205	0.392	88.689
17	21	189873	0.389	89.078
101	104	186461	0.382	89.461
1	26	183804	0.377	89.838
4	18	182536	0.374	90.212
3	104	173522	0.356	90.568
104	107	161909	0.332	90.900
1	105	154033	0.316	91.216
7	104	153246	0.314	91.531
1	24	148225	0.304	91.835
104	104	145491	0.298	92.133
3	21	144598	0.297	92.429
1	16	141738	0.291	92.720
5	7	137372	0.282	93.002
17	24	130917	0.269	93.270
20	21	126301	0.259	93.530
2	20	126293	0.259	93.789
17	20	125271	0.257	94.045
3	7	118342	0.243	94.288
7	26	114214	0.234	94.522
20	34	112705	0.231	94.754
26	104	111331	0.228	94.982
3	18	105750	0.217	95.199
1	10	104850	0.215	95.414
10	26	104067	0.213	95.627
3	107	103468	0.212	95.840
1	107	103390	0.212	96.052
21	104	101143	0.207	96.259
27	104	96080	0.197	96.456
19	21	93060	0.191	96.647
1	21	83191	0.171	96.818
10	16	82448	0.169	96.987
5	21	78463	0.161	97.148
31	104	78411	0.161	97.308
18	104	77510	0.159	97.467
24	104	77415	0.159	97.626
10	105	77141	0.158	97.784
21	26	72925	0.150	97.934
1	18	67924	0.139	98.073
26	31	65123	0.134	98.207
28	104	58600	0.120	98.327
5	10	56924	0.117	98.444
7	107	56034	0.115	98.559
5	107	48158	0.099	98.658
10	27	45774	0.094	98.751

Table J4. Consequence Rankings Based on ASTM Groups
(Sort by Area Above the Lethal Limit) (Cont.)

ASTM #	ASTM #	Total Area	% of Total	Cumul-ative %
7	21	45464	0.093	98.845
10	18	42696	0.088	98.932
34	104	37902	0.078	99.010
5	31	37875	0.078	99.088
7	18	34893	0.072	99.159
10	107	34542	0.071	99.230
3	26	34191	0.070	99.300
5	27	30516	0.063	99.363
21	106	29855	0.061	99.424
10	24	29467	0.060	99.484
7	24	27237	0.056	99.540
10	21	23728	0.049	99.589
105	106	17991	0.037	99.626
104	106	17991	0.037	99.663
104	105	17332	0.036	99.698
1	3	15875	0.033	99.731
27	105	15258	0.031	99.762
21	27	15258	0.031	99.793
18	21	12257	0.025	99.819
1	14	12109	0.025	99.843
21	101	11864	0.024	99.868
27	107	11514	0.024	99.891
21	107	11514	0.024	99.915
16	21	11376	0.023	99.938
10	104	10009	0.021	99.959
1	7	5497	0.011	99.970
1	101	4942	0.010	99.980
3	106	3773	0.008	99.988
106	107	1848	0.004	99.992
31	105	1624	0.003	99.995
1	31	1571	0.003	99.998
18	106	393	0.001	99.999
18	105	393	0.001	100.000

Note: The "Total Area" is a sum of the lethal areas around the spill site for all combinations of specific chemicals within the ASTM groups.

Table J5. Risk Rankings by Binary Combination

ASTM #	Chemical Name #1	Car Moves/yr #1	ASTM #	Chemical Name #2	Car Moves/yr #2	Area Covered sq.m.	Risk *	Normal-ized Risk	% of Total Risk	Cumul-ative %
1	Hydrochloric Acid	10973	2	Sulfuric Acid	46265	490874	2.49E+14	611024	10.394	10.39
2	Sulfuric Acid	46265	4	Methyl Alcohol	20739	189597	1.82E+14	446049	7.588	17.98
2	Oleum	3243	10	Sodium Hydroxide, Liq.	75641	603186	1.48E+14	362799	6.171	24.15
2	Sulfuric Acid	46265	4	Denatured Alcohol	12087	252507	1.41E+14	346222	5.889	30.04
2	Sulfuric Acid	46265	17	Vinyl Chloride	20081	95033	8.83E+13	216482	3.682	33.72
2	Oleum	3243	4	Methyl Alcohol	20739	764509	5.14E+13	126075	2.145	35.87
10	Sodium Hydroxide, Liq.	75641	16	Styrene Monomer	10859	54965	4.51E+13	110699	1.883	37.75
10	Anhydrous Ammonia	42526	104	Chlorine	46686	20017	3.97E+13	97443	1.658	39.41
1	Hydrofluorosilicic Acid	930	2	Sulfuric Acid	46265	907920	3.91E+13	95784	1.629	41.04
2	Sulfuric Acid	46265	17	Carbon Tetrachloride	1343	544281	3.38E+13	82921	1.411	42.45
2	Oleum	3243	4	Denatured Alcohol	12087	855693	3.35E+13	82242	1.399	43.85
2	Sulfuric Acid	46265	16	Benzene	5067	139348	3.27E+13	80097	1.362	45.21
3	Acetic Acid, Glacial	2953	10	Sodium Hydroxide, Liq.	75641	145932	3.26E+13	79925	1.360	46.57
1	Hydrocyanic Acid	1226	104	Chlorine	46686	585487	3.24E+13	79382	1.350	47.92
10	Sodium Hydroxide, Liq.	75641	17	Carbon Tetrachloride	1343	318086	3.23E+13	79230	1.348	49.27
2	Oleum	3243	101	Fuel Oil	39248	251892	3.21E+13	78612	1.337	50.61
2	Sulfuric Acid	46265	26	Acrylonitrile	4811	126656	2.82E+13	69123	1.176	51.78
10	Sodium Hydroxide, Liq.	75641	13	Vinyl Acetate	4431	84060	2.82E+13	69081	1.175	52.96
2	Sulfuric Acid	46265	16	Styrene Monomer	10859	54965	2.76E+13	67708	1.152	54.11
1	Hydrochloric Acid	10973	2	Sulfuric Acid, Spent	4809	490874	2.59E+13	63513	1.080	55.19
10	Anhydrous Ammonia	42526	17	Methyl Chloride	1168	519315	2.58E+13	63247	1.076	56.26
10	Sodium Hydroxide, Liq.	75641	26	Acrylonitrile	4811	69378	2.52E+13	61905	1.053	57.32
2	Oleum	3243	28	LPG	21857	329867	2.34E+13	57331	0.975	58.29
2	Sulfuric Acid	46265	17	Chloroprene, Inhibited	889	565782	2.33E+13	57058	0.971	59.26
2	Oleum	3243	16	Styrene Monomer	10859	655009	2.31E+13	56558	0.962	60.23
4	Denatured Alcohol	12087	104	Chlorine	46686	36161	2.04E+13	50033	0.851	61.08
2	Sulfuric Acid	46265	3	Acetic Acid, Glacial	2953	145932	1.99E+13	48885	0.832	61.91
10	Sodium Hydroxide, Liq.	75641	19	Acetone	2971	86008	1.93E+13	47392	0.806	62.71
2	Sulfuric Acid	46265	18	Xylene	5415	78628	1.92E+13	47071	0.801	63.52
2	Nitric Acid, Fuming	441	10	Sodium Hydroxide, Liq.	75641	552135	1.84E+13	45160	0.768	64.28
1	Hydrochloric Acid	10973	4	Denatured Alcohol	12087	128629	1.71E+13	41831	0.712	64.99
1	Phosphoric Acid	28008	16	Styrene Monomer	10859	54965	1.67E+13	40989	0.697	65.69
2	Oleum	3243	17	Vinyl Chloride	20081	251327	1.64E+13	40131	0.683	66.37
1	Hydrochloric Acid	10973	10	Sodium Hydroxide, Liq.	75641	19635	1.63E+13	39960	0.680	67.05
1	Hydrochloric Acid	10973	104	Hydrogen Peroxide	1646	767526	1.39E+13	33991	0.578	67.63
10	Sodium Hydroxide, Liq.	75641	105	Phosphorus	3533	51427	1.37E+13	33698	0.573	68.21
10	Sodium Hydroxide, Liq.	75641	17	Chloroprene, Inhibited	889	202182	1.36E+13	33336	0.567	68.77
1	Phosphoric Acid	28008	26	Acrylonitrile	4811	95240	1.28E+13	31466	0.535	69.31
2	Oleum	3243	34	Ethylene Oxide	6535	603186	1.28E+13	31344	0.533	69.84
10	Sodium Hydroxide, Liq.	75641	17	Vinyl Chloride	20081	8390	1.27E+13	31247	0.532	70.37
2	Sulfuric Acid	46265	18	Toluene	2084	129751	1.25E+13	30674	0.522	70.89
2	Oleum	3243	18	Xylene	5415	679029	1.19E+13	29238	0.497	71.39
2	Oleum	3243	31	Phenol	5974	605177	1.17E+13	28748	0.489	71.88
2	Sulfuric Acid, Spent	4809	4	Methyl Alcohol	20739	113707	1.13E+13	27806	0.473	72.35
2	Sulfuric Acid	46265	31	Phenol	5974	40476	1.12E+13	27430	0.467	72.82

Table J5. Risk Rankings by Binary Combination (Cont.)

ASTM #	Chemical Name #1	Car Moves/yr #1	ASTM #	Chemical Name #2	Car Moves/yr #2	Area Covered sq.m.	Risk *	Normal-ized Risk	% of Total Risk	Cumul-ative %
2	Oleum	3243	101	Petroleum Naphtha	13541	251854	1.11E+13	27118	0.461	73.28
2	Oleum	3243	16	Benzene	5067	667136	1.10E+13	26880	0.457	73.74
1	Hydroiodic Acid	897	2	Sulfuric Acid	46265	254469	1.06E+13	25893	0.440	74.18
1	Hydrochloric Acid	10973	2	Oleum	3243	289812	1.03E+13	25287	0.430	74.61
2	Sulfuric Acid	46265	4	Ethyl Alcohol	867	252507	1.01E+13	24834	0.422	75.03
2	Oleum	3243	26	Acrylonitrile	4811	637950	9.95E+12	24405	0.415	75.45
2	Sulfuric Acid	46265	104	Hydrogen Peroxide	1646	129591	9.87E+12	24197	0.412	75.86
1	Hydrochloric Acid	10973	4	Methyl Alcohol	20739	42740	9.73E+12	23848	0.406	76.26
2	Sulfuric Acid	46265	13	Methyl Methacrylate	2927	71821	9.73E+12	23847	0.406	76.67
2	Oleum	3243	34	Propylene Oxide	4913	603186	9.61E+12	23564	0.401	77.07
2	Oleum	3243	13	Vinyl Acetate	4431	623629	8.96E+12	21973	0.374	77.44
2	Oleum	3243	101	Petroleum, Refined	10658	251327	8.69E+12	21300	0.362	77.81
2	Oleum	3243	28	Butadiene	8030	329867	8.59E+12	21063	0.358	78.17
1	Hydrochloric Acid	10973	16	Styrene Monomer	10859	71458	8.51E+12	20877	0.355	78.52
2	Oleum	3243	101	Crude Oil Petroleum	9995	251557	8.15E+12	19993	0.340	78.86
2	Sulfuric Acid	46265	4	Isopropanol	2848	60134	7.92E+12	19428	0.330	79.19
1	Phosphoric Acid	28008	19	Acetone	2971	86008	7.16E+12	17548	0.299	79.49
2	Sulfuric Acid	46265	21	Sodium Metal	855	176715	6.99E+12	17140	0.292	79.78
2	Nitric Acid, Fuming	441	4	Methyl Alcohol	20739	762448	6.97E+12	17098	0.291	80.07
2	Oleum	3243	105	Phosphorus	3533	603186	6.91E+12	16945	0.288	80.36
2	Oleum	3243	5	Acetaldehyde	3520	603186	6.89E+12	16883	0.287	80.65
2	Oleum	3243	4	Isopropanol	2848	739283	6.83E+12	16742	0.285	80.93
2	Sulfuric Acid, Spent	4809	4	Denatured Alcohol	12087	111328	6.47E+12	15867	0.270	81.20
2	Oleum	3243	101	Petroleum Residual Fuel	7907	251327	6.44E+12	15802	0.269	81.47
2	Oleum	3243	101	Gasoline	7676	251327	6.26E+12	15340	0.261	81.73
2	Oleum	3243	28	LPG-Propylene	5707	329867	6.11E+12	14969	0.255	81.99
2	Oleum	3243	13	Methyl Methacrylate	2927	637308	6.05E+12	14833	0.252	82.24
2	Oleum	3243	7	Hexamethylene Diamine Sol	5580	330229	5.98E+12	14652	0.249	82.49
2	Sulfuric Acid	46265	19	Methyl Ethyl Ketone	1318	97280	5.93E+12	14545	0.247	82.74
2	Oleum	3243	3	Acetic Acid, Glacial	2953	617171	5.91E+12	14492	0.247	82.98
2	Sulfuric Acid	46265	13	Ethyl Acrylate	1281	99610	5.90E+12	14475	0.246	83.23
2	Oleum	3243	19	Acetone	2971	608923	5.87E+12	14385	0.245	83.47
10	Sodium Hydroxide, Liq.	75641	18	Toluene Diisocyanate	2610	28464	5.62E+12	13779	0.234	83.71
2	Oleum	3243	101	Distillate Fuel Oil	6549	251327	5.34E+12	13088	0.223	83.93
4	Methyl Alcohol	2630	104	Chlorine	46686	42580	5.23E+12	12819	0.218	84.15
2	Oleum	3243	10	Potassium Hydroxide, Liq	2622	603186	5.13E+12	12576	0.214	84.36
2	Oleum	3243	18	Toluene Diisocyanate	2610	603376	5.11E+12	12522	0.213	84.58
1	Phosphoric Acid	28008	17	Chloroprene, Inhibited	889	202182	5.03E+12	12343	0.210	84.79
2	Oleum	3243	101	Fuel, Aviation	6157	251879	5.03E+12	12332	0.210	84.99
1	Hydrochloric Acid	10973	26	Acrylonitrile	4811	95240	5.03E+12	12328	0.210	85.20
2	Sulfuric Acid	46265	7	Aniline Oil, Liquid	1088	97700	4.92E+12	12058	0.205	85.41
4	Isopropanol	2848	104	Chlorine	46686	35792	4.76E+12	11669	0.198	85.61
2	Oleum	3243	16	Toluene	2084	670105	4.53E+12	11104	0.189	85.80
2	Nitric Acid, Fuming	441	4	Denatured Alcohol	12087	834124	4.45E+12	10902	0.185	85.98
1	Hydrochloric Acid	10973	17	Vinyl Chloride	20081	19635	4.33E+12	10608	0.180	86.16

Table J5. Risk Rankings by Binary Combination (Cont.)

ASTM #	Chemical Name #1	Car Moves/yr #1	ASTM #	Chemical Name #2	Car Moves/yr #2	Area Covered sq.m.	Risk *	Normalized Risk	% of Total Risk	Cumulative %
2	Oleum	3243	28	LPG-Butene	3945	329867	4.22E+12	10348	0.176	86.34
2	Sulfuric Acid	46265	13	Vinyl Acetate	4431	20443	4.19E+12	10276	0.175	86.51
10	Sodium Hydroxide, Liq.	75641	19	Methyl Ethyl Ketone	1318	41831	4.17E+12	10225	0.174	86.69
1	Hydrochloric Acid	10973	13	Vinyl Acetate	4431	84080	4.09E+12	10021	0.170	86.86
2	Oleum	3243	13	Butyl Acrylate	1957	612695	3.89E+12	9534	0.162	87.02
2	Oleum	3243	106	Ammonium Nitrate Soln.	1860	639168	3.86E+12	9453	0.161	87.18
26	Acrylonitrile	4811	31	Phenol	5974	130246	3.74E+12	9179	0.156	87.34
4	Denatured Alcohol	12087	104	Hydrogen Peroxide	1646	187691	3.73E+12	9156	0.156	87.49
2	Sulfuric Acid	46265	4	Butyl Alcohol	1052	76591	3.73E+12	9140	0.155	87.65
16	Styrene Monomer	10859	104	Hydrogen Peroxide	1646	206653	3.69E+12	9057	0.154	87.80
10	Sodium Hydroxide, Liq.	75641	13	Ethyl Acetate	1066	45195	3.64E+12	8935	0.152	87.95
1	Hydrofluorosilicic Acid	930	10	Sodium Hydroxide, Liq.	75641	50265	3.54E+12	8670	0.147	88.10
2	Sulfuric Acid	46265	18	Toluene Diisocyanate	2610	28464	3.44E+12	8428	0.143	88.25
2	Sulfuric Acid	46265	19	Acetone	2971	24587	3.38E+12	8286	0.141	88.39
2	Oleum	3243	104	Hydrogen Peroxide	1646	628425	3.35E+12	8225	0.140	88.53
2	Oleum	3243	5	Formaldehyde Solution	3058	330024	3.27E+12	8025	0.137	88.66
2	Oleum	3243	4	Octyl Alcohol	1671	603186	3.27E+12	8015	0.136	88.80
104	Chlorine	46686	106	Ammonium Nitrate Soln.	1860	35982	3.12E+12	7661	0.130	88.93
2	Sulfuric Acid	46265	106	Ammonium Nitrate Soln.	1860	35982	3.10E+12	7592	0.129	89.06
2	Oleum	3243	107	Acetic Anhydride	1533	612556	3.05E+12	7467	0.127	89.19
7	Hexamethylene Diamine Sol	5580	26	Acrylonitrile	4811	111730	3.00E+12	7354	0.125	89.31
2	Nitric Acid, Fuming	441	16	Styrene Monomer	10859	603958	2.89E+12	7092	0.121	89.43
1	Hydrochloric Acid	10973	19	Acetone	2971	86008	2.80E+12	6875	0.117	89.55
2	Sulfuric Acid	46265	4	Alcoholic Beverage	1276	47119	2.78E+12	6820	0.116	89.66
2	Oleum	3243	19	Methyl Ethyl Ketone	1318	639990	2.74E+12	6707	0.114	89.78
2	Oleum	3243	4	Alcoholic Beverage	1276	650305	2.69E+12	6598	0.112	89.89
2	Sulfuric Acid	46265	5	Formaldehyde Solution	3058	19007	2.69E+12	6593	0.112	90.00
2	Oleum	3243	13	Ethyl Acrylate	1281	639964	2.66E+12	6519	0.111	90.11
2	Oleum	3243	17	Carbon Tetrachloride	1343	603186	2.63E+12	6441	0.110	90.22
2	Oleum	3243	101	Combustible Liquid	3139	251327	2.56E+12	6273	0.107	90.33
2	Sulfuric Acid, Spent	4809	26	Acrylonitrile	4811	110162	2.55E+12	6249	0.106	90.44
10	Sodium Hydroxide, Liq.	75641	107	Acetic Anhydride	1533	21936	2.54E+12	6237	0.106	90.54
2	Sulfuric Acid, Spent	4809	16	Benzene	5067	103105	2.51E+12	6160	0.105	90.65
10	Anhydrous Ammonia	42526	24	Motor Fuel Antiknock Comp	1000	58934	2.51E+12	6145	0.105	90.75
1	Phosphoric Acid	28008	5	Butyraldehyde	870	102698	2.50E+12	6136	0.104	90.86
1	Hydrochloric Acid	10973	2	Nitric Acid, Fuming	441	508938	2.46E+12	6039	0.103	90.96
2	Oleum	3243	4	Ethyl Alcohol	867	855693	2.41E+12	5899	0.100	91.06
2	Nitric Acid, Fuming	441	101	Fuel Oil	39248	138010	2.39E+12	5857	0.100	91.16
5	Butyraldehyde	870	10	Sodium Hydroxide, Liq.	75641	35593	2.34E+12	5743	0.098	91.26
2	Oleum	3243	4	Butyl Alcohol	1052	683162	2.33E+12	5715	0.097	91.35
1	Hydrochloric Acid	10973	13	Methyl Methacrylate	2927	71821	2.31E+12	5656	0.096	91.45
2	Oleum	3243	107	Maleic Anhydride	1168	603186	2.28E+12	5602	0.095	91.55
2	Oleum	3243	13	Ethyl Acetate	1066	629531	2.18E+12	5336	0.091	91.64
2	Oleum	3243	7	Aniline Oil, Liquid	1088	606638	2.14E+12	5248	0.089	91.73
1	Hydrofluorosilicic Acid	930	2	Oleum	3243	706858	2.13E+12	5227	0.089	91.81

Table J5. Risk Rankings by Binary Combination (Cont.)

ASTM #	Chemical Name #1	Car Moves/yr #1	ASTM #	Chemical Name #2	Car Moves/yr #2	Area Covered sq.m.	Risk *	Normal-ized Risk	% of Total Risk	Cumul-ative %
1	Hydroiodic Acid	897	4	Methyl Alcohol	20739	113740	2.12E+12	5188	0.088	91.90
2	Oleum	3243	3	Acrylic Acid	1031	626584	2.10E+12	5137	0.087	91.99
1	Phosphoric Acid	28008	18	Toluene Diisocyanate	2610	28464	2.08E+12	5102	0.087	92.08
2	Sulfuric Acid, Spent	4809	3	Acetic Acid, Glacial	2953	145932	2.07E+12	5081	0.086	92.16
16	Xylene	5415	104	Hydrogen Peroxide	1646	230673	2.06E+12	5041	0.086	92.25
2	Sulfuric Acid	46265	14	Glycol Ethers	902	47985	2.00E+12	4910	0.084	92.33
10	Sodium Hydroxide, Liq.	75641	27	Dinitrotoluene, Liquid	866	30518	2.00E+12	4901	0.083	92.42
1	Hydrochloric Acid	10973	105	Phosphorus	3533	51538	2.00E+12	4899	0.083	92.50
1	Hydrochloric Acid	10973	17	Chloroprene, Inhibited	889	202182	1.97E+12	4836	0.082	92.58
2	Oleum	3243	24	Motor Fuel Antiknock Comp	1000	603186	1.96E+12	4796	0.082	92.66
4	Denatured Alcohol	12087	18	Toluene Diisocyanate	2610	61165	1.93E+12	4731	0.080	92.74
2	Oleum	3243	10	Alkaline Liquid, n.o.s.	975	603186	1.91E+12	4676	0.080	92.82
2	Oleum	3243	14	Glycol Ethers	902	638605	1.87E+12	4580	0.078	92.90
2	Sulfuric Acid	46265	13	Ethyl Acetate	1066	37596	1.85E+12	4546	0.077	92.98
10	Anhydrous Ammonia	42526	13	Vinyl Acetate	4431	9777	1.84E+12	4517	0.077	93.05
2	Oleum	3243	101	Flammable Liquid	2256	251327	1.84E+12	4509	0.077	93.13
3	Acrylic Acid	1031	10	Sodium Hydroxide, Liq.	75641	23398	1.82E+12	4474	0.076	93.21
16	Benzene	5067	104	Hydrogen Peroxide	1646	218780	1.82E+12	4474	0.076	93.28
2	Oleum	3243	5	Butyraldehyde	870	638779	1.80E+12	4419	0.075	93.36
2	Oleum	3243	27	Dinitrotoluene, Liquid	866	633702	1.78E+12	4364	0.074	93.43
101	Fuel Oil	39248	104	Hydrogen Peroxide	1646	25890	1.67E+12	4101	0.070	93.50
1	Hydrochloric Acid	10973	4	Isopropanol	2848	53105	1.66E+12	4069	0.069	93.57
10	Potassium Hydroxide, Liq	2622	16	Styrene Monomer	10859	54965	1.56E+12	3837	0.065	93.64
2	Sulfuric Acid	46265	107	Acetic Anhydride	1533	21936	1.56E+12	3815	0.065	93.70
1	Phosphoric Acid	28008	19	Methyl Ethyl Ketone	1318	41831	1.54E+12	3786	0.064	93.77
31	Phenol	5974	104	Hydrogen Peroxide	1646	156821	1.54E+12	3781	0.064	93.83
26	Acrylonitrile	4811	104	Hydrogen Peroxide	1646	189594	1.50E+12	3681	0.063	93.89
2	Nitric Acid, Fuming	441	16	Xylene	5415	627978	1.50E+12	3677	0.063	93.96
10	Anhydrous Ammonia	42526	17	Methyl Chloride	1168	30012	1.49E+12	3655	0.062	94.02
2	Nitric Acid, Fuming	441	16	Benzene	5067	660564	1.48E+12	3619	0.062	94.08
4	Ethyl Alcohol	867	104	Chlorine	46686	36161	1.46E+12	3589	0.061	94.14
2	Nitric Acid, Fuming	441	31	Phenol	5974	554126	1.46E+12	3580	0.061	94.20
1	Phosphoric Acid	28008	24	Motor Fuel Antiknock Comp	1000	52117	1.46E+12	3579	0.061	94.26
2	Sulfuric Acid	46265	5	Butyraldehyde	870	35593	1.43E+12	3513	0.060	94.32
1	Hydrochloric Acid	10973	13	Ethyl Acrylate	1281	99610	1.40E+12	3433	0.058	94.38
2	Nitric Acid, Fuming	441	7	Hexamethylene Diamine Sol	5580	552497	1.36E+12	3334	0.057	94.44
4	Alcoholic Beverage	1276	104	Chlorine	46686	22780	1.36E+12	3327	0.057	94.49
4	Butyl Alcohol	1052	104	Chlorine	46686	27423	1.35E+12	3302	0.056	94.55
2	Oleum	3243	28	LPG-Isobutylene	1258	329867	1.35E+12	3300	0.056	94.61
7	Hexamethylene Diamine Sol	5580	104	Hydrogen Peroxide	1646	145853	1.34E+12	3285	0.056	94.66
4	Octyl Alcohol	1671	104	Chlorine	46686	17168	1.34E+12	3284	0.056	94.72
3	Acetic Acid, Glacial	2953	5	Formaldehyde Solution	3058	148250	1.34E+12	3283	0.056	94.77
2	Nitric Acid, Fuming	441	28	LPG	21857	137445	1.32E+12	3248	0.055	94.83
1	Hydrofluorosilicic Acid	930	4	Denatured Alcohol	12087	116848	1.31E+12	3221	0.055	94.88
2	Nitric Acid, Fuming	441	26	Acrylonitrile	4811	613288	1.30E+12	3190	0.054	94.94

Table J5. Risk Rankings by Binary Combination (Cont.)

ASTM #	Chemical Name #1	Car Moves/yr #1	ASTM #	Chemical Name #2	Car Moves/yr #2	Area Covered sq.m.	Risk *	Normal-ized Risk	% of Total Risk	Cumul-ative %
13	Vinyl Acetate	4431	104	Hydrogen Peroxide	1646	175273	1.28E+12	3134	0.053	94.99
27	Dinitrotoluene, Liquid	866	104	Chlorine	46686	30516	1.23E+12	3025	0.051	95.04
2	Sulfuric Acid, Spent	4809	19	Acetone	2971	88008	1.23E+12	3013	0.051	95.09
1	Hydrochloric Acid	10973	4	Ethyl Alcohol	887	128629	1.22E+12	3001	0.051	95.15
2	Sulfuric Acid	46265	27	Dinitrotoluene, Liquid	866	30516	1.22E+12	2998	0.051	95.20
2	Nitric Acid, Fuming	441	17	Vinyl Chloride	20081	137445	1.22E+12	2984	0.051	95.25
2	Oleum	3243	17	Chloroprene, Inhibited	889	414985	1.20E+12	2934	0.050	95.30
3	Acetic Acid, Glacial	2953	18	Toluene Diisocyanate	2610	153739	1.18E+12	2905	0.049	95.35
2	Oleum	3243	101	Gasoline, nec	1410	251327	1.15E+12	2818	0.048	95.39
2	Oleum	3243	101	Oil	1407	251327	1.15E+12	2812	0.048	95.44
17	Vinyl Chloride	20081	104	Hydrogen Peroxide	1646	34664	1.15E+12	2809	0.048	95.49
3	Acetic Acid, Glacial	2953	10	Potassium Hydroxide, Liq	2622	145932	1.13E+12	2770	0.047	95.54
20	Carbon Disulfide	1013	34	Propylene Oxide	4913	225409	1.12E+12	2751	0.047	95.58
10	Potassium Hydroxide, Liq	2622	17	Carbon Tetrachloride	1343	318086	1.12E+12	2746	0.047	95.63
2	Sulfuric Acid	46265	3	Acrylic Acid	1031	23398	1.12E+12	2737	0.047	95.68
20	Carbon Disulfide	1013	104	Hydrogen Peroxide	1646	668480	1.11E+12	2733	0.046	95.72
7	Hexamethylene Diamine Sol	5580	17	Carbon Tetrachloride	1343	148440	1.11E+12	2728	0.046	95.77
3	Acetic Acid, Glacial	2953	7	Hexamethylene Diamine Sol	5580	64249	1.06E+12	2596	0.044	95.81
2	Oleum	3243	101	Compound, Cleaning	1281	251327	1.04E+12	2560	0.044	95.86
1	Hydrofluorosilicic Acid	930	16	Styrene Monomer	10859	102088	1.03E+12	2528	0.043	95.90
2	Oleum	3243	101	Coal Tar Distillate	1259	251924	1.03E+12	2522	0.043	95.94
7	Hexamethylene Diamine Sol	5580	17	Chloroprene, Inhibited	889	202203	1.00E+12	2459	0.042	95.99
1	Hydrochloric Acid	10973	5	Butyraldehyde	870	103483	9.88E+11	2422	0.041	96.03
10	Potassium Hydroxide, Liq	2622	13	Vinyl Acetate	4431	84060	9.77E+11	2395	0.041	96.07
2	Sulfuric Acid, Spent	4809	17	Carbon Tetrachloride	1343	148440	9.59E+11	2351	0.040	96.11
2	Oleum	3243	17	Methyl Chloride	1168	251327	9.52E+11	2334	0.040	96.15
2	Oleum	3243	101	Pulp Mill Liquid	1159	251327	9.45E+11	2316	0.039	96.19
1	Phosphoric Acid	28008	107	Acetic Anhydride	1533	21936	9.42E+11	2309	0.039	96.23
2	Nitric Acid, Fuming	441	4	Isopropanol	2848	733888	9.22E+11	2260	0.038	96.26
4	Isopropanol	2848	104	Hydrogen Peroxide	1646	195329	9.16E+11	2245	0.038	96.30
2	Oleum	3243	21	Sodium Metal	855	329867	9.15E+11	2243	0.038	96.34
13	Methyl Methacrylate	2927	104	Hydrogen Peroxide	1646	188952	9.10E+11	2232	0.038	96.38
2	Sulfuric Acid	46265	17	Methyl Chloride	1168	16493	8.91E+11	2185	0.037	96.42
2	Nitric Acid, Fuming	441	5	Acetaldehyde	3520	586342	8.79E+11	2156	0.037	96.45
10	Potassium Hydroxide, Liq	2622	26	Acrylonitrile	4811	69378	8.75E+11	2146	0.037	96.49
2	Sulfuric Acid, Spent	4809	17	Chloroprene, Inhibited	889	202182	8.64E+11	2119	0.036	96.53
2	Sulfuric Acid	46265	13	Butyl Acrylate	1957	9509	8.61E+11	2111	0.036	96.56
2	Nitric Acid, Fuming	441	105	Phosphorus	3533	552135	8.60E+11	2109	0.036	96.60
4	Denatured Alcohol	12087	5	Butyraldehyde	870	79420	8.35E+11	2048	0.035	96.63
2	Nitric Acid, Fuming	441	101	Petroleum Naphtha	13541	137972	8.24E+11	2020	0.034	96.67
2	Sulfuric Acid, Spent	4809	4	Isopropanol	2848	60134	8.24E+11	2019	0.034	96.70
3	Acetic Acid, Glacial	2953	104	Hydrogen Peroxide	1646	168815	8.21E+11	2012	0.034	96.73
1	Hydrochloric Acid	10973	18	Toluene Diisocyanate	2610	28464	8.15E+11	1999	0.034	96.77
1	Hydroiodic Acid	897	105	Phosphorus	3533	255742	8.10E+11	1987	0.034	96.80
2	Nitric Acid, Fuming	441	19	Acetone	2971	603495	7.91E+11	1939	0.033	96.84

Table J5. Risk Rankings by Binary Combination (Cont.)

ASTM #	Chemical Name #1	Car Moves/yr #1	ASTM #	Chemical Name #2	Car Moves/yr #2	Area Covered sq.m.	Risk *	Normal-ized Risk	% of Total Risk	Cumul-ative %
19	Acetone	2971	104	Hydrogen Peroxide	1646	160567	7.85E+11	1925	0.033	96.87
2	Sulfuric Acid, Spent	4809	13	Vinyl Acetate	4431	38663	7.81E+11	1916	0.033	96.90
16	Toluene	2084	104	Hydrogen Peroxide	1646	221749	7.61E+11	1865	0.032	96.93
2	Nitric Acid, Fuming	441	13	Methyl Methacrylate	2927	586257	7.57E+11	1855	0.032	96.96
2	Nitric Acid, Fuming	441	5	Formaldehyde Solution	3058	552292	7.45E+11	1826	0.031	97.00
20	Carbon Disulfide	1013	104	Ferric Chloride Solution	1883	388772	7.42E+11	1818	0.031	97.03
1	Hydroiodic Acid	897	2	Oleum	3243	251327	7.31E+11	1793	0.030	97.06
4	Methyl Alcohol	2630	104	Hydrogen Peroxide	1646	167854	7.27E+11	1782	0.030	97.09
3	Acetic Acid, Glacial	2953	107	Acetic Anhydride	1533	158610	7.18E+11	1761	0.030	97.12
10	Anhydrous Ammonia	42526	19	Methyl Ethyl Ketone	1318	12055	6.76E+11	1657	0.028	97.15
10	Potassium Hydroxide, Liq	2622	19	Acetone	2971	86008	6.70E+11	1643	0.028	97.17
18	Toluene Diisocyanate	2610	104	Hydrogen Peroxide	1646	155020	6.66E+11	1633	0.028	97.20
4	Denatured Alcohol	12087	21	Sodium Metal	855	63628	6.58E+11	1612	0.027	97.23
2	Nitric Acid, Fuming	441	101	Petroleum, Refined	10658	137445	6.46E+11	1584	0.027	97.26
1	Hydrochloric Acid	10973	4	Alcoholic Beverage	1276	45600	6.38E+11	1565	0.027	97.28
2	Nitric Acid, Fuming	441	10	Potassium Hydroxide, Liq	2622	552135	6.38E+11	1565	0.027	97.31
2	Nitric Acid, Fuming	441	18	Toluene Diisocyanate	2610	552325	6.36E+11	1559	0.027	97.33
1	Hydrochloric Acid	10973	13	Butyl Acrylate	1957	29144	6.26E+11	1535	0.026	97.36
1	Phosphoric Acid	28008	101	Fuel Oil	39248	565	6.21E+11	1523	0.026	97.39
7	Aniline Oil, Liquid	1088	26	Acrylonitrile	4811	116697	6.11E+11	1498	0.025	97.41
2	Nitric Acid, Fuming	441	101	Crude Oil Petroleum	9995	137675	6.07E+11	1488	0.025	97.44
1	Hydrochloric Acid	10973	19	Methyl Ethyl Ketone	1318	41831	6.05E+11	1483	0.025	97.46
21	Sodium Metal	855	26	Acrylonitrile	4811	145850	6.00E+11	1471	0.025	97.49
3	Acetic Acid, Glacial	2953	17	Chloroprene, Inhibited	889	226871	5.96E+11	1460	0.025	97.51
1	Phosphoric Acid	28008	3	Acetic Acid, Glacial	2953	7104	5.88E+11	1441	0.025	97.54
1	Phosphoric Acid	28008	21	Sodium Metal	855	24513	5.87E+11	1439	0.024	97.56
10	Alkaline Liquid, n.o.s.	975	16	Styrene Monomer	10859	54965	5.82E+11	1427	0.024	97.59
101	Petroleum Naphtha	13541	104	Hydrogen Peroxide	1646	25852	5.76E+11	1413	0.024	97.61
1	Hydrochloric Acid	10973	24	Motor Fuel Antiknock Comp	1000	52117	5.72E+11	1402	0.024	97.63
2	Nitric Acid, Fuming	441	16	Toluene	2084	619054	5.69E+11	1395	0.024	97.66
1	Hydrochloric Acid	10973	10	Potassium Hydroxide, Liq	2622	19635	5.65E+11	1385	0.024	97.68
5	Formaldehyde Solution	3058	10	Sodium Hydroxide, Liq.	75641	2356	5.45E+11	1336	0.023	97.70
1	Hydroiodic Acid	897	16	Styrene Monomer	10859	54965	5.35E+11	1313	0.022	97.73
13	Butyl Acrylate	1957	104	Hydrogen Peroxide	1646	164339	5.29E+11	1298	0.022	97.75
5	Butyraldehyde	870	7	Hexamethylene Diamine Sol	5580	107035	5.20E+11	1274	0.022	97.77
3	Acetic Acid, Glacial	2953	21	Sodium Metal	855	203636	5.14E+11	1261	0.021	97.79
4	Isopropanol	2848	18	Toluene Diisocyanate	2610	68805	5.11E+11	1254	0.021	97.81
3	Acetic Acid, Glacial	2953	5	Butyraldehyde	870	194662	5.00E+11	1226	0.021	97.83
3	Acetic Acid, Glacial	2953	26	Acrylonitrile	4811	34460	4.90E+11	1200	0.020	97.85
5	Acetaldehyde	3520	104	Hydrogen Peroxide	1646	84233	4.88E+11	1197	0.020	97.87
1	Hydrochloric Acid	10973	107	Acetic Anhydride	1533	29005	4.88E+11	1196	0.020	97.89
2	Nitric Acid, Fuming	441	28	Butadiene	8030	137445	4.87E+11	1193	0.020	97.92
1	Hydrochloric Acid	10973	13	Ethyl Acetate	1066	41485	4.85E+11	1190	0.020	97.94
2	Nitric Acid, Fuming	441	13	Butyl Acrylate	1957	561644	4.85E+11	1189	0.020	97.96
2	Nitric Acid, Fuming	441	101	Petroleum Residual Fuel	7907	137445	4.79E+11	1175	0.020	97.98

Table J5. Risk Rankings by Binary Combination (Cont.)

ASTM #	Chemical Name #1	Car Moves/yr #1	ASTM #	Chemical Name #2	Car Moves/yr #2	Area Covered sq.m.	Risk *	Normal-ized Risk	% of Total Risk	Cumul-ative %
10	Potassium Hydroxide, Liq	2622	105	Phosphorus	3533	51427	4.76E+11	1168	0.020	98.00
10	Potassium Hydroxide, Liq	2622	17	Chloroprene, Inhibited	889	202182	4.71E+11	1158	0.020	98.02
2	Nitric Acid, Fuming	441	101	Gasoline	7676	137445	4.65E+11	1141	0.019	98.03
2	Sulfuric Acid, Spent	4809	4	Ethyl Alcohol	867	111328	4.64E+11	1138	0.019	98.05
1	Hydrofluorosilicic Acid	930	4	Methyl Alcohol	20739	23890	4.61E+11	1130	0.019	98.07
104	Ferric Chloride Solution	1883	104	Hydrogen Peroxide	1646	145491	4.51E+11	1106	0.019	98.09
101	Petroleum Refined	10658	104	Hydrogen Peroxide	1646	25325	4.44E+11	1089	0.019	98.11
10	Potassium Hydroxide, Liq	2622	17	Vinyl Chloride	20081	8390	4.42E+11	1083	0.018	98.13
17	Chloroprene, Inhibited	889	104	Ferric Chloride Solution	1883	261833	4.38E+11	1075	0.018	98.15
1	Phosphoric Acid	28008	104	Hydrogen Peroxide	1646	9425	4.35E+11	1065	0.018	98.17
4	Octyl Alcohol	1671	104	Hydrogen Peroxide	1646	154830	4.26E+11	1044	0.018	98.18
101	Crude Oil Petroleum	9995	104	Hydrogen Peroxide	1646	25555	4.20E+11	1031	0.018	98.20
3	Acetic Acid, Glacial	2953	10	Alkaline Liquid, n.o.s.	975	145932	4.20E+11	1030	0.018	98.22
10	Alkaline Liquid, n.o.s.	975	17	Carbon Tetrachloride	1343	318086	4.17E+11	1021	0.017	98.24
7	Hexamethylene Diamine Sol	5580	18	Toluene Diisocyanate	2610	28546	4.16E+11	1019	0.017	98.25
19	Methyl Ethyl Ketone	1318	104	Hydrogen Peroxide	1646	191634	4.16E+11	1019	0.017	98.27
104	Hydrogen Peroxide	1646	107	Acetic Anhydride	1533	164200	4.14E+11	1016	0.017	98.29
1	Hydroiodic Acid	897	26	Acrylonitrile	4811	95240	4.11E+11	1008	0.017	98.30
1	Hydroiodic Acid	897	2	Sulfuric Acid, Spent	4809	95033	4.10E+11	1005	0.017	98.32
34	Propylene Oxide	4913	104	Hydrogen Peroxide	1646	50564	4.09E+11	1003	0.017	98.34
1	Hydrochloric Acid	10973	21	Sodium Metal	855	43363	4.07E+11	998	0.017	98.36
2	Nitric Acid, Fuming	441	107	Acetic Anhydride	1533	599121	4.05E+11	993	0.017	98.37
13	Ethyl Acrylate	1281	104	Hydrogen Peroxide	1646	191608	4.04E+11	991	0.017	98.39
2	Nitric Acid, Fuming	441	101	Distillate Fuel Oil	8549	137445	3.97E+11	973	0.017	98.41
5	Butyraldehyde	870	31	Phenol	5974	75749	3.94E+11	965	0.016	98.42
3	Acetic Acid, Glacial	2953	5	Acetaldehyde	3520	37699	3.92E+11	961	0.016	98.44
2	Sulfuric Acid, Spent	4809	4	Butyl Alcohol	1052	76591	3.87E+11	950	0.016	98.45
2	Nitric Acid, Fuming	441	101	Fuel, Aviation	6157	137997	3.75E+11	919	0.016	98.47
1	Hydrofluorosilicic Acid	930	26	Acrylonitrile	4811	81888	3.66E+11	898	0.015	98.49
10	Alkaline Liquid, n.o.s.	975	13	Vinyl Acetate	4431	84060	3.63E+11	890	0.015	98.50
2	Nitric Acid, Fuming	441	34	Ethylene Oxide	6535	124878	3.60E+11	882	0.015	98.52
2	Nitric Acid, Fuming	441	2	Oleum	3243	251327	3.59E+11	881	0.015	98.53
2	Sulfuric Acid, Spent	4809	18	Toluene Diisocyanate	2610	28464	3.57E+11	876	0.015	98.55
4	Butyl Alcohol	1052	104	Hydrogen Peroxide	1646	203147	3.52E+11	863	0.015	98.56
2	Sulfuric Acid, Spent	4809	4	Alcoholic Beverage	1276	57081	3.50E+11	859	0.015	98.58
2	Nitric Acid, Fuming	441	4	Alcoholic Beverage	1276	617827	3.48E+11	852	0.015	98.59
1	Hydrofluorosilicic Acid	930	2	Nitric Acid, Fuming	441	844303	3.46E+11	849	0.014	98.60
5	Butyraldehyde	870	104	Hydrogen Peroxide	1646	241684	3.46E+11	849	0.014	98.62
2	Nitric Acid, Fuming	441	28	LPG-Propylene	5707	137445	3.46E+11	848	0.014	98.63
2	Nitric Acid, Fuming	441	19	Methyl Ethyl Ketone	1318	588939	3.42E+11	839	0.014	98.65
17	Carbon Tetrachloride	1343	20	Carbon Disulfide	1013	250542	3.41E+11	836	0.014	98.66
1	Hydroiodic Acid	897	13	Vinyl Acetate	4431	84060	3.34E+11	819	0.014	98.68
17	Chloroprene, Inhibited	889	104	Hydrogen Peroxide	1646	227421	3.33E+11	816	0.014	98.69
2	Nitric Acid, Fuming	441	13	Ethyl Acrylate	1281	588913	3.33E+11	816	0.014	98.70
2	Nitric Acid, Fuming	441	13	Vinyl Acetate	4431	168868	3.30E+11	809	0.014	98.72

Table J5. Risk Rankings by Binary Combination (Cont.)

ASTM #	Chemical Name #1	Car Moves/yr #1	ASTM #	Chemical Name #2	Car Moves/yr #2	Area Covered sq.m.	Risk *	Normalized Risk	% of Total Risk	Cumulative %
101	Petroleum Residual Fuel	7907	104	Hydrogen Peroxide	1646	25325	3.30E+11	808	0.014	98.73
1	Hydrofluorosilicic Acid	930	17	Methyl Chloride	1168	301593	3.28E+11	803	0.014	98.74
5	Formaldehyde Solution	3058	7	Hexamethylene Diamine Sol	5580	19115	3.26E+11	800	0.014	98.76
10	Alkaline Liquid, n.o.s.	975	26	Acrylonitrile	4811	69378	3.25E+11	798	0.014	98.77
101	Gasoline	7676	104	Hydrogen Peroxide	1646	25325	3.20E+11	785	0.013	98.78
2	Nitric Acid, Fuming	441	4	Ethyl Alcohol	867	834124	3.19E+11	782	0.013	98.80
13	Ethyl Acetate	1066	104	Hydrogen Peroxide	1646	181175	3.18E+11	779	0.013	98.81
10	Anhydrous Ammonia	42526	13	Ethyl Acetate	1066	6981	3.16E+11	776	0.013	98.82
2	Nitric Acid, Fuming	441	4	Butyl Alcohol	1052	673505	3.12E+11	766	0.013	98.84
13	Vinyl Acetate	4431	104	Ferric Chloride Solution	1883	36731	3.06E+11	751	0.013	98.85
3	Acrylic Acid	1031	104	Hydrogen Peroxide	1646	178228	3.02E+11	742	0.013	98.86
104	Hydrogen Peroxide	1646	107	Maleic Anhydride	1168	155922	3.00E+11	735	0.013	98.88
26	Acrylonitrile	4811	104	Ferric Chloride Solution	1883	33068	3.00E+11	735	0.012	98.89
1	Hydrofluorosilicic Acid	930	13	Vinyl Acetate	4431	70708	2.91E+11	714	0.012	98.90
7	Aniline Oil, Liquid	1088	104	Hydrogen Peroxide	1646	158282	2.83E+11	695	0.012	98.91
4	Methyl Alcohol	2630	18	Toluene Diisocyanate	2610	40538	2.78E+11	682	0.012	98.92
101	Distillate Fuel Oil	6549	104	Hydrogen Peroxide	1646	25325	2.73E+11	669	0.011	98.94
34	Ethylene Oxide	6535	104	Hydrogen Peroxide	1646	25239	2.71E+11	666	0.011	98.95
4	Ethyl Alcohol	867	104	Hydrogen Peroxide	1646	187691	2.68E+11	657	0.011	98.96
2	Nitric Acid, Fuming	441	7	Aniline Oil, Liquid	1088	555587	2.67E+11	654	0.011	98.97
1	Hydrochloric Acid	10973	107	Maleic Anhydride	1168	20727	2.66E+11	651	0.011	98.98
2	Sulfuric Acid, Spent	4809	19	Methyl Ethyl Ketone	1318	41831	2.65E+11	650	0.011	98.99
101	Fuel, Aviation	6157	104	Hydrogen Peroxide	1646	25877	2.62E+11	643	0.011	99.00
13	Methyl Methacrylate	2927	21	Sodium Metal	855	102603	2.57E+11	630	0.011	99.01
24	Motor Fuel Antiknock Comp	1000	104	Hydrogen Peroxide	1646	154830	2.55E+11	625	0.011	99.02
21	Sodium Metal	855	104	Hydrogen Peroxide	1646	178558	2.51E+11	616	0.010	99.03
2	Sulfuric Acid, Spent	4809	24	Motor Fuel Antiknock Comp	1000	52117	2.51E+11	615	0.010	99.04
10	Alkaline Liquid, n.o.s.	975	19	Acetone	2971	86008	2.49E+11	611	0.010	99.05
2	Nitric Acid, Fuming	441	14	Glycol Ethers	902	617036	2.45E+11	602	0.010	99.06
2	Nitric Acid, Fuming	441	24	Motor Fuel Antiknock Comp	1000	552135	2.43E+11	597	0.010	99.07
1	Hydrochloric Acid	10973	101	Fuel Oil	39248	585	2.43E+11	597	0.010	99.08
2	Nitric Acid, Fuming	441	5	Butyraldehyde	870	633351	2.43E+11	596	0.010	99.10
2	Nitric Acid, Fuming	441	28	LPG-Butene	3945	137445	2.39E+11	586	0.010	99.11
28	LPG-Propylene	5707	104	Hydrogen Peroxide	1646	25325	2.38E+11	583	0.010	99.11
1	Hydrofluorosilicic Acid	930	19	Acetone	2971	86008	2.38E+11	583	0.010	99.12
2	Nitric Acid, Fuming	441	10	Alkaline Liquid, n.o.s.	975	552135	2.37E+11	582	0.010	99.13
105	Phosphorus	3533	106	Ammonium Nitrate Soln.	1860	35982	2.36E+11	580	0.010	99.14
2	Nitric Acid, Fuming	441	17	Chloroprene, Inhibited	889	599076	2.35E+11	576	0.010	99.15
17	Chloroprene, Inhibited	889	24	Motor Fuel Antiknock Comp	1000	261833	2.33E+11	571	0.010	99.16
2	Nitric Acid, Fuming	441	3	Acetic Acid, Glacial	2953	177202	2.31E+11	566	0.010	99.17
27	Dinitrotoluene, Liquid	866	104	Hydrogen Peroxide	1646	161644	2.30E+11	565	0.010	99.18
1	Hydrochloric Acid	10973	3	Acetic Acid, Glacial	2953	7104	2.30E+11	564	0.010	99.19
1	Hydroiodic Acid	897	19	Acetone	2971	86008	2.29E+11	562	0.010	99.20
1	Hydrofluorosilicic Acid	930	13	Methyl Methacrylate	2927	83602	2.28E+11	558	0.009	99.21
4	Isopropanol	2848	21	Sodium Metal	855	92219	2.25E+11	551	0.009	99.22

Table J5. Risk Rankings by Binary Combination (Cont.)

ASTM #	Chemical Name #1	Car Moves/yr #1	ASTM #	Chemical Name #2	Car Moves/yr #2	Area Covered sq.m.	Risk *	Normal-ized Risk	% of Total Risk	Cumul-ative %
5	Formaldehyde Solution	3058	18	Toluene Diisocyanate	2610	27796	2.22E+11	544	0.009	99.23
4	Isopropanol	2848	5	Butyraldehyde	870	89450	2.22E+11	543	0.009	99.24
3	Acrylic Acid	1031	17	Chloroprene, Inhibited	889	238922	2.19E+11	537	0.009	99.25
20	Carbon Disulfide	1013	21	Sodium Metal	855	252602	2.19E+11	536	0.009	99.26
1	Hydroiodic Acid	897	2	Nitric Acid, Fuming	441	552135	2.18E+11	536	0.009	99.27
7	Aniline Oil, Liquid	1088	17	Carbon Tetrachloride	1343	148440	2.17E+11	532	0.009	99.28
2	Sulfuric Acid, Spent	4809	7	Aniline Oil, Liquid	1088	41151	2.15E+11	528	0.009	99.29
2	Nitric Acid, Fuming	441	17	Methyl Chloride	1168	412334	2.12E+11	521	0.009	99.29
16	Styrene Monomer	10859	21	Sodium Metal	855	22752	2.11E+11	518	0.009	99.30
4	Butyl Alcohol	1052	18	Toluene Diisocyanate	2610	76625	2.10E+11	516	0.009	99.31
28	Butadiene	8030	104	Hydrogen Peroxide	1646	15900	2.10E+11	515	0.009	99.32
1	Hydrochloric Acid	10973	10	Alkaline Liquid, n.o.s.	975	19635	2.10E+11	515	0.009	99.33
2	Nitric Acid, Fuming	441	21	Sodium Metal	855	552135	2.08E+11	510	0.009	99.34
3	Acetic Acid, Glacial	2953	7	Aniline Oil, Liquid	1088	84424	2.07E+11	508	0.009	99.35
1	Phosphoric Acid	28008	5	Formaldehyde Solution	3058	2356	2.02E+11	495	0.008	99.35
104	Hydrogen Peroxide	1646	105	Phosphorus	3533	34664	2.02E+11	494	0.008	99.36
7	Aniline Oil, Liquid	1088	17	Chloroprene, Inhibited	889	206971	2.00E+11	491	0.008	99.37
1	Phosphoric Acid	28008	101	Petroleum Naphtha	13541	527	2.00E+11	490	0.008	99.38
10	Potassium Hydroxide, Liq	2822	18	Toluene Diisocyanate	2610	28464	1.95E+11	478	0.008	99.39
2	Sulfuric Acid, Spent	4809	13	Ethyl Acetate	1066	37596	1.93E+11	473	0.008	99.40
2	Nitric Acid, Fuming	441	101	Combustible Liquid	3139	137445	1.90E+11	467	0.008	99.40
1	Hydroiodic Acid	897	13	Methyl Methacrylate	2927	71821	1.89E+11	462	0.008	99.41
7	Hexamethylene Diamine Sol	5580	107	Acetic Anhydride	1533	22013	1.88E+11	462	0.008	99.42
3	Acrylic Acid	1031	7	Hexamethylene Diamine Sol	5580	31674	1.82E+11	447	0.008	99.43
1	Hydroiodic Acid	897	17	Carbon Tetrachloride	1343	148440	1.79E+11	438	0.007	99.43
10	Alkaline Liquid, n.o.s.	975	105	Phosphorus	3533	51427	1.77E+11	434	0.007	99.44
17	Chloroprene, Inhibited	889	21	Sodium Metal	855	231305	1.76E+11	431	0.007	99.45
10	Alkaline Liquid, n.o.s.	975	17	Chloroprene, Inhibited	889	202182	1.75E+11	430	0.007	99.46
5	Formaldehyde Solution	3058	7	Aniline Oil, Liquid	1088	52518	1.75E+11	428	0.007	99.46
17	Carbon Tetrachloride	1343	21	Sodium Metal	855	148440	1.70E+11	418	0.007	99.47
3	Acrylic Acid	1031	26	Acrylonitrile	4811	33921	1.68E+11	413	0.007	99.48
1	Hydrofluorosilicic Acid	930	17	Chloroprene, Inhibited	889	202182	1.67E+11	410	0.007	99.49
10	Alkaline Liquid, n.o.s.	975	17	Vinyl Chloride	20081	8390	1.64E+11	403	0.007	99.49
2	Sulfuric Acid, Spent	4809	107	Acetic Anhydride	1533	21936	1.62E+11	397	0.007	99.50
1	Hydroiodic Acid	897	17	Chloroprene, Inhibited	889	202182	1.61E+11	395	0.007	99.51
3	Acrylic Acid	1031	18	Toluene Diisocyanate	2610	57761	1.55E+11	381	0.006	99.51
4	Methyl Alcohol	2630	21	Sodium Metal	855	67322	1.51E+11	371	0.006	99.52
13	Vinyl Acetate	4431	21	Sodium Metal	855	39637	1.50E+11	368	0.006	99.52
2	Sulfuric Acid, Spent	4809	5	Butyraldehyde	870	35593	1.49E+11	365	0.006	99.53
19	Methyl Ethyl Ketone	1318	21	Sodium Metal	855	129828	1.46E+11	359	0.006	99.54
5	Butyraldehyde	870	18	Toluene Diisocyanate	2610	64059	1.45E+11	357	0.006	99.54
10	Potassium Hydroxide, Liq	2822	19	Methyl Ethyl Ketone	1318	41831	1.45E+11	354	0.006	99.55
13	Ethyl Acrylate	1281	21	Sodium Metal	855	130821	1.43E+11	351	0.006	99.56
19	Acetone	2971	21	Sodium Metal	855	56291	1.43E+11	351	0.006	99.56
1	Hydrofluorosilicic Acid	930	4	Isopropanol	2848	53105	1.41E+11	345	0.006	99.57

Table J5. Risk Rankings by Binary Combination (Cont.)

ASTM #	Chemical Name #1	Car Moves/yr #1	ASTM #	Chemical Name #2	Car Moves/yr #2	Area Covered sq.m.	Risk *	Normal-ized Risk	% of Total Risk	Cumul-ative %
4	Ethyl Alcohol	867	18	Toluene Diisocyanate	2610	61165	1.38E+11	339	0.006	99.57
2	Nitric Acid, Fuming	441	101	Flammable Liquid	2256	137445	1.37E+11	335	0.006	99.58
3	Acrylic Acid	1031	5	Formaldehyde Solution	3058	42352	1.34E+11	327	0.006	99.58
101	Combustible Liquid	3139	104	Hydrogen Peroxide	1646	25325	1.31E+11	321	0.005	99.59
5	Formaldehyde Solution	3058	104	Hydrogen Peroxide	1646	25325	1.27E+11	313	0.005	99.59
2	Sulfuric Acid, Spent	4809	27	Dinitrotoluene, Liquid	866	30516	1.27E+11	312	0.005	99.60
2	Sulfuric Acid, Spent	4809	13	Methyl Methacrylate	2927	8980	1.26E+11	310	0.005	99.61
10	Potassium Hydroxide, Liq	2622	13	Ethyl Acetate	1066	45195	1.26E+11	310	0.005	99.61
5	Butyraldehyde	870	107	Acetic Anhydride	1533	93406	1.25E+11	305	0.005	99.62
4	Octyl Alcohol	1671	18	Toluene Diisocyanate	2610	28274	1.23E+11	302	0.005	99.62
2	Nitric Acid, Fuming	441	4	Octyl Alcohol	1671	166834	1.23E+11	301	0.005	99.63
1	Hydrofluorosilicic Acid	930	10	Potassium Hydroxide, Liq	2622	50265	1.23E+11	301	0.005	99.63
1	Hydrofluorosilicic Acid	930	18	Toluene Diisocyanate	2610	50455	1.22E+11	300	0.005	99.64
4	Methyl Alcohol	2630	5	Butyraldehyde	870	53323	1.22E+11	299	0.005	99.64
2	Nitric Acid, Fuming	441	104	Hydrogen Peroxide	1646	162684	1.18E+11	290	0.005	99.65
7	Aniline Oil, Liquid	1088	18	Toluene Diisocyanate	2610	41239	1.17E+11	287	0.005	99.65
28	LPG-Butene	2806	104	Hydrogen Peroxide	1646	25325	1.17E+11	287	0.005	99.66
2	Sulfuric Acid, Spent	4809	3	Acrylic Acid	1031	23398	1.16E+11	284	0.005	99.66
1	Hydroiodic Acid	897	13	Ethyl Acrylate	1281	99610	1.14E+11	281	0.005	99.67
4	Alcoholic Beverage	1276	5	Butyraldehyde	870	102692	1.14E+11	280	0.005	99.67
2	Nitric Acid, Fuming	441	20	Carbon Disulfide	1013	252585	1.13E+11	277	0.005	99.68
2	Nitric Acid, Fuming	441	106	Ammonium Nitrate Soln.	1860	137445	1.13E+11	276	0.005	99.68
1	Hydrofluorosilicic Acid	930	13	Butyl Acrylate	1957	59774	1.09E+11	267	0.005	99.68
1	Hydrocyanic Acid	1226	24	Motor Fuel Antiknock Comp	1000	87982	1.08E+11	264	0.004	99.69
19	Methyl Ethyl Ketone	1318	104	Ferric Chloride Solution	1883	41831	1.04E+11	255	0.004	99.69
5	Acetaldehyde	3520	21	Sodium Metal	855	34309	1.03E+11	253	0.004	99.70
1	Hydrofluorosilicic Acid	930	13	Ethyl Acrylate	1281	86258	1.03E+11	252	0.004	99.70
2	Sulfuric Acid, Spent	4809	21	Sodium Metal	855	23728	9.76E+10	239	0.004	99.71
10	Sodium Hydroxide, Liq.	75641	107	Maleic Anhydride	1168	1092	9.65E+10	237	0.004	99.71
1	Phosphoric Acid	28008	101	Fuel, Aviation	6157	552	9.52E+10	233	0.004	99.71
21	Sodium Metal	855	106	Ammonium Nitrate Soln.	1860	59710	9.50E+10	233	0.004	99.72
4	Alcoholic Beverage	1276	18	Toluene Diisocyanate	2610	28500	9.49E+10	233	0.004	99.72
1	Hydrofluorosilicic Acid	930	4	Ethyl Alcohol	867	116848	9.42E+10	231	0.004	99.73
101	Flammable Liquid, n.o.s.	2256	104	Hydrogen Peroxide	1646	25325	9.40E+10	231	0.004	99.73
2	Sulfuric Acid	46265	7	Hexamethylene Diamine Sol	5580	382	9.35E+10	229	0.004	99.73
27	Dinitrotoluene, Liquid	866	105	Phosphorus	3533	30516	9.34E+10	229	0.004	99.74
2	Sulfuric Acid, Spent	4809	31	Phenol	5974	3248	9.33E+10	229	0.004	99.74
5	Acetaldehyde	3520	27	Dinitrotoluene, Liquid	866	30516	9.30E+10	228	0.004	99.75
2	Sulfuric Acid, Spent	4809	16	Toluene	2084	9174	9.19E+10	225	0.004	99.75
7	Hexamethylene Diamine Sol	5580	21	Sodium Metal	855	19250	9.18E+10	225	0.004	99.75
2	Sulfuric Acid, Spent	4809	16	Styrene Monomer	10859	1758	9.18E+10	225	0.004	99.76
5	Butyraldehyde	870	7	Aniline Oil, Liquid	1088	96076	9.09E+10	223	0.004	99.76
4	Butyl Alcohol	1052	21	Sodium Metal	855	101070	9.09E+10	223	0.004	99.76
4	Butyl Alcohol	1052	5	Butyraldehyde	870	99054	9.07E+10	222	0.004	99.77
2	Sulfuric Acid, Spent	4809	13	Ethyl Acrylate	1281	14338	8.83E+10	217	0.004	99.77

Table J5. Risk Rankings by Binary Combination (Cont.)

ASTM #	Chemical Name #1	Car Moves/yr #1	ASTM #	Chemical Name #2	Car Moves/yr #2	Area Covered sq.m.	Risk *	Normalized Risk	% of Total Risk	Cumulative %
10	Potassium Hydroxide, Liq	2622	107	Acetic Anhydride	1533	21936	8.82E+10	216	0.004	99.78
3	Acrylic Acid	1031	7	Aniline Oil, Liquid	1088	76337	8.58E+10	210	0.004	99.78
2	Nitric Acid, Fuming	441	101	Gasoline, nec	1410	137445	8.55E+10	210	0.004	99.78
2	Nitric Acid, Fuming	441	101	Oil	1407	137445	8.53E+10	209	0.004	99.79
1	Hydrofluorosilicic Acid	930	107	Acetic Anhydride	1533	59635	8.50E+10	208	0.004	99.79
2	Nitric Acid, Fuming	441	107	Maleic Anhydride	1168	164533	8.47E+10	208	0.004	99.79
5	Butyraldehyde	870	104	Ferric Chloride Solution	1883	51437	8.43E+10	207	0.004	99.80
1	Hydrofluorosilicic Acid	930	17	Carbon Tetrachloride	1343	66759	8.34E+10	204	0.003	99.80
1	Hydrochloric Acid	10973	14	Glycol Ethers	902	8335	8.25E+10	202	0.003	99.80
7	Aniline Oil, Liquid	1088	107	Acetic Anhydride	1533	49327	8.23E+10	202	0.003	99.81
5	Butyraldehyde	870	10	Potassium Hydroxide, Liq	2622	35593	8.12E+10	199	0.003	99.81
1	Hydroiodic Acid	897	5	Butyraldehyde	870	102698	8.01E+10	197	0.003	99.81
2	Nitric Acid, Fuming	441	13	Ethyl Acetate	1066	169793	7.98E+10	196	0.003	99.82
1	Hydrochloric Acid	10973	5	Formaldehyde Solution	3058	2356	7.91E+10	194	0.003	99.82
1	Hydrochloric Acid	10973	101	Petroleum Naphtha	13541	527	7.83E+10	192	0.003	99.82
2	Nitric Acid, Fuming	441	101	Compound, Cleaning	1281	137445	7.76E+10	190	0.003	99.83
2	Nitric Acid, Fuming	441	101	Coal Tar Distillate	1259	138042	7.66E+10	188	0.003	99.83
5	Butyraldehyde	870	21	Sodium Metal	855	102698	7.64E+10	187	0.003	99.83
3	Acrylic Acid	1031	107	Acetic Anhydride	1533	48326	7.64E+10	187	0.003	99.84
2	Nitric Acid, Fuming	441	28	LPG-Isobutylene	1258	137445	7.63E+10	187	0.003	99.84
3	Acrylic Acid	1031	21	Sodium Metal	855	85559	7.54E+10	185	0.003	99.84
10	Alkaline Liquid, n.o.s.	975	18	Toluene Diisocyanate	2610	28464	7.24E+10	178	0.003	99.85
1	Phosphoric Acid	28008	7	Aniline Oil, Liquid	1088	2356	7.18E+10	176	0.003	99.85
2	Nitric Acid, Fuming	441	101	Pulp Mill Liquid	1159	137445	7.03E+10	172	0.003	99.85
1	Hydrofluorosilicic Acid	930	5	Butyraldehyde	870	85858	6.95E+10	170	0.003	99.85
10	Potassium Hydroxide, Liq	2622	27	Dinitrotoluene, Liquid	866	30516	6.93E+10	170	0.003	99.86
31	Phenol	5974	105	Phosphorus	3533	3248	6.86E+10	168	0.003	99.86
13	Ethyl Acetate	1066	21	Sodium Metal	855	74806	6.82E+10	167	0.003	99.86
3	Acrylic Acid	1031	5	Butyraldehyde	870	75105	6.74E+10	165	0.003	99.87
7	Aniline Oil, Liquid	1088	21	Sodium Metal	855	71678	6.67E+10	163	0.003	99.87
1	Hydroiodic Acid	897	18	Toluene Diisocyanate	2610	28464	6.66E+10	163	0.003	99.87
1	Phosphoric Acid	28008	101	Crude Oil Petroleum	9995	230	6.44E+10	158	0.003	99.87
3	Acrylic Acid	1031	10	Potassium Hydroxide, Liq	2622	23398	6.33E+10	155	0.003	99.88
2	Nitric Acid, Fuming	441	3	Acrylic Acid	1031	137886	6.27E+10	154	0.003	99.88
4	Ethyl Alcohol	867	5	Butyraldehyde	870	79420	5.99E+10	147	0.002	99.88
7	Aniline Oil, Liquid	1088	24	Motor Fuel Antiknock Comp	1000	54473	5.93E+10	145	0.002	99.88
1	Hydrofluorosilicic Acid	930	21	Sodium Metal	855	73993	5.88E+10	144	0.002	99.89
101	Gasoline, nec	1410	104	Hydrogen Peroxide	1646	25325	5.88E+10	144	0.002	99.89
101	Oil	1407	104	Hydrogen Peroxide	1646	25325	5.87E+10	144	0.002	99.89
2	Sulfuric Acid, Spent	4809	16	Xylene	5415	2237	5.83E+10	143	0.002	99.89
13	Butyl Acrylate	1957	21	Sodium Metal	855	34543	5.78E+10	142	0.002	99.90
1	Hydrofluorosilicic Acid	930	107	Maleic Anhydride	1168	51357	5.58E+10	137	0.002	99.90
18	Toluene Diisocyanate	2610	21	Sodium Metal	855	24513	5.47E+10	134	0.002	99.90
10	Alkaline Liquid, n.o.s.	975	19	Methyl Ethyl Ketone	1318	41831	5.38E+10	132	0.002	99.90
101	Coal Tar Distillate	1259	104	Hydrogen Peroxide	1646	25922	5.37E+10	132	0.002	99.91

Table J5. Risk Rankings by Binary Combination (Cont.)

ASTM #	Chemical Name #1	Car Moves/yr #1	ASTM #	Chemical Name #2	Car Moves/yr #2	Area Covered sq.m.	Risk *	Normalized Risk	% of Total Risk	Cumulative %
101	Compound, Cleaning	1281	104	Hydrogen Peroxide	1646	25325	5.34E+10	131	0.002	99.91
10	Potassium Hydroxide, Liq	2622	21	Sodium Metal	855	23728	5.32E+10	130	0.002	99.91
4	Alcoholic Beverage	1276	104	Hydrogen Peroxide	1646	25325	5.32E+10	130	0.002	99.91
2	Nitric Acid, Fuming	441	27	Dinitrotoluene, Liquid	866	137445	5.25E+10	129	0.002	99.91
28	LPG-Isobutylene	1258	104	Hydrogen Peroxide	1646	25325	5.24E+10	129	0.002	99.92
5	Formaldehyde Solution	3058	21	Sodium Metal	855	19919	5.21E+10	128	0.002	99.92
1	Hydrofluorosilicic Acid	930	19	Methyl Ethyl Ketone	1318	41831	5.13E+10	126	0.002	99.92
7	Aniline Oil, Liquid	1088	107	Maleic Anhydride	1168	39832	5.06E+10	124	0.002	99.92
13	Methyl Methacrylate	2927	104	Ferric Chloride Solution	1883	8980	4.95E+10	121	0.002	99.93
1	Hydroiodic Acid	897	19	Methyl Ethyl Ketone	1318	41831	4.95E+10	121	0.002	99.93
1	Hydrofluorosilicic Acid	930	24	Motor Fuel Antiknock Comp	1000	52117	4.85E+10	119	0.002	99.93
1	Hydrochloric Acid	10973	7	Hexamethylene Diamine Sol	5580	785	4.81E+10	118	0.002	99.93
28	LPG-Butylene	1139	104	Hydrogen Peroxide	1646	25325	4.75E+10	116	0.002	99.93
4	Ethyl Alcohol	867	21	Sodium Metal	855	63628	4.72E+10	116	0.002	99.94
10	Alkaline Liquid, n.o.s.	975	13	Ethyl Acetate	1066	45195	4.70E+10	115	0.002	99.94
1	Hydroiodic Acid	897	24	Motor Fuel Antiknock Comp	1000	52117	4.67E+10	115	0.002	99.94
2	Sulfuric Acid, Spent	4809	5	Butyraldehyde	870	11098	4.64E+10	114	0.002	99.94
1	Hydrofluorosilicic Acid	930	10	Alkaline Liquid, n.o.s.	975	50265	4.56E+10	112	0.002	99.94
1	Hydrofluorosilicic Acid	930	4	Alcoholic Beverage	1276	33819	4.01E+10	98	0.002	99.94
1	Hydroiodic Acid	897	13	Ethyl Acetate	1066	41485	3.97E+10	97	0.002	99.95
3	Acetic Acid, Glacial	2953	106	Ammonium Nitrate Soln.	1860	7104	3.90E+10	96	0.002	99.95
21	Sodium Metal	855	104	Ferric Chloride Solution	1883	23728	3.82E+10	94	0.002	99.95
1	Hydrochloric Acid	10973	101	Fuel, Aviation	6157	552	3.73E+10	91	0.002	99.95
1	Hydrofluorosilicic Acid	930	13	Ethyl Acetate	1066	37558	3.72E+10	91	0.002	99.95
16	Styrene Monomer	10859	104	Ferric Chloride Solution	1883	1758	3.59E+10	88	0.001	99.95
1	Phosphoric Acid	28008	107	Maleic Anhydride	1168	1092	3.57E+10	88	0.001	99.96
2	Sulfuric Acid, Spent	4809	5	Formaldehyde Solution	3058	2356	3.46E+10	85	0.001	99.96
4	Octyl Alcohol	1671	21	Sodium Metal	855	23728	3.39E+10	83	0.001	99.96
10	Alkaline Liquid, n.o.s.	975	107	Acetic Anhydride	1533	21936	3.28E+10	80	0.001	99.96
1	Hydrocyanic Acid	1226	104	Hydrogen Peroxide	1646	15900	3.21E+10	79	0.001	99.96
4	Methyl Alcohol	2630	104	Ferric Chloride Solution	1883	6283	3.11E+10	76	0.001	99.96
17	Methyl Chloride	1168	104	Hydrogen Peroxide	1646	15900	3.06E+10	75	0.001	99.96
101	Pulp Mill Liquid	1159	104	Hydrogen Peroxide	1646	15900	3.03E+10	74	0.001	99.97
5	Butyraldehyde	870	10	Alkaline Liquid, n.o.s.	975	35593	3.02E+10	74	0.001	99.97
1	Hydroiodic Acid	897	107	Acetic Anhydride	1533	21936	3.02E+10	74	0.001	99.97
13	Ethyl Acrylate	1281	104	Ferric Chloride Solution	1883	12212	2.95E+10	72	0.001	99.97
1	Hydrochloric Acid	10973	4	Butyl Alcohol	1052	2534	2.93E+10	72	0.001	99.97
27	Dinitrotoluene, Liquid	866	107	Acetic Anhydride	1533	21936	2.91E+10	71	0.001	99.97
21	Sodium Metal	855	107	Acetic Anhydride	1533	21936	2.88E+10	70	0.001	99.97
1	Hydrochloric Acid	10973	7	Aniline Oil, Liquid	1088	2356	2.81E+10	69	0.001	99.97
4	Alcoholic Beverage	1276	21	Sodium Metal	855	23732	2.59E+10	63	0.001	99.97
10	Alkaline Liquid, n.o.s.	975	27	Dinitrotoluene, Liquid	866	30516	2.58E+10	63	0.001	99.98
1	Hydrochloric Acid	10973	101	Crude Oil Petroleum	9995	230	2.52E+10	62	0.001	99.98
3	Acrylic Acid	1031	10	Alkaline Liquid, n.o.s.	975	23398	2.36E+10	58	0.001	99.98
21	Sodium Metal	855	101	Pulp Mill Liquid	1159	23728	2.35E+10	58	0.001	99.98

Table J5. Risk Rankings by Binary Combination (Cont.)

ASTM #	Chemical Name #1	Car Moves/yr #1	ASTM #	Chemical Name #2	Car Moves/yr #2	Area Covered sq.m.	Risk *	Normal-ized Risk	% of Total Risk	Cumul-ative %
5	Butyraldehyde	870	27	Dinitrotoluene, Liquid	866	30516	2.30E+10	56	0.001	99.98
21	Sodium Metal	855	27	Dinitrotoluene, Liquid	866	30516	2.26E+10	55	0.001	99.98
1	Phosphoric Acid	28008	101	Coal Tar Distillate	1259	597	2.11E+10	52	0.001	99.98
1	Hydrofluorosilicic Acid	930	101	Fuel Oil	39248	585	2.06E+10	51	0.001	99.98
1	Hydroiodic Acid	897	101	Fuel Oil	39248	565	1.99E+10	49	0.001	99.98
10	Alkaline Liquid, n.o.s.	975	21	Sodium Metal	855	23728	1.98E+10	49	0.001	99.98
1	Hydrofluorosilicic Acid	930	3	Acetic Acid, Glacial	2953	7104	1.95E+10	48	0.001	99.99
5	Formaldehyde Solution	3058	10	Potassium Hydroxide, Liq	2622	2356	1.89E+10	46	0.001	99.99
1	Hydroiodic Acid	897	3	Acetic Acid, Glacial	2953	7104	1.88E+10	46	0.001	99.99
1	Hydroiodic Acid	897	21	Sodium Metal	855	24513	1.88E+10	46	0.001	99.99
1	Hydrocyanic Acid	1226	19	Acetone	2971	5024	1.83E+10	45	0.001	99.99
1	Hydrofluorosilicic Acid	930	31	Phenol	5974	3142	1.75E+10	43	0.001	99.99
1	Hydroiodic Acid	897	13	Butyl Acrylate	1957	9509	1.67E+10	41	0.001	99.99
1	Hydrofluorosilicic Acid	930	104	Hydrogen Peroxide	1646	9425	1.44E+10	35	0.001	99.99
1	Hydroiodic Acid	897	104	Hydrogen Peroxide	1646	9425	1.39E+10	34	0.001	99.99
1	Hydrochloric Acid	10973	3	Acrylic Acid	1031	1226	1.39E+10	34	0.001	99.99
5	Formaldehyde Solution	3058	107	Acetic Anhydride	1533	2910	1.36E+10	33	0.001	99.99
5	Formaldehyde Solution	3058	104	Ferric Chloride Solution	1883	2356	1.36E+10	33	0.001	99.99
1	Phosphoric Acid	28008	3	Acrylic Acid	1031	441	1.27E+10	31	0.001	99.99
1	Hydroiodic Acid	897	14	Glycol Ethers	902	13832	1.12E+10	27	0.000	99.99
104	Ferric Chloride Solution	1883	107	Acetic Anhydride	1533	3696	1.07E+10	26	0.000	99.99
106	Ammonium Nitrate Soln.	1860	107	Acetic Anhydride	1533	3696	1.05E+10	26	0.000	99.99
2	Sulfuric Acid, Spent	4809	7	Hexamethylene Diamine Sol	5580	362	9.71E+09	24	0.000	99.99
2	Sulfuric Acid, Spent	4809	13	Butyl Acrylate	1957	985	9.08E+09	22	0.000	100.00
2	Sulfuric Acid, Spent	4809	14	Glycol Ethers	902	2051	8.90E+09	22	0.000	100.00
1	Hydrochloric Acid	10973	101	Coal Tar Distillate	1259	597	8.25E+09	20	0.000	100.00
18	Toluene Diisocyanate	2610	105	Phosphorus	3533	785	7.24E+09	18	0.000	100.00
5	Formaldehyde Solution	3058	10	Alkaline Liquid, n.o.s.	975	2356	7.02E+09	17	0.000	100.00
1	Hydrofluorosilicic Acid	930	5	Formaldehyde Solution	3058	2356	6.70E+09	16	0.000	100.00
1	Hydrofluorosilicic Acid	930	101	Petroleum Naphtha	13541	527	6.64E+09	16	0.000	100.00
1	Hydroiodic Acid	897	5	Formaldehyde Solution	3058	2356	6.46E+09	16	0.000	100.00
1	Hydroiodic Acid	897	101	Petroleum Naphtha	13541	527	6.40E+09	16	0.000	100.00
7	Hexamethylene Diamine Sol	5580	107	Maleic Anhydride	1168	898	5.84E+09	14	0.000	100.00
7	Aniline Oil, Liquid	1088	104	Ferric Chloride Solution	1883	2356	4.83E+09	12	0.000	100.00
1	Hydrofluorosilicic Acid	930	7	Hexamethylene Diamine Sol	5580	785	4.07E+09	10	0.000	100.00
18	Toluene Diisocyanate	2610	106	Ammonium Nitrate Soln.	1860	785	3.81E+09	9	0.000	100.00
13	Butyl Acrylate	1957	104	Ferric Chloride Solution	1883	965	3.56E+09	9	0.000	100.00
14	Glycol Ethers	902	104	Ferric Chloride Solution	1883	2051	3.48E+09	9	0.000	100.00
10	Potassium Hydroxide, Liq	2622	107	Maleic Anhydride	1168	1092	3.34E+09	8	0.000	100.00
1	Hydrofluorosilicic Acid	930	101	Fuel, Aviation	6157	552	3.16E+09	8	0.000	100.00
1	Hydroiodic Acid	897	101	Fuel, Aviation	6157	552	3.05E+09	7	0.000	100.00
1	Hydrofluorosilicic Acid	930	105	Phosphorus	3533	785	2.58E+09	6	0.000	100.00
1	Hydrofluorosilicic Acid	930	4	Butyl Alcohol	1052	2534	2.48E+09	6	0.000	100.00
1	Hydrofluorosilicic Acid	930	7	Aniline Oil, Liquid	1088	2356	2.38E+09	6	0.000	100.00
1	Hydroiodic Acid	897	7	Aniline Oil, Liquid	1088	2356	2.30E+09	6	0.000	100.00

Table J5. Risk Rankings by Binary Combination (Cont.)

ASTM #	Chemical Name #1	Car Moves/yr #1	ASTM #	Chemical Name #2	Car Moves/yr #2	Area Covered sq.m.	Risk *	Normal-ized Risk	% of Total Risk	Cumul-ative %
1	Hydrofluorosilicic Acid	930	101	Crude Oil Petroleum	9995	230	2.14E+09	5	0.000	100.00
1	Hydroiodic Acid	897	101	Crude Oil Petroleum	9995	230	2.06E+09	5	0.000	100.00
1	Hydrofluorosilicic Acid	930	14	Glycol Ethers	982	2051	1.72E+09	4	0.000	100.00
10	Alkaline Liquid, n.o.s.	975	107	Maleic Anhydride	1168	1092	1.24E+09	3	0.000	100.00
1	Hydrofluorosilicic Acid	930	3	Acrylic Acid	1031	1226	1.18E+09	3	0.000	100.00
1	Hydroiodic Acid	897	107	Maleic Anhydride	1168	1092	1.14E+09	3	0.000	100.00
27	Dinitrotoluene, Liquid	868	107	Maleic Anhydride	1168	1092	1.10E+09	3	0.000	100.00
21	Sodium Metal	855	107	Maleic Anhydride	1168	1092	1.09E+09	3	0.000	100.00
3	Acrylic Acid	1031	106	Ammonium Nitrate Soln.	1860	441	8.46E+08	2	0.000	100.00
1	Hydrofluorosilicic Acid	930	101	Coal Tar Distillate	1259	597	6.99E+08	2	0.000	100.00
1	Hydroiodic Acid	897	101	Coal Tar Distillate	1259	597	6.74E+08	2	0.000	100.00
1	Hydroiodic Acid	897	3	Acrylic Acid	1031	441	4.08E+08	1	0.000	100.00

* Risk = Car moves/yr for #1 chemical x Car moves/yr for #2 chemical x area covered.
The Normalized Risk is the Risk divided by the risk from the combination with the lowest risk (i.e. hydroiodic acid with acrylic acid). It is a relative measure of the risk between the binary combinations.

Table J8. Risk Ranking by Specific Chemical

Chemical Name	Total Risk	Normal-ized Risk	% of Total Risk	Cumul-ative %
Sulfuric Acid	1.02E+15	951	21.16	21.16
Oleum	6.15E+14	575	12.79	33.95
Sodium Hydroxide, Liq.	4.32E+14	404	8.99	42.94
Hydrochloric Acid	3.88E+14	363	8.07	51.02
Methyl Alcohol	2.70E+14	253	5.63	56.65
Denatured Alcohol	2.32E+14	217	4.82	61.47
Styrene Monomer	1.32E+14	123	2.74	64.21
Vinyl Chloride	1.25E+14	117	2.60	66.81
Chlorine	1.12E+14	105	2.34	69.14
Acrylonitrile	9.75E+13	91	2.03	71.17
Carbon Tetrachloride	7.34E+13	69	1.53	72.70
Anhydrous Ammonia	7.24E+13	68	1.51	74.21
Acetic Acid, Glacial	7.10E+13	66	1.48	75.69
Nitric Acid, Fuming	6.67E+13	62	1.39	77.07
Hydrogen Peroxide	6.54E+13	61	1.36	78.44
Sulfuric Acid, Spent	5.97E+13	56	1.24	79.68
Phosphoric Acid	5.32E+13	50	1.11	80.79
Vinyl Acetate	5.21E+13	49	1.08	81.87
Hydrofluorosilicic Acid	5.09E+13	48	1.06	82.93
Chloroprene, Inhibited	5.03E+13	47	1.05	83.98
Benzene	4.94E+13	46	1.03	85.01
Acetone	4.29E+13	40	0.89	85.90
Fuel Oil	3.70E+13	35	0.77	86.67
Xylene	3.47E+13	33	0.72	87.39
Hydrocyanic Acid	3.25E+13	30	0.68	88.07
Phenol	3.02E+13	28	0.63	88.70
Methyl Chloride	2.97E+13	28	0.62	89.32
Phosphorus	2.56E+13	24	0.53	89.85
Isopropanol	2.49E+13	23	0.52	90.37
Toluene Diisocyanate	2.48E+13	23	0.52	90.89
LPG	2.47E+13	23	0.51	91.40
Methyl Methacrylate	2.06E+13	19	0.43	91.83
Petroleum Naphtha	1.92E+13	18	0.40	92.23
Toluene	1.85E+13	17	0.38	92.61
Hydroiodic Acid	1.74E+13	16	0.36	92.98
Methyl Ethyl Ketone	1.72E+13	16	0.36	93.33
Hexamethylene Diamine Solution	1.67E+13	16	0.35	93.68
Ethyl Alcohol	1.66E+13	16	0.35	94.03
Potassium Hydroxide, Liq	1.50E+13	14	0.31	94.34
Sodium Metal	1.44E+13	13	0.30	94.64
Butyraldehyde	1.36E+13	13	0.28	94.92
Ethylene Oxide	1.34E+13	13	0.28	95.20
Ethyl Acrylate	1.12E+13	10	0.23	95.44
Propylene Oxide	1.11E+13	10	0.23	95.67
Acetic Anhydride	1.11E+13	10	0.23	95.90
Ammonium Nitrate Soln.	1.06E+13	10	0.22	96.12

Table J8. Risk Ranking by Specific Chemical (Cont.)

Chemical Name	Total Risk	Normal-ized Risk	% of Total Risk	Cumul-ative %
Formaldehyde Solution	1.00E+13	9	0.21	96.33
Aniline Oil, Liquid	9.90E+12	9	0.21	96.53
Petroleum Refined	9.78E+12	9	0.20	96.74
Ethyl Acetate	9.39E+12	9	0.20	96.93
Butadiene	9.29E+12	9	0.19	97.13
Crude Oil Petroleum	9.27E+12	9	0.19	97.32
Butyl Alcohol	8.88E+12	8	0.18	97.50
Acetaldehyde	8.84E+12	8	0.18	97.69
Alcoholic Beverage	8.49E+12	8	0.18	97.86
Motor Fuel Antiknock Compound	7.74E+12	7	0.16	98.03
Petroleum Residual Fuel	7.25E+12	7	0.15	98.18
Gasoline	7.04E+12	7	0.15	98.32
Dinitrotoluene, Liquid	7.00E+12	7	0.15	98.47
Acrylic Acid	6.80E+12	6	0.14	98.61
LPG-Propylene	6.69E+12	6	0.14	98.75
Butyl Acrylate	6.59E+12	6	0.14	98.89
Distillate Fuel Oil	6.01E+12	6	0.13	99.01
Fuel, Aviation	5.80E+12	5	0.12	99.13
Alkaline Liquid, n.o.s.	5.59E+12	5	0.12	99.25
Octyl Alcohol	5.31E+12	5	0.11	99.36
LPG-Butene	4.62E+12	4	0.10	99.46
Glycol Ethers	4.22E+12	4	0.09	99.54
Carbon Disulfide	3.65E+12	3	0.08	99.62
Maleic Anhydride	3.19E+12	3	0.07	99.69
Combustible Liquid	2.88E+12	3	0.06	99.75
Ferric Chloride Solution	2.65E+12	2	0.06	99.80
Flammable Liquid, n.o.s.	2.07E+12	2	0.04	99.84
LPG-Isobutylene	1.47E+12	1	0.03	99.87
Gasoline, nec	1.29E+12	1	0.03	99.90
Oil	1.29E+12	1	0.03	99.93
Coal Tar Distillate	1.19E+12	1	0.02	99.95
Compound, Cleaning	1.18E+12	1	0.02	99.98
Pulp Mill Liquid	1.07E+12	1	0.02	100.00

Table J7. Risk Ranking by ASTM Group

ASTM No.	Total Risk	Normal-ized Risk	% of Total Risk	Cumul-ative %
2	1.78E+15	481	36.59	36.59
4	5.66E+14	155	11.79	48.37
1	5.42E+14	148	11.28	59.65
10	5.25E+14	144	10.93	70.58
17	2.78E+14	76	5.79	76.37
16	2.34E+14	64	4.88	81.25
104	1.8E+14	49	3.76	85.00
101	1.12E+14	31	2.34	87.34
13	9.98E+13	27	2.08	89.42
26	9.75E+13	27	2.03	91.45
3	7.78E+13	21	1.62	93.07
19	6.01E+13	16	1.25	94.32
28	4.68E+13	13	0.97	95.29
5	3.24E+13	9	0.68	95.97
31	3.02E+13	8	0.63	96.60
7	2.66E+13	7	0.55	97.15
105	2.56E+13	7	0.53	97.69
18	2.48E+13	7	0.52	98.20
34	2.46E+13	7	0.51	98.71
21	1.44E+13	4	0.30	99.01
107	1.43E+13	4	0.30	99.31
106	1.06E+13	3	0.22	99.53
24	7.74E+12	2	0.16	99.69
27	7E+12	2	0.15	99.84
14	4.22E+12	1	0.09	99.92
20	3.65E+12	1	0.08	100.00

The Normalized Risk is the Risk divided by the risk from the ASTM group with the lowest risk (ASTM Group #20). It is a relative measure of the contribution from each ASTM Group to the total risk.