



Unexpected Projects and Equipment Requiring San Jose Fire Department Hazardous Materials Review

Table 1: Hazardous Materials (Haz Mat) Review Summary Criteria

- All project types noted the below need the following (unless otherwise noted)
- **Completion of Building Occupancy Classification Inventory Form (UN-35)**
- Addition of Hazardous Materials Architectural Review Process (Haz Mat Arch Review) for Building Permits, and
- Addition of Hazardous Materials Inspection required on “Info” field in Amanda

Criteria for requiring additional system specific Hazardous Materials Construction Permits (HZ Permits is also indicated, where applicable. Listed are typical equipment with hazardous materials and more hazardous materials may be on site than listed below.

Project Types	Potential Hazardous Materials Equipment and Minimum Table Thresholds
1. Medium or large construction projects	<p>Any projects when there is no temporary electrical connection onsite for trailer and construction equipment and the following:</p> <ul style="list-style-type: none"> □ Diesel generators (any size) – (A temporary HZ Permit required if over the generator for tanks 60+ gallons (gal) and onsite for 30 to 180 days.)
2. Fire Pumps, Emergency and Standby Power Systems and Cell Sites	<p>Many Projects now require emergency or standby power systems and are included in checklists below for various types of projects where these systems are common. Review requirements for the various types of systems:</p> <ul style="list-style-type: none"> □ Batteries/Inverters/UPS systems any interconnected battery system See Table 1A for review requirements □ Flammable Liquids (any size) – (HZ Permit required 60+ gal) □ Liquid Petroleum Gas (LPG such as propane) If there is any gas storage that is bolted down in cylinders or tank. (HZ Permit required) □ Natural Gas if there is a gas storage cylinder or tank – NO Haz Mat review or Haz Mat inspection required if just plumbed from street natural gas line to generator □ Others including fuel cells any size – Requires review and various requirements for HZ Permit depending on fuel.

Table 1A: Battery Technology and Minimum Capacity Review Criteria for Haz Mat Review

Battery Technology	Minimum Kilowatt hours for Haz Mat Architectural and HZ Permit Review	Range for Haz Mat Inspection Only (No Haz Mat Plan Review)	No Haz Mat Review or Inspection
Lead acid all types	<i>70+ kWh</i>	<i><70 kWh and ≥10 kWh</i>	<i><10 kWh</i>
Nickel-Cadmium (Ni-Cd)	<i>70+ kWh</i>	<i><70 kWh and ≥10 kWh</i>	<i><10 kWh</i>
Lithium, all types	<i>20+ kWh</i>	<i><20 kWh and ≥10 kWh</i>	<i><10 kWh</i>
Sodium: Ion	<i>70+ kWh</i>	<i><70 kWh and ≥10 kWh</i>	<i><10 kWh</i>
Sodium: Non-ion	<i>20+ kWh</i>	<i><20 kWh and ≥10 kWh</i>	<i><10 kWh</i>
Total Flow batteries	<i>20+ kWh</i>	<i><20 kWh and ≥10 kWh</i>	<i><10 kWh</i>
Other Battery Types	<i>10+ kWh</i>	<i>NA</i>	<i><10 kWh</i>

Project Types	Potential Hazardous Materials Equipment and Minimum Thresholds
<p>3. Large Properties:</p> <ul style="list-style-type: none"> • Hotels, • Large business campus offices • High-rises • Private or trade schools, colleges • Shopping malls (not individual tenant spaces) • Gyms 	<p>For any of these project types that contain any of the following:</p> <ul style="list-style-type: none"> □ Has emergency or standby power systems – See Project Type #2 □ Has grills, fire pits, or heaters for common area patios and separate stationary fuel tank or separate storage of any portable propane tanks (HZ Permits required for any bolted down LPG system) □ Contains maintenance shops (performs hot work) □ Has any water treatment chemicals for boilers, cooling towers and swimming pools used or stored onsite (HZ Permit required tanks 60+ gal) □ Has any bulk laundry onsite (not coin operated) and bulk storage of sanitizing chemicals (HZ Permit required tanks 60+ gal) □ Has a cafeteria, room service, bar or restaurant – See Project Type#5. <p>Watch out for phased deferrals for pools, generators, etc. make sure the deferrals include a hazardous materials review, easily missed!</p>
<p>4. Retail</p>	<ul style="list-style-type: none"> □ All paint stores – Kelly Moore, Sherman Williams etc. □ All auto stores – waste oil tanks □ All pool supply stores (may require a HZ-Permit if storage quantities require control area separation) □ All big box retail – e.g. Walmart, Home Depot, Target – Usually has a source of emergency or standby power system – See Project Type #2 □ Looking at hazardous materials combustible storage height max is 6 feet if in display area and 8 feet if in storage (front of the store vs storage areas) □ Chemical secondary separation.
<p>5. Food Service:</p> <ul style="list-style-type: none"> • Restaurants • Food service facilities • Coffee bars • Bars • Wineries • Breweries • Marijuana dispensaries serving food • Grocery Stores 	<p>If none of the below is true than require NO Haz Mat Arch Review Process and NO Haz Mat Inspection (Document in Amanda Comments)</p> <ul style="list-style-type: none"> □ Has emergency or standby power systems – See Project Type #2 □ Has indoor cooking oil or oil waste tank or other aboveground process tanks 60+ gal (also HZ Permit required) □ Has any beverage system or soda fountain dispensers or beer taps with systems using or connected to 100 pounds of Carbon Dioxide (HZ Permit required) □ Has refrigeration rooms – See Project Type #7 (next item) □ Has any use and storage of helium and nitrogen (HZ Permit required 6000+ cubic feet at Normal Temperature and Pressure (NTP)) □ Has grills, fire pits, or heaters for common area patios and separate stationary fuel tank or separate storage of any portable propane tanks (HZ Permits required for any bolted down LPG system).
<p>6. Mechanical Systems:</p> <ul style="list-style-type: none"> • Refrigeration Room • HVAC • Chillers 	<ul style="list-style-type: none"> □ Refrigeration rooms (not just refrigerators) with A1 Group Refrigerants 220+ pounds or any other group 30+ pounds listed in attached Table 1D: 2016 California Mechanical Table 1102.2 Refrigerants Groups and Properties and allowable [ASHRAE 34: TABLE 4-1, TABLE 4-2] (A-1 Refrigerant highlighted in yellow) No HZ Permit required.

Project Types	Potential Hazardous Materials Equipment and Minimum Thresholds
7. Public storage or warehouses	For any of these project types that contain any of the following: <ul style="list-style-type: none"> <input type="checkbox"/> Has emergency or standby power systems – See Project Type #2 <input type="checkbox"/> Need to make sure what is stored is not hazardous materials. Need inventory of any chemical stored. <input type="checkbox"/> Has any water treatment chemicals for boilers, cooling towers and swimming pools used or stored onsite (HZ Permit required tanks 60+ gal) <input type="checkbox"/> Performs hot work.
8. Auto facilities <ul style="list-style-type: none"> • Auto repair shops • Carwashes • Auto showrooms • Auto wrecking yards 	<ul style="list-style-type: none"> <input type="checkbox"/> Storing any drums or tanks for used oil/used batteries, etc. <input type="checkbox"/> Storing any cleaning or paint supplies <input type="checkbox"/> Stores body work chemicals, paint, bondo, spray booths or dipping, ovens <input type="checkbox"/> Using any defueling or chemical <input type="checkbox"/> Oil waste storage (any size) – (HZ Permit required if 60+gal) <input type="checkbox"/> Performs hot work <input type="checkbox"/> Contains spray booths.
9. Maintenance and government (NOT federal, state or county) corporation yards	For any facilities containing any of the following: <ul style="list-style-type: none"> <input type="checkbox"/> Has emergency or standby power systems – See Project Type #2 <input type="checkbox"/> Any hydrogen, compressed natural gas, diesel, or gasoline Fueling Stations (HZ Permits 60+ - also see Tables 1B and 1C) <input type="checkbox"/> Has any water treatment chemicals for boilers, cooling towers and swimming pools used or stored onsite (HZ Permit Required tanks 60+ gal) <input type="checkbox"/> Has any automobile or truck washing stations <input type="checkbox"/> Has any chemicals and hazardous equipment stored outside <input type="checkbox"/> Has any used batteries, used oil or chemical waste storage <input type="checkbox"/> Performs hot work.
10. Medical and Institutional <ul style="list-style-type: none"> • Doctor’s office • Dentist’s office • Surgical Centers, • Cryogenic therapies • Hospitals, • Elderly care facilities, • Other institutional care facilities 	For any of these project types that contain any of the following: <ul style="list-style-type: none"> <input type="checkbox"/> Has emergency or standby power systems – See Project Type #2 <input type="checkbox"/> Stores or uses any medical gas e.g. oxygen, nitrogen, nitrous oxide gases or cryogenic fluids –See Tables 1B and 1C for when HZ Permit required <input type="checkbox"/> Has laboratories or fume hoods <input type="checkbox"/> Has any water treatment chemicals for boilers, cooling towers and swimming pools used or stored onsite (HZ Permit required tanks 60+ gal) <input type="checkbox"/> Has any bulk laundry onsite (not coin operated) (HZ Permit required tanks 60+ gal) <input type="checkbox"/> Has bulk storage and delivery of sanitizing chemicals (HZ Permit required tanks 60+ gal) <input type="checkbox"/> Has a cafeteria, room service, bar or restaurant – See Project Type#5 <input type="checkbox"/> Has grills, fire pits, or heaters for common area patios and separate stationary fuel tank or separate storage of any portable propane tanks (HZ Permits required for any bolted down LPG system).

Table 1B: Compressed Gas Minimum Permit Quantity Criteria for HZ Construction Permit from 2016 CFC Table 105.6.9	
Class of Gas	Amount (cubic feet at NTP)
Carbon dioxide used in used in carbon dioxide enrichment systems and beverage systems	874 (100 lbs)
Corrosive	200
Flammable (except cryogenic fluids and liquified petroleum gases)	200
Highly Toxic	Any
Inert and simple asphyxiant	6000
Oxidizing (including Oxygen)	504
Pyrophoric	Any
Toxic	Any

Table 1C: Cryogenic Fluids Minimum Permit Quantity Criteria for HZ Construction Permit from 2016 CFC Table 105.6.11		
Class of Cryogenic Fluid	Inside Building Amount (gal)	Outside Building Amount (gal)
Flammable	Over 1	60
Inert	60	500
Oxidizing	10	50
Physical or Health Hazard Not indicated above	Any	Any

Table 2: Good Reminders of Some Other Projects Types Frequently Needing Hazardous Materials Architectural Review and Permits	
<ul style="list-style-type: none"> <input type="checkbox"/> Liquid propane gas <input type="checkbox"/> Gas stations <input type="checkbox"/> Plating shops <input type="checkbox"/> Recycling facilities <input type="checkbox"/> Industrial tool installations using and storing hazardous materials <input type="checkbox"/> Data Centers <input type="checkbox"/> Dry cleaning businesses installing new machines <input type="checkbox"/> Marijuana laboratories, grow and processing facilities 	<ul style="list-style-type: none"> <input type="checkbox"/> Paint booths/spray rooms <input type="checkbox"/> Chemical waste handling businesses <input type="checkbox"/> Roofing materials storage businesses <input type="checkbox"/> Fumigation businesses <input type="checkbox"/> Fire Pumps <input type="checkbox"/> Facilities Using Fume Hoods <input type="checkbox"/> Compressed gas or liquid gas systems <input type="checkbox"/> Wineries and Breweries

**Table 1D: 2016 California Mechanical Code Table 1102.2
Refrigerant Groups, Properties, And Allowable Quantities
[ASHRAE 34: Table 4-1, Table 4-2]**

Refrigerant	Chemical Formula ³	Chemical Name ¹ (Composition For Blends)	Safety Group ⁷	OEL ² (Ppm)	Pounds Per 1000 Cubic Feet of Space
R-11	CCl ₃ F	Trichlorofluoromethane	A1	C1000	0.39
R-12	CCl ₂ F ₂	Dichlorodifluoromethane	A1	1000	5.6
R-13	CClF ₃	Chlorotrifluoromethane	A1	1000	-
R-13B1	CBrF ₃	Bromotrifluoromethane	A1	1000	-
R-14	CF ₄	Tetrafluoromethane (carbon tetrafluoride)	A1	1000	25
R-21	CHCl ₂ F	Dichlorofluoromethane	B1	-	-
R-22	CHClF ₂	Chlorodifluoromethane	A1	1000	13
R-23	CHF ₃	Trifluoromethane	A1	1000	7.3
R-30	CH ₂ Cl ₂	Dichloromethane (methylene chloride)	B1	-	-
R-32	CH ₂ F ₂	Difluoromethane (methylene fluoride)	A2L	1000	4.8
R-40	CH ₃ Cl	Chloromethane (methyl chloride)	B2	-	-
R-50	CH ₄	Methane	A3	1000	-
R-113	CCl ₂ FCClF ₂	1, 1, 2-trichloro-1, 2, 2 - trifluoro ethane	A1	1000	1.2
R-114	CClF ₂ CClF ₂	1, 2-dichloro-1, 1, 2, 2 tetrafluoro ethane	A1	1000	8.7
R-115	CClF ₂ CF ₃	Chloropentafluoroethane	A1	1000	47
R-116	CF ₃ CF ₃	Hexafluoroethane	A1	1000	34
R-123	CHCl ₂ CF ₃	2, 2-dichloro-1, 1, 1, - trifluoroethane	B1	50	3.5
R-124	CHClF ₂ CF ₃	2-chloro-1, 1, 2, 2 - tetrafluoroethane	A1	1000	3.5
R-125	CHF ₂ CF ₃	Pentafluoroethane	A1	1000	23

Refrigerant	Chemical Formula ³	Chemical Name ¹ (Composition For Blends)	Safety Group ⁷	OEL ² (Ppm)	Pounds Per 1000 Cubic Feet of Space
R-134a	CH ₂ FCF ₃	1, 1, 1, 2-tetrafluoroethane	A1	1000	13
R-141b	CH ₃ CCl ₂ F	1, 1-dichloro- 1 -fluoroethane	-	500	0.78
R-142b	CH ₃ CClF ₂	1-chloro-1, 1 -difluoroethane	A2	1000	5.1
R-143a	CH ₃ CF ₃	1, 1, 1-trifluoroethane	A2L	1000	4.5
R-152a	CH ₃ CHF ₂	1, 1 -difluoroethane	A2	1000	2.0
R-170	CH ₃ CH ₃	Ethane	A3	1000	0.54
R-E170	CH ₃ OCH ₃	Methoxymethane(Dimethyl ether)	A3	1000	1.0
R-218	CF ₃ CF ₂ CF ₃	Octafluoropropane	A1	1000	43
R-227ea	CF ₃ CHF ₂ CF ₃	1, 1, 1, 2, 3, 3, 3-heptafluoropropane	A1	1000	36
R-236fa	CF ₃ CH ₂ CF ₃	1, 1, 1, 3, 3, 3-hexafluoropropane	A1	1000	21
R-245fa	CHF ₂ CH ₂ CF ₃	1, 1, 1, 3, 3-pentafluoropropane	B1	300	12
R-290	CH ₃ CH ₂ CH ₃	Propane	A3	1000	0.56
R-C318	-(CF ₂) ₄ -	Octafluorocyclobutane	A1	1000	41
R-400	Zoetrope	R-12/114 (50.0/50.0)	A1	1000	10
R-400	Zoetrope	R-12/114 (60.0/40.0)	A1	1000	11
R-401A	Zoetrope	R-22/152a/124 (53.0/13.0/34.0)	A1	1000	6.6
R-401B	Zoetrope	R-22/152a/124 (61.0/11.0/28.0)	A1	1000	7.2
R-401C	Zoetrope	R-22/152a/124 (33.0/15.0/52.0)	A1	1000	5.2
R-402A	Zoetrope	R-125/290/22 (60.0/2.0/38.0)	A1	1000	17
R-402B	Zoetrope	R-125/290/22 (38.0/2.0/60.0)	A1	1000	15
R-403A	Zoetrope	R-290/22/218 (5.0/75.0/20.0)	A2	1000	7.6
R-403B	Zoetrope	R-290/22/218 (5.0/56.0/39.0)	A1	1000	18

Refrigerant	Chemical Formula ³	Chemical Name ¹ (Composition For Blends)	Safety Group ⁷	OEL ² (Ppm)	Pounds Per 1000 Cubic Feet of Space
R-404A	Zoetrope	R-125/143a/134a (44.0/52.0/4.0)	A1	1000	31
R-405A	Zoetrope	R-22/152a/142b/C318 (45.0/7.0/5.5/42.5)	-	1000	16
R-406A	Zoetrope	R-22/600a/142b (55.0/4.0/41.0)	A2	1000	4.7
R-407A	Zoetrope	R-32/125/134a (20.0/40.0/40.0)	A1	1000	19
R-407B	Zoetrope	R-32/125/134a (10.0/70.0/20.0)	A1	1000	21
R-407C	Zoetrope	R-32/125/134a (23.0/25.0/52.0)	A1	1000	18
R-407D	Zoetrope	R-32/125/134a (15.0/15.0/70.0)	A1	1000	16
R-407E	Zoetrope	R-32/125/134a (25.0/15.0/60.0)	A1	1000	17
R-407F	Zoetrope	R-32/125/134a (30.0/30.0/40.0)	A1	1000	20
R-408A	Zoetrope	R-125/143a/22 (7.0/46.0/47.0)	A1	1000	21
R-409A	Zoetrope	R-22/124/142b (60.0/25.0/15.0)	A1	1000	7.1
R-409B	Zoetrope	R-22/124/142b (65.0/25.0/10.0)	A1	1000	7.3
R-410A	Zoetrope	R-32/125 (50.0/50.0)	A1	1000	26
R-410B	Zoetrope	R-32/125 (45.0/55.0)	A1	-	27
R-411A ⁶	Zoetrope	R-1270/22/152a (1.5/87.5/11.0)	A2	990	2.9
R-411B ⁶	Zoetrope	R-1270/22/152a (3.0/94.0/3.0)	A2	980	2.8
R-412A	Zoetrope	R-22/218/142b (70.0/5.0/25.0)	A2	1000	5.1
R-413A	Zoetrope	R-218/134a/600a (9.0/88.0/3.0)	A2	1000	5.8

Refrigerant	Chemical Formula ³	Chemical Name ¹ (Composition For Blends)	Safety Group ⁷	OEL ² (Ppm)	Pounds Per 1000 Cubic Feet of Space
R-414A	Zoetrope	R-22/124/600a/142b (51.0/28.5/4.0/16.5)	A1	1000	6.4
R-414B	Zoetrope	R-22/124/600a/142b (50.0/39.0/1.5/9.5)	A1	1000	6.0
R-415A	Zoetrope	R-22/152a (82.0/18.0)	A2	1000	2.9
R-415B	Zoetrope	R-22/152a (25.0/75.0)	A2	1000	2.1
R-416A ⁶	Zoetrope	R-134a/124/600 (59.0/39.5/1.5)	A1	1000	3.9
R-417A ⁶	Zoetrope	R-125/134a/600 (46.6/50.0/3.4)	A1	1000	3.5
R-417B	Zoetrope	R-125/134a/600 (79.0/18.3/2.7)	A1	1000	4.3
R-417C	Zoetrope	R-125/134a/600 (19.5/78.8/1.7)	A1	1000	5.4
R-418A	Zoetrope	R-290/22/152a (1.5/96.0/2.5)	A2	1000	4.8
R-419A	Zoetrope	R-125/134a/E170 (77.0/19.0/4.0)	A2	1000	4.2
R-419B	Zoetrope	R-125/134a/E170 (48.5/48.0/3.5)	A2	1000	4.6
R-420A	Zoetrope	R-134a/142b (88.0/12.0)	A1	1000	12
R-421A	Zoetrope	R-125/134a (58.0/42.0)	A1	1000	17
R-421B	Zoetrope	R-125/134a (85.0/15.0)	A1	1000	21
R-422A	Zoetrope	R-125/134a/600a (85.1/11.5/3.4)	A1	1000	18
R-422B	Zoetrope	R-125/134a/600a (55.0/42.0/3.0)	A1	1000	16
R-422C	Zoetrope	R-125/134a/600a (82.0/15.0/3.0)	A1	1000	18
R-422D	Zoetrope	R-125/134a/600a (65.1/31.5/3.4)	A1	1000	16
R-422E	Zoetrope	R-125/134a/600a (58.0/39.3/2.7)	A1	1000	16
R-423A	Zoetrope	R-134a/227ea (52.5/47.5)	A1	1000	19

Refrigerant	Chemical Formula ³	Chemical Name ¹ (Composition For Blends)	Safety Group ⁷	OEL ² (Ppm)	Pounds Per 1000 Cubic Feet of Space
R-424A ⁶	Zoetrope	R-125/134a/600a/600/601a (50.5/47.0/0.9/1/0/0.6)	A1	970	6.2
R-425A	Zoetrope	R-32/134a/227ea (18.5/69.5/12.0)	A1	1000	16
R-426A ⁶	Zoetrope	R-125/134a/600/601a (5.1/93.0/1.3/0.6)	A1	900	5.2
R427A	Zoetrope	R-32/125/143a/134a (15.0/25.0/10.0/50.0)	A1	1000	18
R428A	Zoetrope	R-125/143a/290/600a (77.5/20.0/0.6/1.9)	A1	1000	23
R429A	Zoetrope	R-E170/152a/600a (60.0/10.0/30.0)	A3	1000	0.81
R430A	Zoetrope	R-152a/600a (76.0/24.0)	A3	1000	1.3
R431A	Zoetrope	R-290/152a (71.0/29.0)	A3	1000	0.69
R432A	Zoetrope	R-1270/E170 (80.0/20.0)	A3	700	0.13
R433A	Zoetrope	R-1270/290 (30.0/70.0)	A3	880	0.34
R433B	Zoetrope	R-1270/290 (5.0/95.0)	A3	950	0.54
R433C	Zoetrope	R-1270/290 (25.0/75.0)	A3	790	0.41
R434A	Zoetrope	R-125/141a/134a/600a (63.2/18.0/16.0/2.8)	A1	1000	20
R435A	Zoetrope	R-E170/152a (80.0/20.0)	A3	1000	1.1
R436A	Zoetrope	R-290/600a (56.0/44.0)	A3	1000	0.50
R436B	Zoetrope	R-290/600a (52.0/48.0)	A3	1000	0.51
R-437A	Zoetrope	R-125/134a/600/601 (19.5/78.5/1.4/0.6)	A1	990	5.0
R-438A	Zoetrope	R-32/125/134a/600/601a (8.5/45.0/44.2/1.7/0.6)	A1	990	4.9
R-439A	Zoetrope	R-32/125/600a (50.0/47.0/3.0)	A2	990	4.7
R-440A	Zoetrope	R-290/134a/152a (0.6/1.6/97.8)	A2	1000	1.9
R-441A	Zoetrope	R-170/290/600a/600 (3.1/54.8/6.0/36.1)	A3	1000	0.39

Refrigerant	Chemical Formula ³	Chemical Name ¹ (Composition For Blends)	Safety Group ⁷	OEL ² (Ppm)	Pounds Per 1000 Cubic Feet of Space
R-442A	Zoetrope	R-32/125/134a/152a/227ea (31.0/31.0/30.0/3.0/5.0)	A1	1000	21
R-443A	Zoetrope	R-1270/290/600a (55.0/40.0/5.0)	A3	580	0.19
R-444A	Zoetrope	R-32/152a/1234ze(E) (12.0/5.0/83.0)	A2L	850	5.1
R-445A	Zoetrope	R-744/134a/1234ze(E) (6.0/9.0/85.0)	A2L	930	4.2
R-446A	Zoetrope	R-32/1234ze(E)/600 (68.0/29.0/3.0)	A2L	960	2.5
R-447A	Zoetrope	R-32/125/1234ze(E) (68.0/3.5/28.5)	A2L	900	2.6
R-500	Zoetrope	R-12/152a (73.8/26.2) ⁴	A1	1000	7.6
R-501	Zoetrope	R-22/12 (75.0/25.0)	A1	1000	13
R-502	Zoetrope	R-22/115 (48.8/51.2)	A1	1000	21
R-503	Zoetrope	R-23/13 (40.1/59.9)	-	1000	-
R-504	Zoetrope	R-32/115 (48.2/51.8.)	-	1000	28
R-507A ⁵	Zoetrope	R-125/143a (50.0/50.0)	A1	1000	32
R-508A ⁵	Zoetrope	R-23/116 (39.0/61.0)	A1	1000	14
R-508B	Zoetrope	R-23/116 (46.0/54.0)	A1	1000	13
R-509A ⁵	Zoetrope	R-22/218 (44.0/56.0)	A1	1000	24
R-510A	Zoetrope	R-E170/600a (88.0/12.0)	A3	1000	0.87
R-511A	Zoetrope	R-290/E170 (95.0/5.0)	A3	1000	0.59
R-512A	Zoetrope	R-134a/152a (5.0/95.0)	A2	1000	1.9
R-600	CH ₃ CH ₂ CH ₂ CH ₃	Butane	A3	1000	0.15
R-600a	CH(CH ₃) ₂ CH ₃	2-methylpropane (isobutane)	A3	1000	0.59
R-601	CH ₃ CH ₂ CH ₂ CH ₂ CH ₃	Pentane	A3	600	0.18
R-601a	(CH ₃) ₂ CHCH ₂ CH ₃	2-methylbutane (isopentane)	A3	600	0.18
R-610	CH ₃ CH ₂ OCH ₂ CH ₃	Ethoxyethane (ethyl ether)	-	400	-

Refrigerant	Chemical Formula ³	Chemical Name ¹ (Composition For Blends)	Safety Group ⁷	OEL ² (Ppm)	Pounds Per 1000 Cubic Feet of Space
R-611	HCOOCH ₃	Methyl formate	B2	100	-
R-702	H ₂	Hydrogen	A3	-	-
R-704	He	Helium	A1	-	-
R-717	NH ₃	Ammonia	B2L	25	0.014
R-718	H ₂ O	Water	A1	-	-
R-720	Ne	Neon	A1	-	-
R-728	N ₂	Nitrogen	A1	-	-
R-740	Ar	Argon	A1	-	-
R-744	CO ₂	Carbon dioxide	A1	5000	4.5
R-764	SO ₂	Sulfur dioxide	B1	-	-
R-1150	CH ₂ =CH ₂	Ethene (ethylene)	A3	200	-
R-1233zd(E)	CF ₃ CH=CHCl	Trans- 1 -chloro- 3, 3, 3- trifluoro- 1 - propane	A1	800	5.3
R-1234yf	CF ₃ CF=CH ₂	2, 3, 3, 3-tetrafluoro- 1 - propane	A2L	500	4.7
R-1234ze(E)	CF ₃ CH=CHF	Trans-1, 3, 3, 3- tetrafluoro- 1- propene	A2L	800	4.7
R-1270	CH ₃ CH=CH ₂	Propene (propylene)	A3	500	0.11

For SI units: 1 pound = 0.453 kg, 1 cubic foot = 0.0283 m³

Notes:

- ¹ The preferred name is followed by the popular name in parenthesis.
- ² The OEL are 8-hour TWA; a C designation denotes a ceiling limit.
- ³ Azeotropic refrigerants exhibit some segregation of components at conditions of temperature and pressure other than those at which they were formulated. The extent of segregation depends on the particular azeotrope and hardware system configuration.
- ⁴ The exact composition of this azeotrope is in question and additional experimental studies are needed.
- ⁵ R-507, R-508, and R-509 shall be permitted as alternative designations for R-507A, R-508A, and R-509A due to a change in designations after assignment of R-500 through R-509. Corresponding changes were not made for R-500 through R-506.
- ⁶ The amount of refrigerant per occupied space values for these refrigerant blends are approximated in the absence of adequate data for a component comprising less than 4 percent m/m of the blend and expected to have a small influence in an acute, accidental release.
- ⁷ Refrigerant flammability classification of Class 2L shall comply with the requirements for flammability classification or Class 2.