



Operational Permit Application

Refrigeration Equipment



www.cityofvancouver.us/departments/fire-department

International Fire Code as adopted by VMC 16.04 (Washington State Fire Code)

Permitting Requirements

Refrigeration equipment consists of components that are part of a repeatable cycle in a mechanical refrigerant system. This type of cooling system uses refrigerants to absorb and remove heat from a designated area, thereby lowering its temperature. These systems are commonly used in air conditioning, refrigeration, and some industrial processes. The typical components usually include compressors, condensers, expansion valves, and evaporators. This FRI permit is required to ensure fire code compliance and is in addition to a CMI permit.

An **operational permit** is required to operate a mechanical refrigeration unit or system regulated by WSFC 105.5.44

Project Information

Site Address		Owner Name	
Other			

Applicant Information

Company Name		Address		
Contact Name				
Office Phone		Cellular		Email

Contractor

Company Name		Address		
Contact Name				
Office Phone		Cellular		Email
Related Permits:	CMI _____	FRI _____	DEF _____	MPE _____

Refrigeration

Equipment:	<input type="checkbox"/> Level 1: Min 220 lbs. Group A1; 30 lbs. other refrigerant not level 2 or 3 <input type="checkbox"/> Level 2: Refrigerant machinery room <input type="checkbox"/> Level 3: Equipped with treatment/flaring/ammonia diffusion system
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Description of Work

Electronic Plan Standards

File Naming Standards:

Electronic plans and documents shall be named as specified in the City of Vancouver [ePLANS](https://www.cityofvancouver.us/business/permits-licenses-and-inspections/eplans/) system:
<https://www.cityofvancouver.us/business/permits-licenses-and-inspections/eplans/>



Acceptable File Types:

Plans, calculations, specifications and supporting documents shall be uploaded as a PDF file.

Plan Sheet Standards:

All plans shall be drawn to scale, as identified in the checklist, and each sheet shall state the scale and show a measurable scale on the page for measurement calibrations.

Document Orientation:

All plans must be uploaded in "Landscape" format in the horizontal position with a north indicator. All other documents can be in "Portrait" format.

Stamped:

Where documentation contains a code analysis or engineering calculations, such documents shall be stamped by the design professional.

Minimum Submittal Checklist for Upload to ePLANS

- Completed Fire Installation Permit Application – Refrigeration Equipment (this document) Check all *Permit Conditions* checkboxes that are applicable to your project
- Completed Materials Management Plan (HMMP) documents and supplemental documents (*See Document Details* below)
- Site plans and floor plans (*see Plan Details* below)

Document Details

HMMP Guide: <https://www.cityofvancouver.us/wp-content/uploads/2023/10/Hazardous-Materials-Management-Plan.pdf>
See Vancouver Fire Department HMMP Guide for direction on completing required HMMP and/or supplemental forms

- Completed Facility Information Forms, Hazardous Materials Inventory Statement (HMIS), Site Map, and Storage Plan (see HMMP Guide linked above for direction on these forms)
- Manufacturers cut sheets for all equipment
- Listings of all refrigerants in use

Plan Details

The following is a list of information required on all plan submittals for review of a refrigeration equipment permit. The plan shall be drawn to 1/8" = 1'-0" minimum scale. The applicant is required to submit all applicable information so an accurate and timely review may be completed:

General:

- Site plan to include a north arrow, a measurable scale for calibration purposes, fire hydrants, emergency access lanes and doors, vehicle gates, fire department connection, facility evacuation meeting point locations, sprinkler riser(s), standpipes, fire alarm control panel, Knox Box, and roof access (if provided).
- Identify all locations of each refrigerant in circuit of the refrigerant system.
- Mechanical drawings of the ventilation system showing discharge of refrigerants into the atmosphere with required separation requirements.

- Identification of all electrical equipment and appliances conforming to Class 1, Division 2 hazardous location classification requirements to be in conjunction with the refrigeration system.
- Identify all refrigerant-containing parts in systems exceeding 100 horsepower (hp), except evaporators used for refrigeration or dehumidification; condensers used for heating; control and pressure relief valves for either, low-probability pumps and connecting piping, are located either outdoors or in a machinery room.
- Detailed plans showing 1-hr fire barrier construction (if non-sprinklered building) of refrigerant machinery rooms as well as showing that rooms larger than 1,000 square feet are equipped with not less than two exits or exit access doorways.
- Areas of open flames and sparks, hot surfaces, or other ignition sources.
- A clearly identified switch of the break-glass type or with an approved tamper-resistant cover shall provide off-only control of refrigerant compressors, refrigerant pumps and normally closed automatic refrigerant valves located in the machinery room.
- Show where all each high- and intermediate-pressure zone in the refrigerant system is provided with a single automatic valve that provides cross-over connection to a low-pressure zone.
- Distinguish where each refrigerant system(s) is equipped with a treatment system, ammonia diffusion system, or flaring system.

Permit Conditions

The following is a list of WSFC Chapter 6 requirements related to refrigeration equipment operations. Use this form to confirm that all applicable requirements are met. Non-applicable requirements can be left blank.

General:

- Refrigeration systems shall be installed in accordance with the International Mechanical Code (IMC) (WSFC 608.1).
 - Other Than Ammonia: Where a refrigerant other than ammonia is used, refrigeration systems and the buildings in which such systems are installed shall be in accordance with ASHRAE 15 (WSFC 608.1.1).
 - Ammonia Refrigeration: Refrigeration systems using ammonia refrigerant and the buildings in which such systems are installed shall comply with IIAR 2 for system design; IIAR 6 for inspection, testing and maintenance; and IIAR 7 for operating procedures (WSFC 608.1.2).
- The use and purity of new, recovered, and reclaimed refrigerants shall be in accordance with the IMC (WSFC 608.3)
- Refrigerants shall be classified in accordance with the IMC (WSFC 608.4).
- A change in the type of refrigerant in a refrigeration system shall be in accordance with the IMC (WSFC 608.5)
- Access to refrigeration systems having a refrigerant circuit containing more than 220 pounds of Group A1 or 30 pounds of any other group refrigerant shall be provided for the fire department at all times (WSFC 608.6).
- Refrigeration units or systems having a refrigerant circuit containing more than 220 pounds of Group A1 or 30 pounds of any other group refrigerant shall be provided with approved emergency signs, charts, and labels in accordance with NFPA 704. Hazard signs shall be in accordance with the IMC for the classification of refrigerants listed therein(WSFC 608.8).
- Flammable and combustible materials shall not be stored in machinery rooms for refrigeration systems having a refrigerant circuit containing more than 220 pounds of Group A1 or 30 pounds of any other group refrigerant. Storage, use or handling of extra refrigerant or refrigerant oils shall be as required by Chapters 50, 53, 55 and 57 (WSFC 608.12).

Exception: This provision shall not apply to spare parts, tools, and incidental materials necessary for the safe and proper operation and maintenance of the system.
- Exhaust from mechanical ventilation systems serving refrigeration machinery rooms containing flammable, toxic, or highly toxic refrigerants, other than ammonia, capable of exceeding 25 percent of the LFL or 50 percent of the IDLH shall be equipped with approved treatment systems to reduce the discharge concentrations to those values or lower.

Exception: Refrigeration systems containing Group A2L complying with Section 608.18 (WSFC 608.14).
- The fire code official shall be notified immediately when a discharge becomes reportable under state, federal or local regulations in accordance with WSFC 5003.3.1 (WSFC 608.15).
- A record of refrigerant quantities brought into and removed from the premises shall be maintained (WSFC 608.16).

- Where refrigerant of Groups A2, A3, B2 and B3, as defined in the International Mechanical Code, are used, refrigeration machinery rooms shall conform to the Class I, Division 2, hazardous location classification requirements of NFPA 70 (WSFC 608.17).

Exceptions:

1. Ammonia machinery rooms that are provided with ventilation in accordance with Section 1101.1.2, Exception 1 of the IMC.
2. Machinery rooms for systems containing Group A2L refrigerants that are provided with ventilation in accordance with Section 608.18.

Testing of Equipment:

- Refrigeration equipment and systems having a refrigerant circuit containing more than 220 pounds of Group A1 or 30 pounds of any other group refrigerant shall be subject to periodic testing in accordance with the following. Records of tests shall be maintained. Tests of emergency devices or systems required by this chapter shall be conducted by persons trained and qualified in refrigeration systems (WSFC 608.7).
 - Periodic Testing: The following emergency devices or systems shall be periodically tested in accordance with the manufacturer's instructions and as required by the fire code official (WSFC 608.7.1).
 1. Treatment and flaring systems.
 2. Valves and appurtenances necessary to the operation of emergency refrigeration control boxes.
 3. Fans and associated equipment intended to operate emergency ventilation systems.
 4. Detection and alarm systems.

Refrigerant Detection:

- Machinery rooms shall be provided with a refrigerant detector with an audible and visible alarm. Where ammonia is used as the refrigerant, detection shall comply with IIAR 2. For refrigerants other than ammonia, refrigerant detection shall comply with the following (WSFC 608.9):
 - A detector, or a sampling tube that draws air to a detector, shall be provided at an approved location where refrigerant from a leak is expected to accumulate. The system shall be designed to initiate audible and visible alarms inside of and outside each entrance to the refrigerating machinery room and transmit a signal to an approved location where the concentration of refrigerant detected exceeds the lesser of the following (WSFC 608.9.1):
 1. The corresponding TLV-TWA values shown in the IMC for the refrigerant classification.
 2. Twenty-five percent of the lower flammable limit (LFL).

Detection of a refrigerant concentration exceeding the upper detection limit or 25 percent of the lower flammable limit (LFL), whichever is lower, shall stop refrigerant equipment in the machinery room in accordance with WSFC 608.10.1.

Remote Controls:

- Where flammable refrigerants are used and compliance with Section 1106 of the IMC is required, remote control of the mechanical equipment and appliances located in the machinery room as required by the following shall be provided at an approved location immediately outside the machinery room and adjacent to its principal entrance (WSFC 608.10).
 - Emergency Shutoff: A clearly identified switch of the break-glass type or with an approved tamper-resistant cover shall provide off-only control of refrigerant compressors, refrigerant pumps and normally closed automatic refrigerant valves located in the machinery room. Additionally, this equipment shall be automatically shut off when the refrigerant vapor concentration in the machinery room exceeds the vapor detector's upper detection limit or 25 percent of the LEL, whichever is lower (WSFC 608.10.1).
 - Ventilation System: A clearly identified switch of the break-glass type or with an approved tamper-resistant cover shall provide on-only control of the machinery room ventilation fans (WSFC 608.10.2).

Emergency Pressure Control System:

- Permanently installed refrigeration systems in machinery rooms containing more than 6.6 pounds of flammable, toxic or highly toxic refrigerant or ammonia shall be provided with an emergency pressure control system in accordance with the following (WSFC 608.11):
 - Automatic Crossover Valves: Each high- and intermediate-pressure zone in a refrigeration system shall be provided with a single automatic valve providing a crossover connection to a lower pressure zone. Automatic crossover valves shall comply with the following (WSFC 608.11.1):
 1. Automatic crossover valves shall be arranged to automatically relieve excess system pressure to a lower pressure zone if the pressure in a high- or intermediate-pressure zone rises to within 90 percent of the set point for emergency pressure relief devices.
 2. Where required by the fire code official, automatic crossover valves shall be capable of manual operation.
 3. Refrigeration system zones that are connected to a higher-pressure zone by an automatic crossover valve shall be designed to safely contain the maximum pressure that can be achieved by interconnection of the two zones.
 - Automatic emergency Stop: An automatic emergency stop feature shall be provided in accordance with the following (WSFC 608.11.2):
 1. Operation of an automatic crossover valve shall cause all compressors on the affected system to immediately stop. Dedicated pressure-sensing devices located immediately adjacent to crossover valves shall be permitted as a means for determining operation of a valve. To ensure that the automatic crossover valve system provides a redundant means of stopping compressors in an overpressure condition, high-pressure cutout sensors associated with compressors shall not be used as a basis for determining operation of a crossover valve.
 2. The lowest pressure zone in a refrigeration system shall be provided with a dedicated means of determining a rise in system pressure to within 90 percent of the set point for emergency pressure relief devices. Activation of the overpressure sensing device shall cause all compressors on the affected system to immediately stop.

Discharge/Termination of Pressure Relief and Purge Systems:

- Pressure relief devices, fusible plugs and purge systems discharging to the atmosphere from refrigeration systems containing flammable, toxic, or highly toxic refrigerants or ammonia shall comply with the following (WSFC 608.13):
 - Fusible Plugs and Rupture Members: Discharge piping and devices connected to the discharge side of a fusible plug or rupture member shall have provisions to prevent plugging the pipe in the event the fusible plug or rupture member functions (WSFC 608.13.1).
 - Flammable Refrigerants: Systems containing more than 6.6 pounds of flammable refrigerants having a density equal to or greater than the density of air shall discharge vapor to the atmosphere only through an approved treatment system in accordance with WSFC 608.13.5 or a flaring system in accordance with WSFC 608.13.6. Systems containing more than 6.6 pounds of flammable refrigerants having a density less than the density of air shall be permitted to discharge vapor to the atmosphere provided that the point of discharge is located outside of the structure at not less than 15 feet above the adjoining grade level and not less than 20 feet from any window, ventilation opening or exit (WSFC 608.13.2).
 - Toxic Refrigerants: Systems containing more than 6.6 pounds of toxic or highly toxic refrigerants shall discharge vapor to the atmosphere only through an approved treatment system in accordance with WSFC 608.13.5 or a flaring system in accordance with WSFC 608.13.6 (WSFC 608.13.3).
 - Ammonia Refrigerant: Systems containing more than 6.6 pounds of ammonia refrigerant shall discharge vapor to the atmosphere in accordance with one of the following methods (WSFC 608.13.4):
 1. Directly to atmosphere where the fire code official determines, on review of an analysis prepared in accordance with WSFC 104.8.2, that a health hazard would not result from atmospheric discharge of ammonia.
 2. Through an approved treatment system in accordance with WSFC 608.13.5.
 3. Through a flaring system in accordance with WSFC 608.13.6.
 4. Through an approved ammonia diffusion system in accordance with WSFC 608.13.7.
 5. By other approved means.

Exception: Ammonia/water absorption systems containing less than 22 pounds of ammonia and for which the ammonia circuit is located entirely outdoors.

- Treatment Systems: Treatment systems shall be designed to reduce the allowable discharge concentration of the refrigerant gas to not more than 50 percent of the IDLH at the point of exhaust. Treatment systems shall be in accordance with WSFC Chapter 60. (WSFC 608.13.5)
- Flaring Systems: Flaring systems for incineration of flammable refrigerants shall be designed to incinerate the entire discharge. The products of refrigerant incineration shall not pose health or environmental hazards. Incineration shall be automatic upon initiation of discharge, shall be designed to prevent blowback and shall not expose structures or materials to threat of fire. Standby fuel, such as LP-gas, and standby power shall have the capacity to operate for one and one-half the required time for complete incineration of refrigerant in the system. Standby electrical power, where required to complete the incineration process, shall be in accordance with WSFC 1203 (WSFC 608.13.6).
- Ammonia Diffusion Systems: Ammonia diffusion systems shall include a tank containing 1 gallon of water for each pound of ammonia that will be released in 1 hour from the largest relief device connected to the discharge pipe. The water shall be prevented from freezing. The discharge pipe from the pressure relief device shall distribute ammonia in the bottom of the tank, but not lower than 33 feet below the maximum liquid level. The tank shall contain the volume of water and ammonia without overflowing (WSFC 608.13.7).

Group A2L Refrigerant Machinery Rooms:

- Machinery rooms with systems containing Group A2L refrigerants that do not comply with the Class I, Division 2, hazardous location electrical requirements of NFPA 70, as permitted by Section 608.17, Exception 2, shall comply with the following (WSFC 608.18):
 - Ventilation shall be activated by the refrigerant detection system in the machinery room. Refrigerant detection shall be in accordance with WSFC 608.9 and all of the following (WSFC 608.18. 1):
 1. The detectors shall activate at or below a refrigerant concentration of 25 percent of the LFL.
 2. Upon activation, the detection system shall activate the emergency ventilation system in Section 608.18.2.
 3. The detection, signaling and control circuits shall be supervised.
 - An emergency ventilation system shall be provided at the minimum exhaust rate specified in ASHRAE 15 or the following table (see right). Shut down of the emergency ventilation system shall be by manual means (WSFC 608.18.2).
 - The point of discharge to the atmosphere shall be located outside of the structure at not less than 15 feet above the adjoining grade level and not less than 20 feet from any window, ventilation opening or exit (WSFC 608.18.3).

**[M] TABLE 608.18.2
MINIMUM EXHAUST RATE**

REFRIGERANT	Q (m ³ /sec)	Q (cfm)
R32	15.4	32,600
R143a	13.6	28,700
R444A	6.46	13,700
R444B	10.6	22,400
R445A	7.83	16,600
R446A	23.9	50,700
R447A	23.8	50,400
R451A	7.04	15,000
R451B	7.05	15,000
R1234yf	7.80	16,600
R1234ze(E)	5.92	12,600

NOTE: This is not intended to be an all-inclusive list. The WSFC requirements listed are intended to ensure that we have adequate information to begin a review of the application. Additional information may be required.

I understand that all applicable codes apply and that other regulatory codes may also apply. Errors and/or omissions on the plans and corrections from field inspections are the responsibility of the owner/contractor. All work is subject to compliance with City of Vancouver ordinances and laws of the State of Washington.

APPLICANT NAME: _____ APPLICATION DATE: _____

APPLICANT SIGNATURE: _____