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**Refrigerating systems and heat  
pumps — Safety and environmental  
requirements —**

**Part 3:  
Installation site**

**iTeh STANDARD PREVIEW**  
*Systemes frigorifiques et pompes à chaleur — Exigences de sécurité et  
d'environnement —  
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Partie 3: Site d'installation*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 86, *Refrigeration and air-conditioning*, Subcommittee SC 1, *Safety and environmental requirements for refrigerating systems*.

ISO 5149-3, together with ISO 5149-1, ISO 5149-2, and ISO 5149-4, cancels and replaces ISO 5149:1993, which has been technically revised.

ISO 5149 consists of the following parts, under the general title *Refrigerating systems and heat pumps — Safety and environmental requirements*:

- *Part 1: Definitions, classification and selection criteria*
- *Part 2: Design, construction, testing, marking and documentation*
- *Part 3: Installation site*
- *Part 4: Operation, maintenance, repair and recovery*

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# Refrigerating systems and heat pumps — Safety and environmental requirements —

## Part 3: Installation site

### 1 Scope

This part of ISO 5149 is applicable to the installation site (plant space and services). It specifies requirements for the site for safety, which could be needed because of, but not directly connected with, the refrigerating system and its ancillary components.

This part of ISO 5149 is applicable to new refrigerating systems, extensions or modifications of existing systems, and for used systems being transferred to and operated on another site. This part of ISO 5149 also applies in the case of the conversion of a system for another refrigerant.

### 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5149-1:2014, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 1: Definitions, classification and selection criteria*

ISO 5149-2:2014, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 2: Design, construction, testing, marking and documentation*

ISO 13850, *Safety of machinery — Emergency stop — Principles for design*

IEC 60204-1, *Safety of machinery — Electrical equipment of machines — General requirements*

IEC 60364-1, *Low-voltage electrical installations — Part 1: Fundamental principles, assessment of general characteristics, definitions*

IEC 60364-5, *Electrical installations of buildings — Part 5: Selection and erection of electrical equipment*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5149-1 apply.

### 4 Location of refrigerating equipment

#### 4.1 General

Refrigerating equipment can be sited outside the building in the open air, in a designated machinery room, in occupied areas, or in unoccupied areas not designated as a machinery room.

The refrigerating equipment can be contained in a ventilated enclosure provided by the manufacturer. Requirements for this enclosure are given in ISO 5149-2:2014, 5.2.17.

## 4.2 Refrigerating equipment located in the open air

Refrigerating systems sited in the open air shall be positioned to avoid refrigerant leaking into the building or endangering people. If sited on the roof, the refrigerant shall not be able to flow across the roof into any ventilation fresh air opening, doorway, trap door, or similar opening in the event of a leak. Where a shelter is provided for refrigerating equipment sited in the open air, it shall have natural or forced ventilation.

A room where at least one of the longer walls is open to the outside air by means of louvres with 75 % free area and covering at least 80 % of the wall area (or the equivalent if more than one wall is to outside) is considered as being in the open air.

## 4.3 Refrigerating equipment located in a machinery room

When a machinery room is chosen as the location of the refrigerating equipment, it shall meet the requirements specified in 5.1 to 5.14. Where the charge of a refrigerant is above the practical limits specified in ISO 5149-1, the refrigerating system shall be located in a special machinery room unless the ignition sources in the machinery room meet the requirements of 5.3, 5.4, and 5.14.4.

NOTE 1 Additional requirements could be needed for refrigerating systems containing R-717 or other B2L, B2, B3, A2L, A2, and A3 refrigerants as specified in 5.12.

NOTE 2 Where housing around refrigerating equipment is sufficiently large for people to enter, the housing is considered as a machinery room and requirements for such rooms apply.

## 4.4 Refrigerating equipment located in the occupied space

The requirements shall be as specified in ISO 5149-1:2014, Annex A.

## 4.5 Refrigerating equipment located in unoccupied areas not designated a machinery room

If this area is sealed from any occupied area, the requirements shall be as those for a machinery room. If the area cannot be sealed from any occupied space, then the refrigerating machinery shall be considered as located in a human-occupied space and requirements for such spaces shall apply.

## 4.6 Refrigerating equipment located in a ventilated enclosure within an occupied space

The ventilated enclosure containing the refrigerating system shall have a ventilation duct as specified by the manufacturer. The duct shall be no greater in length and have no more bends than the maximum number specified by the manufacturer. The room into which the ventilated enclosure is installed shall be at least 10 times the volume of the enclosure and shall have sufficient make up air to replace any exhausted air. The ventilation from the enclosure shall be to outside air or to a room having a minimum volume specified in ISO 5149-1:2014, 5.2.17 for an occupied space.

## 4.7 Piping duct or shaft

Where hand-operated shut-off devices are mounted in a piping duct or shaft designed for human entry, the duct or shaft shall have more than one escape exit. The duct shall have at least 1,2 m of ceiling height.

# 5 Machinery rooms

## 5.1 Occupancy of machinery rooms and special machinery rooms

Machinery rooms should not be used as occupied spaces. The building owner or user shall ensure that access is permitted only by instructed personnel doing the necessary maintenance to the machinery room or general plant. If machinery rooms are occupied for significant periods, e.g. used as a building

maintenance workspace, they shall be considered as occupied spaces under occupancy category c, "Authorized Occupancy" given in ISO 5149-1.

A special machinery room shall not be used as an occupied space.

In accordance with ISO 5149-4, when occupied for maintenance or repair, a duly authorized person, familiar with the use of the emergency protective equipment and emergency procedures, should be available near to the machinery room during such occupation in case of an emergency.

## 5.2 Venting from or through the machinery room

Refrigerant shall be prevented from entering neighbouring rooms, staircases, courts, gangways, or building draining systems. The escaping gas shall be vented outdoors.

There shall be no airflow to an occupied space through a machinery room unless the air is ducted and sealed to prevent any refrigerant leakage from entering the air stream.

## 5.3 Combustion equipment and air compressors

Where a piece of combustion equipment is located in a machinery room containing refrigerating equipment, the combustion air supply for combustion engines, boilers, or the supply air for air compressors shall be drawn from a place where there is no refrigerant gas. If such a piece of equipment is installed in a machinery room, the combustion air for combustion engines or the supply air for air compressors shall be ducted from outside in such a manner as to prevent any refrigerant leakage from entering the combustion chamber.

## 5.4 Open flame

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Open (naked) flames shall not be permitted in machinery rooms or special machinery rooms, except for welding, brazing, or similar activity and then provided that the refrigerant concentration is monitored and adequate ventilation is ensured. Such open flames shall not be left unattended.

NOTE When the refrigerant in the refrigerating machinery is R-744, the use of an open flame can be permitted.

The ventilation rate for welding and brazing shall be adequate, considering the combustion (products of combustion) of any refrigerant contained in the room.

## 5.5 Storage

Machinery rooms shall not be used for storage with the exception of tools, spare parts, and compressor oil for the installed equipment. Any refrigerants and flammable or toxic materials shall be stored as required by national regulations.

## 5.6 Remote emergency switch

A remote switch for stopping the refrigerating system shall be provided outside the room, near the machinery room. A similar-acting switch shall be located at a suitable location inside the room. The switches shall meet the requirements for emergency switches in accordance with ISO 13850 and IEC 60204-1.

## 5.7 Exterior openings of the machinery room

Exterior openings shall not be situated within 2 m of building emergency exit staircases or other building openings, e.g. windows, doors, ventilation inlets, etc.

## 5.8 Piping and ducting

All piping and ventilation ducting that passes through walls, ceiling, and floors of machinery rooms shall be sealed where it passes through the walls, ceiling, or floors. The sealing shall have at least equivalent fire-resisting properties to the walls, ceiling, or floor.

NOTE 1 Discharge pipes from relief devices, safety valves, and fusible plugs can diffuse the charge into the air by adequate means but away from any air intake to the building or discharge into an adequate quantity of a suitable absorbing material.

Relief devices for refrigerants in group A1 can discharge into the machinery room provided the system charge is less than the limits set in Annex A of ISO 5149-1:2014. Such discharges of refrigerant should take place so that persons and property are not endangered.

## 5.9 Normal lighting

Fixed lighting shall be selected and positioned in spaces containing refrigerating equipment to provide adequate illumination for safe operation. The illumination level and location shall be as required by national regulations. Filament light bulbs shall be protected by "splash-safe" covers (IP X4) in machinery rooms containing R-717 refrigerating systems.

## 5.10 Emergency lighting

A fixed or portable emergency lighting system shall be provided, adequate to allow operation of controls and evacuation of personnel, when normal lighting fails.

## 5.11 Dimensions and accessibility (standards.iteh.ai)

The dimensions of the machinery room shall allow easy installation and sufficient room for service, maintenance, operation, repair, and disassembly of the refrigerating equipment, including sufficient space for persons wearing personal protection equipment.

If necessary, catwalks and fixed ladders shall be provided in order to avoid standing or walking on piping, fittings, their supports and supporting structures, and components during the operation, maintenance, inspection, and repair of the refrigerating system.

There shall be clear headroom of at least 2 m below equipment situated over gangways and permanent workplaces.

NOTE Headroom is defined as 2 m above the walking surface.

## 5.12 Doors, walls, and ducts

### 5.12.1 Doors and openings

Machinery rooms shall have doors opening outward and sufficient in number to ensure persons can escape in an emergency.

The doors shall be tight-fitting, self-closing, and so designed that they can be opened from inside (anti-panic system).

The doors shall have at least 1 h fire-resistive construction, using materials and construction tested in accordance with national regulations. There shall be no openings that permit unintended passage of escaping refrigerant, vapours, odours, and all other gases to other parts of the building.

### 5.12.2 Emergency

Provision shall be made to facilitate immediate exit from the machinery room in the event of an emergency.

At least one emergency exit shall open directly to the open air or it shall lead to an emergency exit passageway.

### 5.12.3 Walls, floor, and ceiling

Walls, floor, and ceiling between the inside of the building and of the machinery room shall have at least a 1 h fire-resistive construction and be tightly sealed. They shall be of materials and construction that are in accordance with national regulations.

### 5.12.4 Service ducts

Service ducts shall conform to the requirements of national regulations and they shall be sealed to minimize escaped refrigerant leakage into the service duct and have the same fire resistance as walls and doors. Service ducts, including walkways and crawl spaces containing piping for flammable or toxic refrigerants, shall be vented to a safe place to prevent a dangerous accumulation (i.e. exceeds the limits of ISO 5149-1:2014, A.1) of vapour in the event of a leak.

Service ducts shall not be used for ventilation or conditioned air.

### 5.12.5 Emergency ventilation ducts

Sheet metal for normal and emergency ventilation ducts shall be in accordance with national standards and supported as required. After erection, all duct seams and joints shall be sealed to minimize gas leakage from the duct. The ventilation duct shall have the same fire resistance as the doors and walls of the machinery room.

## 5.13 Ventilation

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### 5.13.1 General

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The ventilation of machinery rooms shall be sufficient both for normal operating conditions and emergencies.

Air from machinery rooms shall be vented outdoors using mechanical ventilation in case of a release of refrigerant due to leaks or rupture of components. This ventilation system shall be independent of any other ventilation system on the site.

Provision shall be made for a sufficient supply of outside replacement air and a good distribution of that air over the machinery room avoiding dead zones.

Openings for outside air shall be positioned to avoid re-circulation into the room.

### 5.13.2 Ventilation for normal operating conditions or when machinery room is occupied

Ventilation shall be in accordance with national regulations with a minimum of four air changes per hour when the machinery room is occupied.

### 5.13.3 Emergency mechanical ventilation

If gas detection is required in the machinery room, the emergency mechanical ventilation system shall be activated by a detector(s) located in the machinery room. The detector(s) shall be as specified in [Clause 9](#).

Emergency mechanical ventilation shall also be provided with two independent emergency controls, one located outside the machinery room and the other inside.

In case the necessary ventilation rate cannot be achieved, an audible and/or visual alarm shall be initiated and, where relevant, electrical supplies shall also be terminated.