

SECONDARY COOLANT SYSTEMS

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The following directive is being issued by a provincial safety manager pursuant to section 30 of the Safety Standards Act (the Act) to clarify the application of secondary coolant overpressure protection, testing, and maintenance requirements.

Definitions

Refrigeration System: means a refrigeration plant;

Refrigeration Equipment: means machinery in which refrigerants are capable of being vaporized, compressed, and liquified;

Refrigeration Plant: means an assembly of refrigeration equipment and includes a pressure plant connected to it;

Secondary Coolant: any liquid or slurry used for the transmission of heat without a change of state to vapour.

General Details

Refrigeration systems and equipment are subject to the requirements of the Power Engineers, Boiler, Pressure Vessel and Refrigeration Safety Regulation (the regulation) unless specifically exempt from the application of the regulation under section [3\(2\)\(f\)](#), [3\(2\)\(i\)](#), or [3\(2\)\(r\)](#).

The CSA B52, which is adopted under the regulation, sets out the minimum requirements for design, maintenance, and operation of the secondary coolant side of indirect refrigeration systems in clauses 5.13 and 8.4.2.(j) and (i). Prior to the introduction of these requirements into the 2023 edition of the CSA B52, Technical Safety BC addressed requirements for secondary coolant systems through safety order SO-BP-2021-01. With the introduction of requirements directly into the CSA B52:23, this safety order has been rescinded and replaced with the following directive.

This directive clarifies the application of overpressure protection requirements, and testing and maintenance requirements for secondary coolant systems.

Specific Details

Overpressure Protection of Secondary Coolant Systems

In accordance with clause 5.13 of the CSA B52, the secondary coolant side of all indirect refrigeration systems, as well as the fluid-cooled condensers, shall be designed to address how the secondary coolant system can safely withstand the effects of a refrigerant leak, including, but not limited to over-pressurization.

The following are risk mitigation options listed within the CSA B52 clause 5.13 for consideration as applicable:

- a) The non-refrigerant secondary coolant system is designed for a system pressure that includes a potential pressure rise due to a refrigerant leak, or at a pressure at the refrigerant design pressure or higher.

- b) Over-pressurization is addressed through automated controls such as pressure-relief devices.
- c) Provide for a safe configuration of the chiller or heat exchanger in the event a leak is discovered (e.g., equipment isolation).
- d) Monitor the secondary coolant for developing hazardous refrigerant exposure on a regular basis, such that timely repairs are completed.

Where the chosen approach includes monitoring or process management elements, the owner or operator shall develop procedures to support its effective implementation. Procedures must document the overall process/requirements, frequency, reporting, emergency response, etc. and be made available to a safety officer upon request.

For uncertified refrigeration systems, the secondary coolant design consideration shall be addressed during design registration of the system with Technical Safety BC in accordance with [IB-DA-2020-01, Design Registration of Refrigeration Plants and Systems](#).

Testing and Maintenance

Early detection of refrigerant in secondary coolant systems is a vital part of maintaining the safety and effective operation of refrigeration systems and equipment. In accordance with CSA B52 clause 8.4.2(j) and (i), owners are responsible for conducting periodic secondary coolant testing.

Owners must establish testing practices and frequencies that are proportionate to the potential risks associated with their systems and equipment. For refrigeration systems utilizing toxic and/or flammable refrigerants (A2, A3, B1, B2L (including ammonia), B2, and B3), secondary coolant testing must be performed no less than twice per year* for the purposes of:

- monitoring for refrigerant levels in the secondary coolant;
- monitoring corrosion inhibitor level in the secondary coolant (when applicable); and
- monitoring iron content (both visible and dissolved).

*Alternative testing frequencies may be established if it can be demonstrated that the risk of a refrigerant leak into the secondary coolant system is effectively managed through alternative means justifying a reduced frequency. Owners seeking to establish alternative testing frequencies must complete a risk assessment involving appropriately qualified individuals and document their technical justification supporting the reduced frequency. Documentation supporting reduced testing frequencies is subject to inspection and must be made available to a safety officer upon request.

The testing method utilized should be appropriate for the type of secondary coolant in use and include the capability of detecting the presence of refrigerant in the secondary coolant in parts per million (ppm).

Upon detection of refrigerant or change in the refrigerant residual level in the secondary coolant, the condition must be reported to Technical Safety BC as soon as possible and in accordance with information bulletin [IB-BP-2017-01](#), Incident and Hazard Reporting - Boilers, Pressure Vessels, Piping, and Fittings.

All secondary coolant analysis records, regardless of testing outcome, shall be retained for a minimum of seven years and shall be made available for review by Technical Safety BC upon request.

In addition to testing the secondary coolant for the presence of refrigerant, the owner shall also continually monitor for possible indications of refrigerant leaks. Examples of other possible indicators include, but are not limited to:

- unexpected increase in the normal operating level of the secondary coolant;
- increase in pressure of the secondary coolant system beyond the normal operating range; or
- detection of a leak during pressure testing of the heat exchanger.

The owner shall take immediate action to correct any refrigerant leaks that are detected in the refrigeration plant and take further actions as necessary to reduce and/or prevent the re-occurrence of an ammonia leak. This includes shutting down the system if necessary.

Provincial Safety Manager – Boiler, Pressure Vessel, and Refrigeration.

References:

Safety Standards Act

Power Engineers, Boiler, Pressure Vessel & Refrigeration Safety Regulation

CSA B52: 2023, Mechanical Refrigeration Code

CSA B51:24, Boiler, pressure vessel, and pressure piping code

ASME B31.5:2022, Refrigeration Piping and Heat Transfer Components

Technical Safety BC Information Bulletin IB-DA-2020-01: Design Registration of Refrigeration Plants and Systems

Technical Safety BC Information Bulletin IB-BP-2017-01: Incident and Hazard Reporting - Boilers, Pressure Vessels, Piping and Fittings