SAFETY ORDER

SECONDARY COOLANT

No: SO-BP 2021-01

Date of Issue: Date of Issue: March 30th, 2021

This safety order is issued pursuant to section 31 of the Safety Standards Act. *A person affected by this safety order may appeal this order in writing to the Safety Standards Appeal Board within 30 days. The appeal process is set out on the Safety Standards Appeal Board's website at www.gov.bc.ca/safetystandardsappealboard.*

Failure to comply with a safety order is an offence under section 72 of the Safety Standards Act.

Part 1: Details of Regulated Work or Regulated Product

This safety order is applicable to all ammonia refrigeration plants that are subject to the Power Engineers, Boiler, Pressure Vessel, and Refrigeration Safety Regulation ("PEBPVR Safety Regulation"), and employ a secondary coolant in their evaporator or condenser or any other part of the system as a means of transferring heat.

For the purpose of this safety order**,** the term "secondary coolant" means any liquid or slurry used for the transmission of heat without a change of state to vapour.

Examples of a secondary coolant include, but are not limited to:

- Non-refrigerant side of indirect cooling systems
- Non-refrigerant side of fluid-cooled condensers
- Non-refrigerant side of heat reclaim systems
- Any similar application of similar nature

Part 2: Requirement(s) of this Safety Order

In addition to the existing requirements under the *Safety Standard Act*, PEBPVR Safety Regulation, and all adopted codes, the owner of a refrigeration plant that is within the scope of this safety order must comply with the following requirements:

1) The owner of a refrigeration system that utilizes ammonia as refrigerant shall, no less than twice per year, conduct a secondary coolant analysis for the purposes of:
    - Meeting the requirements of CSA B52, Paragraph 8.4.2 (j)
    - Monitoring Ammonia Level in the secondary coolant
    - Monitoring corrosion inhibitor level in the secondary coolant
    - Monitoring Iron content (both visible and dissolved)

2) The testing method utilized should be appropriate for the type of secondary coolant in use and include the capability of detecting the presence of ammonia in the secondary coolant in parts per million (ppm). The report of the test results shall specify the method and testing standard used, and report the value of ammonia concentration in ppm. The testing method must be an industry-accepted method including: ASTM 1426 (method B), EPA 350.3, or SM4500-NH_3.

3) Upon detection of ammonia or change in the ammonia 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.

4) All secondary coolant analysis records, regardless of testing outcome, shall be retained for a minimum of 7 years and shall be made available for review by Technical Safety BC upon request.

5) In addition to testing the secondary coolant for the presence of ammonia, the owner shall also investigate and ensure there are no other indications that an ammonia leak to the secondary coolant has occurred. Examples of other possible indicators include, but are not limited to: unexpected increase in the normal operating level of the secondary coolant, an 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.

6) The owner shall take immediate action to correct any ammonia 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.

7) The owner shall comply with a safety officer's request to conduct additional testing of a secondary coolant at any time.

8) Secondary coolant piping: the owner shall ensure that the design and operation of the secondary coolant side of the heat exchanger and any associated piping systems provides provisions to prevent over-pressurization of the secondary coolant system. Over-pressurization can occur in the event of a leakage from the refrigerant side into the secondary coolant system, or in the event of pressurization due to thermal expansion of the secondary coolant when it is isolated from the system. Provisions to prevent over-pressurization may include, but are not limited to:

    - The addition of a pressure relief valve to the secondary coolant piping. This will help prevent over-pressurization beyond its safe operating pressure. The safety relief valve must be sized and installed by a class REF licensed contractor or a professional engineer. Discharge from such relief valve must be connected to a holding tank. The pressure relief valve sizing documents must be submitted to Technical Safety BC with the Compliance Declaration form for documentation.
    - Locking isolation devices in their proper position to prevent partial isolation of the secondary coolant that may result in over-pressurization. This provision would also include the development of safe operating procedures by a qualified individual* for the operation of any isolation device. The safe operating procedure must be submitted to Technical Safety BC with the Compliance Declaration form for documentation.
    - The development of detailed periodic inspection plans for the secondary cooling system by a qualified individual*. These inspection plans must be based on adopted codes and standards and must evaluate system integrity (an example of compromised integrity would be a leakage due to corrosion). The inspection plan must be submitted to Technical Safety BC with the Compliance Declaration form for documentation. The inspection plan must also have provisions for periodic inspection results to be reviewed and approved by a professional engineer in order to capture any potential failure and if the equipment is fit-for-service, and records must be retained on site for the life of the equipment.

- Designing the secondary coolant piping system as per the requirements of ASME B31.5, for a design pressure no less than the design pressure of the refrigerant side of the heat exchanger. The design must be submitted to the Technical Safety BC Engineering design registration portal** for review before implementation.
- Any other method developed by a qualified individual* to prevent over-pressurization in the secondary coolant system in the event of refrigerant leakage. This "owner-developed" method must be submitted to BPVRSupport@technicalsafetybc.ca for review before implementation.

9) All new installations must conform with the requirements of this safety order upon issuance and must include their method of compliance to item 8 in the "refrigeration system design registration" submission, when applying for registration.

10) Existing refrigeration plants must:
    a) Submit your "Compliance Method Declaration – Secondary Coolant" form (FRM-1734-00), completed by a qualified individual* no later than June 30 2021. You must submit your documents to BPVRSupport@technicalsafetybc.ca.
    b) Implement the compliance method selected in 10(a) and submit your "Compliance Declaration – Secondary Coolant" form (FRM-1375-00) with proof of compliance*** no later than February 28 2022. You must submit your documents to BPVRSupport@technicalsafetybc.ca.

Failure to comply with the requirements of this safety order may result in enforcement action under the Safety Standards Act and associated regulations. For more information regarding Technical Safety BC and progressive enforcement, please visit our enforcement webpage at: www.technicalsafetybc.ca/enforcement.

Submittal of the documents and safe operating procedures to Technical Safety BC does not relieve the owner(s) from their duty to ensure effective procedures are implemented to address safety risks.

* For the purpose of this safety order, a "qualified individual" is considered to be a professional engineer, a licensed class REF contractor, or person in charge of plant with a certificate of qualification of "refrigeration operator" or "4th class or higher power engineer" in accordance with the PEBPVR Safety Regulation.

** The "secondary coolant piping design" shall be submitted through the Design Registration portal under the "Piping design registration" category. The project name should be entered as "Piping Design for Safety Order SO-BP-2021-01."

*** Proof of compliance may be, but is not limited to, anything in the following list:

- Secondary coolant Safety relief valve sizing documents and a photo of installed relief valve
- Isolation valve SOP
- Inspection Plan
- Secondary coolant design registration letter and piping construction data report
- Confirmation letter from boiler senior safety officer on review of "alternative compliance method" and any other proof required as result of this review

Part 3: Details of Issue

This safety order is being issued to reduce the risk of personal injury and damage to property as a result of an accidental leak from a refrigeration system, especially the systems utilizing ammonia as a refrigerant. Accidental ammonia leaks, from any pressurized system, have the potential to cause injuries and even death to any person within the immediate vicinity and surrounding area.

It is very important that the secondary coolant in an indirect ammonia system be tested for the presence of ammonia on a periodic basis. The presence of ammonia in the secondary coolant is an indication that an internal leak may have occurred in the heat exchanger (e.g. chiller) from the ammonia refrigerant side to the secondary coolant side of the heat exchanger.

It is critical that any indication of an ammonia leak is detected at the earliest possible opportunity and that corrective action is taken immediately.

Part 4: Details of Ordering Safety Manager or Safety Officer

This Safety Order is being issued by a Provincial Safety Manager in accordance with sections 15 (d) and 31 of the Safety Standards Act.

Nav Chahal
Provincial Safety Manager – Energy (Acting)

Date: March 25, 2021

Failure to comply with a safety order is an offence under section 72 of the *Safety Standards Act*.

A person affected by this safety order may appeal this order in writing to the Safety Standards Appeal Board within 30 days. The appeal process is set out on the Safety Standards Appeal Board's website at www.gov.bc.ca/safetystandardsappealboard

Safety Standards Act:

Safety Orders

31 (1) To prevent, avoid or reduce risk of personal injury or damage to property, a provincial safety manager may, in writing, issue a safety order.

(2) A safety order may be issued to any person in relation to any of the following:
- (a) regulated work or regulated products generally;
- (b) a specific class of regulated product or regulated work;
- (c) a specific regulated product or regulated work.

(3) For certainty, a safety order issued under this section may apply to
- (a) regulated work that meets the requirements under this Act,
- (b) regulated work that previously met the requirements under this Act or a former Act but does not meet the current requirements under this Act,
- (c) regulated products that meet the requirements under this Act, or
- (d) regulated products that previously met the requirements under this Act or a former Act but do not meet the current requirements under this Act, including a regulated product that bears a certification mark.

(4) A safety order may specify any requirement that is intended to prevent, avoid or reduce the risk of personal injury or damage to property and may include any of the following orders:
- (a) that an existing regulated work or regulated product must be made safe in compliance with the safety order;
- (b) that a regulated product must be
  - (i) disconnected from a power source,
  - (ii) uninstalled, or
  - (iii) modified before continued use;
- (c) that a regulated product must be operated, installed, manufactured or disposed of only as specified or that a regulated product must not be moved;
- (d) that current or future regulated work or a regulated product must conform to the terms or conditions of the order;
- (e) that a person take or refrain from taking any action that a safety manager considers necessary to prevent, avoid or reduce a risk of personal injury to persons or damage to property;
- (f) that the manufacturer make reasonable efforts to recall the regulated product.

(5) The provincial safety manager must give written notice of the safety order to the following persons:
- (a) the manufacturer of the regulated product;
- (b) an owner of the regulated product if the identity of the owner is known to the provincial safety manager;
- (c) the person in charge of the regulated work.

(6) The notice must state the reasons for the decision and that the person has the right to appeal the decision to the appeal board.

(7) Despite section 54, a safety order may not be stayed during an appeal.

References:

Safety Standards Act