

DESIGN REGISTRATION OF REFRIGERATION PLANTS AND SYSTEMS**Date of Issue: October 19, 2020****No: IB-DA 2020-01****Topic: Design registration of refrigeration plants and systems**

Refrigeration system designs must be registered according to the *Safety Standards Act*, the Power Engineering Boiler Pressure Vessel and Refrigeration Safety Regulation (PEBPVRSR Safety Regulation) and CSA B52 code. This bulletin clarifies guidelines surrounding design registration of refrigeration systems.

Basis for design registration

The *Safety Standards Act*, PEBPVRSR Safety Regulation, CSA B52, and CSA B51 Code states that registration to a regulatory authority is necessary:

1. Adoption of CSA B52 and B51 and the regulation requirements in Section 88 and 84 of the PEBPVRSR Safety Regulation requires design registration of pressure equipment and regulated refrigeration systems. Designs are required to be submitted to the Provincial Safety Manager, Engineering for registration before installation.
2. Refrigerants are fluids that expand and compress, and undergo phase change during pressure or temperature fluctuations.
3. CSA B52 Clause 5.3.1 requires registration and acceptance to the regulatory authority of the "refrigeration system."
4. CSA B52 Clause 5.5.1 determines a regulated refrigeration system shall meet a minimum design pressure of 103 kPag (15psig) and shall be not less than the pressure-temperature saturation limits contained within this Clause.
5. CSA B51 Clause 5.1.2 and 5.1.3 remains unchanged and requires registration. Note that pressure piping registration for NPS 3 exemptions from the PEBPVRSR Safety Regulation 84 (2)(a) still applies to all refrigerant pressure piping and the existing requirements remain unchanged.
6. From the PEBPVRSR Safety Regulation, design registration is required to all refrigeration systems¹ under the following:
 - Group A1, A2, or B1 refrigerants with a total prime mover nameplate rating of 125 kW or more
 - Group A3, B2, or B3 refrigerants with a total prime mover nameplate rating of 25 kW or more

Requirements for design registration

A refrigeration system design must consider operational and maintenance hazards. Any new, existing, or retrofit refrigeration system design must follow requirements in the latest edition of CSA B52, *Clause 5.3.2 Contents of drawings*, and include the following additional content as part of a design submission to Technical Safety BC:

1. A reasonable form of documented analysis authenticated by a professional engineer (examples: Failure Mode Effects Analysis, Bow Tie Analysis, Hazardous Operation Analysis, or alternate form of recognized and generally accepted good engineering practices) disclosing operating hazards, consequences, mitigations and acceptance of the presented hazards. The professional

¹ A2L and B2L refrigerants also apply in the future, pending the upcoming changes to CSA B52 and the PEBPVRSR Safety Regulation

engineer must be review these hazards with the owner to discuss mitigation measures if necessary.

2. Secondary coolant designs on heat exchangers and associated piping systems must include considerations on preventing over-pressurization (due to thermal expansion of trapped secondary coolant or refrigerant leaks into a secondary coolant system) during normal operation or failure mode scenarios.
3. Relief discharge piping calculation demonstrating conformance to CSA B52 Annex H. The final assumptions and documentation for these calculations must be provided to the owner of the refrigeration system for future reference.
4. A reasonable form of documented summary of the amount of refrigerant used for the system at point of installation and its safe operating allowable limits. Use the methods described under the Notes section of CSA B52 *Table 1 – Refrigerant classifications and quantities*.
5. Where legacy refrigeration systems require relief system upgrades to the requirements of the latest and future editions of CSA B52, the emergency discharge fire line must be removed.
6. Machinery room emergency and code required ventilation designs must consider proper air circulation in the room as well as safe discharge of the exhaust air outside of the room. This assessment is to be prepared by a Professional Engineer qualified to address HVAC requirements from the BC Building Code and CSA B52.
7. A professional engineer must apply reasonable judgement to consider defrost cycles and temperature changes during operational and off cycles in a flexibility analysis. NPS 3 exemptions from PEBPVRSR Safety Regulation 84(2)(a) still apply and the flexibility analysis must be submitted with the application.
8. The professional engineer of record must provide design assumptions used in their design's scope of work, including at a minimum, project outcome, modification scope, and assumptions or judgements that impact the design's scope.
9. Modifications to legacy refrigeration systems must assess the impact of the design changes from the above criteria. Abridged document packages based on the modification scope can be submitted. However, follow-up for additional information will be requested if the design intent is unclear. Example: in the event a chiller vessel replacement requires piping modifications, it may impact refrigerant capacity and volume, and impact relief system sizing and capacity. A professional engineer must apply reasonable professional judgement to assess if the scope shall incorporate these types of hazard impact scenarios.

A design registration application can be submitted by a qualified professional, designer, or professional engineer. However, refrigeration system design packages must be authenticated by a professional engineer (Engineer of Record). By signing the Professional Declaration, a qualified professional verifies that the final design is compliant to *the Act*, Regulations, and Codes.

After registration, a design registration letter will be provided by Technical Safety BC. Design registration fees will follow the standard fee schedule for pressure equipment design registration.

Provincial Safety Manager, Engineering – Tom Ng, P.Eng

References:

Safety Standards Act

Power Engineers, Boiler, Pressure Vessel & Refrigeration Safety Regulation

Safety Standards General Regulation

CSA B51 (latest editions) Boiler, pressure vessel, and pressure piping code

CSA B52 (latest editions) Mechanical Refrigeration Code