DIRECTIVE

DETERMINING THE CAPACITY OF REFRIGERATION SYSTEMS

This Directive is being issued by a provincial safety manager pursuant to section 30 of the Safety Standards Act.

Date of Issue: July 12, 2013 **Directive No: D-BP-2013-02**

General Details

The Power Engineers, Boiler, Pressure Vessel and Refrigeration Safety Regulation (the Regulation) requires that the capacity of a refrigeration system be determined from the prime mover nameplate rating. This Directive is being issued to owners of refrigeration plants and refrigeration contractors to specify how the prime mover nameplate rating is to be determined.

Specific Details

Refrigeration systems certified by a certification agency

In accordance with subsection 88(2) of the Regulation refrigeration systems with a capacity not exceeding 125 kW using Group Al, A2 or B1 refrigerants, or having a capacity not exceeding 25 kW prime mover nameplate rating using Group A3, B2 or B3 refrigerants do not require registration with the BC Safety Authority. These refrigeration systems may comply with CSA B52 section 5.2 requiring them to be tested and certified by an approved testing laboratory.

Section 3(2)(j) of the Regulation exempts refrigeration plants with a capacity of 5 kilowatts (kW) or less prime mover name plate rating.

The Regulation does not provide a definition for prime mover name plate rating or specify how the capacity of a refrigeration system is to be determined

For certified refrigeration systems the BC Safety Authority interprets prime mover to be the motor which drives the refrigeration compressor and the prime mover name plate rating to be the power output in horsepower or kW marked on the name plate of the motor or the refrigeration unit in accordance with the certification standard for the motor or refrigeration unit.

If the power output is not marked on the name plate it shall be calculated from the information on the nameplate using full load amperes or rated load amperes for hermetically sealed compressor motors. All calculations must be based on information marked on the nameplate. When the power factor or efficiency are marked on the nameplate, these factors can be considered in the power calculation. In the absence of name plate information the power output is to be calculated assuming unity (one) for the power factor and efficiency.

505 SIXTH STREET, SUITE 200, NEW WESTMINSTER, BRITISH COLUMBIA, CANADA V3L 0E1
Toll Free: 1-866-566-7233 Fax: 778-396-2064 Web Site: www.safetyauthority.ca E-mail: info@safetyauthority.ca

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The power of a motor is determined from the following formulas:

HP X 0.7457 = kW

Three phase motor

Power = $\sqrt{3}$VI x power factor x efficiency*

Single phase motor

Power = VI x power factor x efficiency*

* power factor and efficiency shall be unity (one) if not marked on the nameplate

Where HP = horsepower
kW = kilowatts
V= voltage (marked on unit nameplate)
I = amperage (marked on unit nameplate as rated load amperes (RLA))

Refrigeration systems not certified by a certification agency

Refrigeration systems not certified in accordance with CSA B52 section 5.2 shall be registered with the BCSA in accordance with CSA B52 section 5. In accordance with subsection 88(2) of the Regulation refrigeration systems with a capacity of 125 kW or more using Group Al, A2 or B1 refrigerants, or having a capacity of 25 kW prime mover nameplate rating using Group A3, B2 or B3 refrigerants require registration of the piping with the BC Safety Authority. CSA B51 section 5.3 requires drawings and specifications to be submitted for registration and requires the specifications to include the compressor manufacturer's prime mover power rating to be included in these registration submissions.

For refrigeration systems not certified by a certification agency the BC Safety Authority interprets prime mover nameplate rating to be the prime mover power rating from the manufacturer which is registered with the BC Safety Authority.

Ed Hurd P.Eng.
Provincial Safety Manager, Boilers

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References:
Relevant Legislation

Power Engineers, Boiler, Pressure Vessel & Refrigeration Safety Regulation

Definitions and interpretation for this regulation

2 (1) In this regulation:

"refrigerant group" means the classification of one or more refrigerants into risk categories based on flammability and toxicity as defined in CSA B52;

Application of this regulation

3 (1) This regulation applies in respect of every boiler and boiler plant, every pressure plant, every pressure vessel, every pressure piping system, every fitting, every plant and all refrigeration equipment and refrigeration plants.

(2) Despite subsection (1), this regulation does not apply to any of the following:

(a) a power plant with a heating surface of 2 m^2 or less;

(b) a heating plant with a heating surface of 3 m^2 or less;

(c) Repealed. [B.C. Reg. 134/2009, s. 11 (a).]

(d) a low pressure thermal fluid plant with a heating surface of 3 m^2 or less;

(e) a heating plant that has no valves or other obstruction to prevent circulation of fluid between the boiler and an expansion tank that is fully vented to the atmosphere;

(f) a heating plant, refrigeration plant or pressure vessel plant, other than plants with toxic or flammable contents, that are located in a building that contains only 4 or fewer self-contained residential units;

(g) a pressure vessel operating at and with relief valves set at a pressure of 103 kPa or less;

(h) a pressure vessel not equipped with heating element that is constructed for the storage of water at a temperature of 65°C or less and a pressure of 1 720 kPa or less or has a diameter of 610 mm or less;

(i) a pressure vessel used for hydraulic purposes having an operating temperature of less than 82°C, if the primary design considerations are mechanical in nature and

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stresses are derived from the functional requirements of the device rather than fluid pressure;

(j) a refrigeration plant with a capacity of less than 5 kW prime mover nameplate rating;

(k) a cushion tank with a diameter of 610 mm or less that is constructed to operate at a working pressure of 207 kPa or less;

(l) a distribution main or service pipe as defined in the Gas Safety Regulation;

(m) piping and fittings external to the boiler proper in a low temperature low pressure fluid plant;

(n) a pressure piping system operating at and with a relief valve or valves set at 103 kPa or less;

(o) a water heater with a heat input of 120 kW or less;

(p) a boiler or pressure vessel subject to the jurisdiction of Transport Canada under the *Transportation of Dangerous Goods Act* (Canada) or a boiler or pressure vessel subject to the *Canadian Shipping Act*;

(q) gas-insulated switchgear and control gear used for control of high voltage electricity;

(r) refrigeration equipment used for air conditioning or refrigerated compartments on railway cars, motor vehicles, motor-drawn vehicles, aircraft or ships.

(s) air or hydraulic brake systems subject to the Motor Vehicle Safety Regulations under the *Motor Vehicle Safety Act* (Canada);

(t) air or hydraulic brake or steering systems for off road vehicles.

Refrigeration plant installations

88 (1) For this section, **"Canadian Registration Number"** has the same meaning as in CSA B51.

(2) If a refrigeration plant

(a) has a capacity of 125 kW prime mover nameplate rating or more and uses Group Al, A2 or B1 refrigerants, or

(b) has a capacity of 25 kW prime mover nameplate rating or more and uses Group A3, B2 or B3 refrigerants,

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a licensed contractor must, before performing an installation, provide a registration number for the pressure piping to a provincial safety manager.

CSA B52

5.2 Refrigeration systems rated 125 kW or less
Refrigeration systems that have a prime mover nameplate rating of 125 kW or less and are covered by the following Standards shall be tested and certified by an approved testing laboratory:
(a) CSA C22.2 No. 63*;*
(b) CSA C22.2 No. 92
(c) CSA C22.2 No. 117*;*
(d) CAN/CSA-C22.2 No. 120*;*
(e) CSA C22.2 No. 128*;* and
(f) CAN/CSA-C22.2 No. 236*.*

5.3 Filing of drawings

5.3.1 Submission of drawings and specifications
Before the construction of a refrigeration system whose prime movers exceed a 125 kW nameplate rating, or as required by the Act, the owner or its designated representative shall submit drawings and specifications to the regulatory authority for registration and acceptance.
Note: *The regulatory authority may accept a standard drawing in lieu of a separate drawing for each installation, provided that the registered number of such a drawing is indicated for each installation.*

5.3.2 Contents of drawings
Each drawing shall include, at a minimum, the following:
(a) type of occupancy (see Clause 4.2);
(b) refrigerant: group number, name, and weight of charge in system;
(c) machinery room: construction details, including ventilation if applicable;
(d) position of equipment;
(e) size, run, material, and type of piping;
(f) compressors: manufacturer, displacement, setting of relief valves, and prime mover power rating;
(g) pressure vessels: size, Canadian registration number, and data reports;
(h) existing machinery: full particulars, where applicable; and
(i) safety devices: relieving pressures, manufacturer's name, and size and number of safety valves, relief
valves, and rupture members.

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