



Inspection and Technical Services

ITS BPV Guide 06,
Guarded Status Information & Requirements
for Owners & Operators of Refrigeration Plants

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Preamble

In Manitoba, many refrigeration plants found in arenas, curling rinks, manufacturing/processing and warehouse facilities require Constant Supervision under the Manitoba Power Engineers' Act and Regulation. By "Constant Supervision," the Act means that a Power Engineer, of the required class for the plant, must be in the operating area of the refrigeration plant 24 hours per day, 7 days a week, while the refrigeration plant is in operation. This law applies to refrigeration plants that operate with pressures greater than 15 psig (103 kPag), and exceed 50 tons of refrigeration in cooling capacity.

The purpose of this manual is to assist owners in determining whether the Constant Supervision requirements apply to their plant, and to inform them of the options to Constant Supervision that are available to the owner.

Disclaimer

If there is a contradiction between the contents of this booklet and the Manitoba Acts and Regulations, the Manitoba Acts and Regulations prevail. The intended use of this booklet is to act as a guide for the application, installation and maintenance of Guarded Status Refrigeration Plants.

Frequently Asked Questions

What is Guarded Status?

In some plants that require Constant Supervision, the owner may wish the Power Engineer on duty to leave the operating area of the plant for periods greater than twenty minutes at a time. The owner may then request the privilege of Guarded Status, providing they undertake extra measures to ensure the safety of the plant during the period of time it is unattended.

Are there advantages to Guarded Status?

If a refrigeration plant is an approved Guarded Status Plant, Power Engineers employed by the owner may:

- a) Leave the operating area for more than twenty minutes to perform other duties on the premises (such as ice-making or machinery maintenance), if the plant is located in an occupied building and the plant has an approved audio-visual alarm system.
- b) Leave the operating area for up to twenty-four hours, if the plant is located in an unoccupied building, or
- c) Leave the operating area for greater than twenty-four hours, if the plant is located in an unoccupied building and the plant has an approved audio-visual read-out system.

What plants are eligible for Guarded Status?

Guarded Status may apply to any 4th Class or Refrigeration Class plant:

- a) With high-side pressures in excess of 15 psig and rated capacity in excess of 50 tons (if having field-erected refrigerant piping) or,
- b) With high-side pressures in excess of 15 psig and rated capacity in excess of 100 tons (if factory built, and pressure/leak tested, and having no field-erected refrigerant piping connections).

Inspection and Technical Services (ITS) determines plant tonnage by:

- a) Manufacturer's nameplate rating, or
- b) Compressor driver horsepower rating (one driver horsepower equal to one ton of refrigeration), or
- c) Calculated evaporator tonnage, based upon maximum actual operating and design conditions, and certified by a Mechanical Engineer registered in the Province of Manitoba.

The plant tonnage, then, is the maximum of either (a) or (b), unless (c) is provided and stamped by a Mechanical Engineer registered in the Province of Manitoba or reciprocating Jurisdiction.

How do I request Guarded Status?

In accordance with the Power Engineers' Act and Regulations, the following procedure applies in all cases where requests for guarded status are made:

- First, the owner of the power plant must email a request in writing to the Director of ITS
 - Stating that the plant will be well maintained and its safety limit controls tested regularly by a power engineer of the required class, and
 - Operate in accordance with the guidelines set out in this booklet, the current Act and Regulations as well as all relevant safety codes.

Email must be sent to bpvintake@gov.mb.ca.

- The plant must then be surveyed by an ITS Boiler and Pressure Vessel Inspector to determine whether it meets safety code standards and other stipulated regulatory requirements. All deficiencies will result in an 'Order to Remedy'.
- Following the completion of the work by the owner, the plant must be inspected to determine if the completed work is acceptable. At this time, the inspector will witness testing of the system to verify that the system functions properly.
- Finally, the Director of ITS, upon the advice of the Boiler and Pressure Vessel Inspector, will issue a letter, granting permission to operate the plant without constant supervision. The Guarded Status approval letter shall be posted in the vicinity of the equipment.

When the plant is issued a Guarded Status approval letter, it is then considered in compliance with the acceptable minimum guarded status requirements, and is being officially recognized as Guarded Status.

Note: Any change to the configuration, equipment or ownership of the plant must be made immediately to ITS, at which time Guarded Status will be re-evaluated.

Minimum Mandatory Requirements to Qualify for Guarded Status

The following lists, as a minimum, are the mandatory requirements for refrigeration *Guarded Status Plants*. Depending on the configuration of the plant, additional controls and equipment may be necessary.

Machinery Room:

The machinery room in which the plant is located must meet the latest CSA B52 Mechanical Refrigeration Code machinery room requirements. The machinery room shall be upgraded to the requirements of a “Class T” machine room.

Emergency Shut Down Switch:

The machinery room in which the plant is located must have a remote pilot control, located immediately outside the machinery room, provided solely for shutting down the equipment in an emergency.

Audio-Visual Alarm Read-Out System:

An audio-visual read-out system is required when the plant in question is an unoccupied building, and where the owner requests an extension to the unattended period greater than 24 hours. Where audio-visual read-out systems are required, they shall be located in the Central Control Station and at least one other remote location selected by the owner. The audio alarm may be equipped with silencing buttons.

High Pressure Limit Control:

The high-pressure limit control, in addition to its normal function, shall energize an Audio-Visual Alarm, which will require a manual reset before the plant can be restarted. A means shall be devised to bypass the function of the operating control while the high limit is being tested. A pressure gauge shall be installed in the vicinity of the control being tested.

High Discharge Gas Temperature Limit Control:

The high discharge gas temperature limit control, in addition to its normal function, shall energize an Audio-Visual Alarm, which will require a manual reset before the plant can be restarted. A thermometer shall be installed in the vicinity of the control being tested. This temperature-sensitive limit control shall be of the type to allow ease of testing for set point- accuracy

Low Oil Pressure Sensor:

The low oil pressure-sensing device, in addition to its normal function, shall energize an Audio-Visual Alarm, which will require a manual reset before the plant can be restarted. The low-oil pressure sensor shall have the shortest time-delay heater installed, as permitted by the compressor manufacturer. For the purpose of testing, a labeled three-way valve shall be installed in the pressure sensing line, with one of the lines returning to the crankcase.

Compressor Jacket/Cooling Water/Temperature Control:

In addition to its normal function, this control shall energize an Audio-Visual Alarm, which will require a manual reset before the plant can be restarted. A temperature-sensitive limit control shall be of the type to

allow ease of testing for set point-accuracy. If cooling water flow is proven by a pressure-sensitive element, a means shall be provided to easily prove its functionality.

Mechanical Room Ventilation and Refrigeration Vapour Detection System:

In continuously operating ventilation systems, an air-proving device shall be used to prove the ventilation system is operating, and shall trigger an Audio-Visual Alarm to indicate ventilation system failure. The mechanical ventilating system, detectors, and alarms, shall be subject to annual testing and calibration, or more frequently in accordance with manufacturer's recommendations. Refer to CSA B52 Mechanical Refrigeration Code for other requirements pertaining to the safety of the machinery room.

An approved two-stage refrigeration detection system shall be used:

1. The first-stage (low level) alarm shall start supervised alarm annunciation, including a strobe light and audible alarm, and activate the mechanical ventilation system on high air- flow.
2. The second-stage alarm shall shut down the refrigeration plant at or below the threshold limit value for the refrigerant. For ammonia, threshold limit values of up to 300 ppm may be used in accordance with the current CSA B52 Mechanical Refrigeration Code.

There shall be a means to test the strobe light and audible alarm.

Marking and Labelling:

As a minimum, marking and labelling of the equipment shall follow the current CSA B52 Mechanical Refrigeration Code. Each refrigeration system shall be provided with a permanent sign that is securely attached, readily accessible, and legible, and that indicates the following:

- a) Name and address of installer;
- b) Refrigerant type;
- c) Lubricant type and amount;
- d) Total weight of refrigerant required for normal operation;
- e) Field test pressures applied;
- f) Refrigeration capacity at design or nominal conditions; and
- g) For prime mover(s), the rating in kilowatts (hp) or full-load current and voltage.

Training and Procedures:

Emergency procedures shall be posted in a safe and easily accessible location.

Operators shall be trained on how to operate the guarded status panel and on how to conduct the Guarded Status tests. There shall be a documented training program. Refresher classes must be provided as necessary. The plant engineers will perform the guarded status checks for the inspector at the time of the recurring inspection.

As a minimum, maintenance of the equipment shall follow the current CSA B52 Mechanical Refrigeration Code, and shall be documented. The documented maintenance records shall be provided to the inspector during the recurring plant inspection.

Testing and Maintenance Requirements

Once a Refrigeration Plant is an approved Guarded Status Plant, periodic testing of all controls and safety devices is necessary to determine that the controls are operating as designed.

Owner's Responsibility

The owner is responsible to ensure the following:

- That an inspection and testing plan is developed, and followed.
- That, in the event of malfunction of any control or plant equipment, prompt corrective action is taken.
- That the shift engineers maintain a written log showing, for each day of operation
 - Each check of the plant carried out by him or her and the time and date thereof;
 - The results of any tests of automatic safety controls;
 - Any abnormal condition in the plant, and the time and date when it is first observed; and
 - Any order given respecting the operation of the plant and the time and date thereof; and
 - That the shift engineer signs the entries for each shift.
- That records of all maintenance work performed on the plant are maintained.
- Maintain two log books, one for the guarded status checks and the main plant log book.
- That all records are made available to the Boiler and Pressure Vessel Inspector on request. That ITS is notified, in writing, of the names of the power engineers who will be supervising the plant, together with the size and location of the plant.
- That the Power Engineer responsible for the plant is present during the time of the recurring inspection.

The intent of the above requirements is for owners to develop and implement a “*preventative maintenance program*” of their own. The exact structure of a program of this type cannot be made mandatory due to the many variations of plants. Nevertheless, a guideline can be developed to facilitate and document testing and maintenance, vital for the reduction of the likelihood of failures, accidents, explosions, etc. In addition to the above, owners (or contractors) shall follow the requirements listed in CSA B52 Mechanical Refrigeration Code.

The following Table contains a schedule prepared to suit a general situation. It is strongly recommended that owners (or contractors) draw up their own detailed check lists/schedules as suggested by the unit manufacturer's instructions, these requirements, and those listed in CSA B52 Mechanical Refrigeration Code. Consultation with ITS inspection staff should be considered as well.

Frequency	Item
Daily	<ul style="list-style-type: none"> • High discharge gas temperature cutoff – set point accuracy.
	<ul style="list-style-type: none"> • Compressor jacket cooling water temperature cutoff – set point accuracy.
	<ul style="list-style-type: none"> • Refrigerant leak detection system checks.
	<ul style="list-style-type: none"> • Ventilation system checks.
Weekly	<ul style="list-style-type: none"> • High pressure limit control (to be set at a maximum of 90% of the set pressure of the safety relief valves.)
	<ul style="list-style-type: none"> • Low oil pressure cut-off.
Annually	<ul style="list-style-type: none"> • Liquid level controls (if applicable)
	<ul style="list-style-type: none"> • All limits and systems checked as per CSA B52 Mechanical Refrigeration code.
	<ul style="list-style-type: none"> • All limits to be checked and documented by a Power Engineer of the required class, and submitted to inspector at time of the recurring inspection. The Power Engineer may choose to witness and sign-off an annual check performed by a competent service company.
Every Five Years	<ul style="list-style-type: none"> • Safety relief valves to be renewed or re-certified, as per CSA B52 Mechanical Refrigeration code. A date tag shall be installed on each relief valve when new or re-certified.

All controls to be checked and tested in accordance with the inspector's recommendation. The owner shall provide annual maintenance start-up procedure report to the inspector for verification, as per CSA B52 Mechanical Refrigeration Code and these guidelines.

Table 1 Minimum Schedule of Periodic Testing and Maintenance for Guarded Status

Definitions and Interpretations

The following definitions and interpretations of words are related to the words found in this booklet:

- **“Act”** means The Power Engineers Act.
- **“Alarm Annunciator”** means an audio and visual warning system, known as a “Guarded Status Panel”, to alert operators of alarm conditions in the plant.

Guarded Status Panels shall have warning lights paired with the name of a potential alarm condition (high temperature, low pressure, etc.). Warning lights are controlled by hard-wired switches in the plant, arranged to alert operators of alarm conditions.

In the event of a malfunction in the plant, a light will flash and an audible sound (bell, horn, etc.) will emit to attract the operator’s attention. The operator can silence the alarm with a button, and the light will remain lit until the malfunction is rectified. When the condition returns to normal, the light will turn off.

Note: Guarded Status Panels are not limited to the above style, different styles can be installed however, it shall incorporate the same visual and alarm functions.

- **“Approved”** means accepted or approved by the Minister.
- **“Audio-Visual Alarm”** means an audio and visual alarm annunciation equipment as in the “Alarm Annunciation” noted above.
- **“Audio-Visual Read-Out System”** means alarm annunciation equipment, with the addition of an electronic telecommunication device that is connected to a printer so that, in the events of a malfunction in the plant, it signals an alarm either:
 - a) To the on-call Power Engineer having in possession another alarm-responding device such as a cellular telephone, or
 - b) To a Central Control Station for the direct attention of the supervising Power Engineer or a responsible person in charge and on duty.

The printer shall register all alarm signals, and is a requirement for all extended *Guarded Status Plants*. An “Audio-visual read-out system” is compulsory for extended *Guarded Status Plants* (exceeding 24 hours).

- **“Central Control Station”** means the area in a plant containing an approved visual read-out system through which the systems being monitored are controlled.
- **“Constant Supervision”** means the supervision that requires a power engineer to be present continuously in or near an operating area.

- **“Guarded Status Plant”** means a plant equipped with automatic safety controls that is permitted by the Minister to operate under Section 7 of the latest edition of The Power Engineers Regulations.
- **“Operating Area”** means
 - a) The major area of a plant where steam is produced or air, another gas or a refrigeration or any combination thereof is compressed, or
 - b) A *Central Control Station* of a high-pressure industrial occupancy plant that is equipped with a full set of automatic safety and an approved visual read-out system.
- **“Plant Supervision”** means the supervision that requires a power engineer to be present continuously on the premises.
- **“Regulation”** means The Power Engineers Regulations.
- **“Unoccupied”** means that the building in which the plant is located is not being used for its usual and normal purposes involving the presence of one or more persons or that there are no persons present in the building in which the plant is located.

Further Notes

A power engineer of the class to which the plant is certified must only do testing of limit controls and other operating refrigeration plant equipment. The details of the supervision are outlined in Section 6 of The Power Engineers Regulation.

It is very important that the Refrigeration Plant logs be kept in a consistent format, in order for trends to be perceived and followed with preventive action. Standard forms are suggested in this booklet; however, the log may be more useful if the log form is customized for the particular installation. A separate log sheet is suggested for each period. The log sheets can be filed in a loose-leaf binder, and should be retained as a permanent maintenance record. The log sheets can be used as a handy check-off system when establishing a plant facility maintenance program. It is always advisable that the equipment manufacturer’s recommendations are followed.

A well thought-out operation and maintenance log program designed to address the requirements of the power plant facility will reduce accidents, downtime, and equipment loss. Such a program, properly carried out, will focus attention of both management and operating personnel on the often overlooked plant, thereby addressing small problems before they become large ones. Management must stress the need for complete accurate logs, and must also explain the need for analysis and its benefits.

Referenced Codes and Standards

Boiler, Pressure Vessel, and Pressure Piping Code, CSA B51:19, National Standard of Canada, published by Canadian Standards Association Group, 178 Rexdale Boulevard, Rexdale (Toronto), Ontario, Canada, M9W 1R3.

Mechanical Refrigeration Code, CSA-B52:18, National Standards of Canada, published by Canadian Standards Association Group, 178 Rexdale Boulevard, Rexdale (Toronto), Ontario, Canada, M9W 1R3.

Canadian Electrical Code, Part 1, 22.1-1994 and its Revision, a National Standard of Canada, published by Canadian Standards Association; Appendix B, page. 495, Notes on Rules 26-804, CSA Standard C22.2, No. 3.

Annex B

Inspection Technical Services Incident Report

(Month / Day / Year)

Building Name: _____

Address: _____

Manitoba Unit Number: _____ Refrigeration Machine: _____

Incident:

Reported By: _____

Action Taken by Engineering/Maintenance Department:

Action Taken By: _____ Date: _____

