

**GUARDED STATUS INFORMATION and REQUIREMENTS
For
OWNERS AND 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 Regulations. 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.

PART A: QUESTIONS AND ANSWERS

1) 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.

2) 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*. ("*Plant Supervision*"),
- 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*.

3) WHAT PLANTS ARE ELIGIBLE FOR GUARDED STATUS?

Guarded Status may apply to any refrigeration 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).

The Mechanical and Engineering Branch 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.

4) 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 make a request in writing to the Director of the Department of Labour Mechanical and Engineering Branch, stating that the plant will be well maintained and its safety limit controls tested regularly by a power engineer of the required class, in accordance with the guidelines set out in this booklet, the current Act and Regulations as well as all pertinent safety codes,
- The plant must then be surveyed by a Department of Labour inspector to determine whether it meets the minimum safety code standards and other stipulated regulatory requirements. The assigned inspector will detail the necessary safety controls and mechanical room improvements required for that plant, and give a copy of this report to the owner of the plant.
- Following the completion of the work by the owner, the plant must be inspected to determine if the completed work is satisfactory. At this time, the inspector will test the system to verify that the system functions properly.
- Finally, the Director of the Mechanical and Engineering Branch, upon the advice of the inspector, will, in writing, grant permission to operate the plant without continuous supervision. A guarded status "*label*" will be affixed to the equipment at this time.

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

PART B: MINIMUM MANDATORY REQUIREMENTS TO QUALIFY FOR GUARDED STATUS

The following lists, as a minimum, 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 CAN/CSA B52 Mechanical Refrigeration Code machinery room requirements. Circumstances may require the machinery room to be upgraded to the requirements of a “Class T” machine room.

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 refrigeration plant 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 setpoint-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 back to the crankcase (as per **Diagram “A”**).

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 setpoint-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. Other requirements pertaining to the safety of the machinery room are outlined in CSA B52 Mechanical Refrigeration Code.

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 B52 Mechanical Refrigeration Code.

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

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 annual inspection.

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

PART C: 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.

It is the owner's responsibility 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
 - (a) each check of the plant carried out by him or her and the time and date thereof;
 - (b) the results of any tests of automatic safety controls;
 - (c) any abnormal condition in the plant, and the time and date when it is first observed;
and
 - (d) any order given respecting the operation of the plant and the time and date thereof;
 - (e) and that the entries for each shift are signed by the shift engineer.
- That records of all maintenance work performed on the plant are maintained.
- That all records are made available to a provincial inspector on request.

- That the Department of Labour 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 annual 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.

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 and these requirements. Consultation with the Department of Labour inspection staff should be considered as well.

TABLE 1: MINIMUM SCHEDULE OF PERIODIC TESTING AND MAINTENANCE for GUARDED STATUS (All items to be logged)

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.	
FREQUENCY	ITEM
Daily	<ul style="list-style-type: none"> • High discharge gas temperature cutoff – setpoint accuracy.
	<ul style="list-style-type: none"> • Compressor jacket cooling water temperature cutoff – setpoint 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 annual 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.

PART D: DEFINITIONS AND INTERPRETATIONS

IN THIS BOOKLET:

- **Act** means The Power Engineers Act.
- **Regulation** means The Power Engineers Regulations.
- **Approved** means accepted or approved by the Minister of Labour.
- **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 of Labour 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.
- **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.
- **Audio-Visual Alarm** means a combination of visual and audible alarm annunciation equipment, designed to notify the duty engineer of both the presence and nature of an alarm condition. The visual annunciation is normally in the form of individual annunciation lights at a specially constructed “Guarded Status panel,” located in the machinery room. The audible alarm may be in the form of one or more horns located so that the duty engineer will be aware of the alarm condition, while he or she is on the building premises
- **Audio-Visual Read-Out System** means a combination of visual and audible alarm annunciation equipment as in the “*Audio-Visual Alarm*” noted above, with the addition of an electronic telecommunication device and a printer, so that a plant alarm signal, will either:

- (a) Activate another alarm-responding device such as a pager or a cellular telephone, in the possession of an on-call power engineer, or
- (b) Alert 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), but not compulsory if the owner is requesting “*Plant Supervision*.”

Further Notes

Testing of limit controls and other operating refrigeration plant equipment must only be done by a power engineer of the class to which the plant is certified. The details of the supervision are given 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.

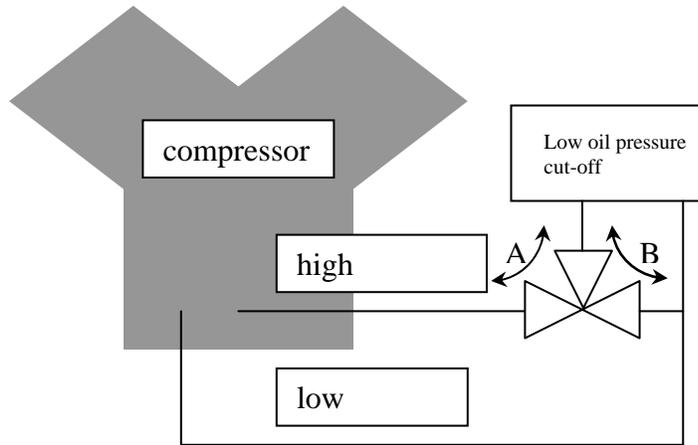
PART E: REFERENCED CODES AND STANDARDS

Boiler, Pressure Vessel, and Pressure Piping Code, CAN/CSA-B-51-M1995, National Standard of Canada, published by Canadian Standards Association, 178 Rexdale Boulevard, Rexdale (Toronto), Ontario, Canada, M9W 1R3.

Mechanical Refrigeration Code, CAN/CSA-B-52-M1999, National Standards of Canada, published by Canadian Standards Association, , 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.

DIAGRAM “A”: METHOD OF INSTALLING THREE-WAY VALVE FOR THE PURPOSE OF TESTING THE LOW OIL PRESSURE CUT-OFF



A suitable pressure and service rated 3-way ball valve shall be installed with the high pressure connection to the low oil pressure cut-off as “common.” When the 3-way valve is in position “A,” it is in the run position. When the 3-way valve is in position “B,” it is in the test position, and shall cause a safety shut-down and lock-out of the compressor.

Date: _____

MB Unit Number: _____

Owner: _____

Address: _____

Owner Number	Manufacturer	Serial Number	Tons	Boiler HP	kW	MAMP	Use	Refrigerant

Operating Engineers Employed:			Total Horse Power of Plant is:		
Name	Certificate Number	Expires	Name	Certificate Number	Expires

RE: Your application for Guarded Status on the above is listed refrigeration plant under section _____ of Manitoba Regulation 15/94 The Power Engineers Act

This Plant is to be equipped with the following mandatory controls:

1. HIGH PRESSURE LIMIT CONTROL:

This control, in addition to its normal function, shall energize a plant-wide audio alarm, and a visual alarm, which will require 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.

2. HIGH DISCHARGE GAS TEMPERATURE LIMIT CONTROL:

This control, in addition to its normal function, energize a plant-wide audio alarm, and a visual alarm, which will require 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 setpoint-accuracy

3. LOW OIL PRESSURE SENSOR:

This control, in addition to its normal function, shall energize a plant-wide audio alarm, and a visual alarm, which will require 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 back to the crank case.

4. COMPRESSOR JACKET/COOLING WATER/TEMPERATURE CONTROL:

This control, in addition to its normal function, shall energize a plant-wide audio alarm, and a visual alarm, which will require manual reset before the plant can be restarted. A temperature-sensitive limit control shall be of the type to allow ease of testing for setpoint-accuracy. If cooling water flow is proven by a pressure-sensitive element, a means shall be provided to easily prove its functionality.

5. MECHANICAL ROOM VENTILATION:

The ventilating system shall be equipped with a plant-wide audio alarm, and a visual alarm to indicate failure of the system. In ventilating systems required by CSA B52 code to operate continuously, an air-proving device shall cause a plant-wide audio alarm, and a visual alarm if the ventilation system fails.

6. REFRIGERATION VAPOUR DETECTION SYSTEM:

An approved refrigeration detection system shall be used. The refrigeration detection system shall have at least two stages.

- First-stage (low level) activation shall start supervised alarm annunciation, including an appropriately shielded (caged-in) strobe light and plant-wide audible alarm, and activate the mechanical ventilation system on high air-flow.
- Second-stage activation, at or below the threshold limit value for the refrigerant, shall shut down the refrigeration plant. For ammonia, threshold limit values of up to 300 ppm may be used in accordance with the current B52 Mechanical Refrigeration Code.

7. There shall be a mean to test the strobe light, panel lights, and audible alarm.

8. Emergency procedures shall be posted.

9. Operators shall be trained upon installation 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.

10. A minimum maintenance of the equipment shall be followed and documented, as per B52 Mechanical Refrigeration Code. The documented maintenance records shall be provided to the inspector during the annual plant inspection.

11. Other items requiring modification or upgrade, as per CSA B52 Mechanical Refrigeration Code:

12. Guarded Status panels must be built by a CSA approved facility, or carry a Manitoba Special Acceptance for Electrical Equipment.

13. For further information and final certification, testing, and labeling, contact 1 (204) 945-3373 or notify in writing.

INSPECTOR: _____

PHONE: _____