



ONTARIO RECREATION
FACILITIES ASSOCIATION INC.

S.A.F.E.R.

SAFETY ACTIVITIES

FOR

EFFECTIVE REFRIGERATION

MARCH 2002





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ORFA.COM

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THE PROGRAM

The S.A.F.E.R. (Safety Activities For Effective Refrigeration) program is an initiative being promoted to operators of recreation facilities with refrigeration systems primarily in the Province of Ontario.

It is becoming of increasing importance that you and your organization promote and participate in continuous programs pertaining to the safe and efficient operation of your refrigeration systems. This document has been compiled as a partnership initiative among several organizations to address the issue of refrigeration safety and to promote an overview of risk management activities related to the safe operation of refrigeration systems.

The Ontario Recreation Facilities Association, Local 787 of the Refrigeration Workers of Ontario, CIMCO Lewis Refrigeration Ltd. and the Ontario Refrigeration Trade Labour-Management Health and Safety Committee have all partnered together to create this document which will serve to assist refrigeration operators, employers and service contractors in the “SAFER” operation of refrigeration systems in Ontario.

The Ontario Ministry of Consumer and Commercial Relations was an active participant and contributor to the process. The Construction Safety Association of Ontario through the Refrigeration/Air Conditioning Trade Labour Management Health and Safety Committee also supported the project.

BACKGROUND

Refrigeration systems in recreation facilities, dependent upon their capacity, are regulated in varying ways by codes, legislation and regulations pertaining to safety, operating practices and operating personnel. The variance of application of operating regulations was of major issue to the aforementioned groups. This document was originally designed to apply to all types of operators in the primary interest of safer operations for owners, operators, and service personnel and to assist the Ministry of Consumer and Commercial Relations (M.C.C.R.) in their endeavours to monitor regulations and safe operations.

The Operating Engineer’s Act was administered by the M.C.C.R. Pressure Vessels Safety Branch, which served as the Provincial Ministry, which monitored the regulations, inspections and safe operation of refrigeration plants in Ontario.

In June of 2001, the Government of Ontario passed the Technical Standards and Safety Act, and the former Operating Engineers Act, and Boilers and Pressure Vessels Act were revised and adopted as Regulations under the new Act. At the same time, jurisdiction was passed from the M.C.C.R. to the Ministry of Consumer and Business Services. The administrative authority for the Act and Regulations is the Technical Standards and Safety Authority (T.S.S.A.)

The regulations require that any plant, which exceeds 30 horsepower, be registered. Plants under 200 horsepower are required to meet the regulations for a fully guarded plant which will then not require the attendance of an Operating Engineer as defined in the regulations. Plants in excess of 200 horsepower require attendance by an Ontario Refrigeration Operator Class B Operator, or equivalent Operating Engineer at least 8 hours of every 24- hour period of operation.

In addition, the Ontario Recreation Facilities Association serves to educate operators through a voluntary-based refrigeration training program which assists in ensuring that operational and safety training in refrigeration is available for all people employed in Ontario recreation facilities that may not qualify them to acquire certification as an Ontario Refrigeration Operator Class B under the Operating Engineers Regulation. Therefore, whether your refrigeration system is registered as requiring attendance by a Class B Operator, or Operating Engineer, or if your plant is a fully guarded, unattended system, this document is designed to assist you in complying with safe and efficient operating practices.

HOW TO USE THIS DOCUMENT

1. This document has been designed as a "self-help" tool to provide owners/operators with an improved understanding of the safety requirements of refrigeration system operations.
2. The document has been developed in the most "user-friendly" format possible and is not intended to be highly technical in content.
3. The main goal of the S.A.F.E.R. program is to stimulate a process of self-inspection of refrigeration systems to provide an evaluation of the safety status of your respective system and to provide for improved understanding and awareness of the safety requirements for the operation of systems. A key objective of the program is to "operationalize" the many legislative and regulated requirements of owners and operators of refrigeration systems in recreation facilities.
4. It is highly recommended that competent members of your staff conduct the inspection. The Occupational Health and Safety Act of Ontario defines a competent person as a person who,
 - i. is qualified because of his/her knowledge, training and experience to organize the work and its performance,
 - ii. is familiar with the provisions of the Act and the regulations that apply to the work, and
 - iii. has knowledge of any pertinent or actual changes to health or safety in the workplace"
5. Make this document available to staff and the refrigeration service contractor.
6. Once the inspection is completed, circulate the results of the inspection to management (or owner representative) in order that routine or major improvements/replacements can be made to the system to ensure maximum safety and compliance.
7. Maintain an ongoing logbook of inspections and corrective action in chronological order.

Once compiled, this information and corrective actions are designed to assist in an improved understanding and safer operation of the refrigeration system. It is NOT intended for use as a basis for an inspector to shut your system down for non-compliance to safety requirements.

THE S.A.F.E.R. PROGRAM AND RISK MANAGEMENT

The S.A.F.E.R. Program has been designed to assist recreation facility operators in enhancing their Risk Management programs. Refrigeration systems represent large capital investments, continuous operational expenditures and regular maintenance costs along with potential hazards related to safety of operations.

The S.A.F.E.R. program has been developed to provide you with a simple, effective way of:

- a) identifying safety (or risk) exposure
- b) evaluating the safety deficiencies and level of risk
- c) correcting the safety deficiencies
- d) managing the risk through safety of operations

Operators of refrigeration systems need to be concerned with both employee and public safety. Safety regulations and requirements are changing constantly. When was the last time your refrigeration system was thoroughly inspected for safety? The S.A.F.E.R. program will show you how. It will also provide you with some valuable documentation to assist you in your risk management activities.

The S.A.F.E.R. Program has many other benefits:

1. Improved understanding of the legislation and regulations affecting refrigeration systems.
2. Improved understanding of operational responsibilities/service responsibilities by staff and refrigeration service contractors.
3. Diagnostic updates on the status of refrigeration system components.

4. Data for development of maintenance programs and budgets (planned/preventive/ programmed/ replacement).
5. Insurance premiums maintained at the lowest possible level.
6. Safe environment for employees and public.
7. Improved plan for risk avoidance.
8. Less chance of negligence and impending liability.
9. Peace of mind!

HOW TO GET STARTED

The S.A.F.E.R. Program is yours to use in the manner that best meets the needs of your organization. Perhaps you already have a thorough inspection program. GREAT! Just use this one as an additional resource tool. If your organization doesn't inspect your refrigeration system on a regular basis, the S.A.F.E.R. Program is for YOU!

FOLLOW THESE STEPS:

- Read the document thoroughly
- If you need further clarification, call the Ontario Recreation Facilities Association Office 1-800-661-ORFA (6732) for assistance.
- Talk to your employer about the value of the program and how it could be applied in your organization.
- Talk to your refrigeration service contractor about it.
- Call a meeting with your staff about the program.
- Conduct the inspection (jointly or independently).
- Notify your owner representative of the inspection results and any required actions.
- Act on the information compiled as required.
- Communicate your actions with the appropriate authorities (i.e.: insurance carrier, local inspectors, etc.).
- Develop a program for re-inspection on a regular basis and incorporate into your risk management program.

You will then reap the benefits of a S.A.F.E.R. refrigeration system!!!

For further assistance regarding information pertinent to legislation, regulations, training programs or risk management programs, please contact the O.R.F.A. Office at 1-800-661-ORFA (6732). We will be pleased to assist you!

SAFETY

Training – DO	DO NOT
<ul style="list-style-type: none"> Send your key personnel to industry, government or other sponsored safety training courses and/or conduct “in house” safety training courses for your personnel. 	<ul style="list-style-type: none"> Assume people will conduct themselves in a safe manner. The safety of the system and of employees is first the responsibility of management and secondly that of the operators/maintenance personnel.
<ul style="list-style-type: none"> Train personnel in the proper use of protective equipment. 	<ul style="list-style-type: none"> Allow inexperience, haste or fatigue to affect good judgement and considerations for safety.
<ul style="list-style-type: none"> Conduct drills to train personnel in emergency procedures. 	
<ul style="list-style-type: none"> Train your personnel in the safe use of all tools and equipment and in the safe response to emergencies. 	
<ul style="list-style-type: none"> Acquaint your local Fire Department with your plant, personnel, safety plans and procedures - involve them in safety drills. 	
<ul style="list-style-type: none"> Comply with federal, state/provincial and local laws and regulations concerning the release of gases or liquids from a refrigeration system. 	
Equipment - DO	DO NOT
<ul style="list-style-type: none"> Use safety glass or safety face shield to protect eyes. Install appropriate size and type of fire extinguishers in all machinery rooms. 	
<ul style="list-style-type: none"> Keep recommended protective equipment readily available and in clean, sanitary and workable condition. Provide as appropriate, gas mask, air packs, water sprays, eye wash stations, emergency lighting, and protective clothing. 	
<ul style="list-style-type: none"> Attach safety tags appropriately labelled, dated and signed to valves, switches, equipment, etc. when making repairs. Ex. “Danger”, “Hands Off”, “Do Not Operate”, “Do Not Throw Switch”, “Do Not Open”, etc. 	
<ul style="list-style-type: none"> Insure that all wiring is in accordance with governing electrical codes. 	

OPERATIONS

DO	DO NOT
<ul style="list-style-type: none"> • Cordon off equipment or areas under repair. 	<ul style="list-style-type: none"> • Work on any system component without having help nearby and observing.
<ul style="list-style-type: none"> • Install machinery guards in accordance with applicable codes. 	<ul style="list-style-type: none"> • Smoke in refrigeration machinery rooms.
<ul style="list-style-type: none"> • Protect personnel from falling by using approved safety ladders or platforms. 	<ul style="list-style-type: none"> • Attempt repairs to equipment with power "ON".
<ul style="list-style-type: none"> • Lock "OFF" and tag the source of power supply before working on electrical wiring or electrically operated devices or electrically driven equipment. 	<ul style="list-style-type: none"> • Energize a solenoid valve with the coil cover or plunger assembly removed.
<ul style="list-style-type: none"> • Permit only electricians who are qualified/certified to work on power or control wiring and electrical devices and equipment. 	<ul style="list-style-type: none"> • Attempt to repair safety relief valves.
<ul style="list-style-type: none"> • Return safety relief valves to the manufacturer or to certified inspection stations for repair and/or resetting. 	<ul style="list-style-type: none"> • Use a solenoid valve as a shut off valve while making repairs.
<ul style="list-style-type: none"> • Use only positive closing shut-off valves to isolate equipment or system components when parts or a refrigeration system are to be opened up or removed for inspection and service or repair. 	<ul style="list-style-type: none"> • Rely on a check valve to be tight holding when making repairs.
<ul style="list-style-type: none"> • Remove seal cap covers with caution. Liquid refrigerant can accumulate under these covers. 	<ul style="list-style-type: none"> • Subject threaded parts to excessive torque.
<ul style="list-style-type: none"> • Avoid contact with liquid refrigerant. 	<ul style="list-style-type: none"> • Attempt to tighten valve bonnets of screwed bonnet valves unless the valve is in a partially open position.
<ul style="list-style-type: none"> • Use a backup wrench on mating parts when loosening a screwed joint. 	<ul style="list-style-type: none"> • Open a screwed bonnet valve without first determining the condition of the packing nut and packing to avoid unscrewing the packing nut or the valve bonnet.
<ul style="list-style-type: none"> • Approach a potentially hazardous area with caution. Escaping refrigerant can have a startling effect. Use approved protective masks, clothing, safety ladders and/or platforms and other equipment as appropriate. 	<ul style="list-style-type: none"> • Purge or purposely release refrigerant into a room; especially an equipment room.

<ul style="list-style-type: none"> • Before opening an operating refrigeration system: <ol style="list-style-type: none"> a. Isolate the portion of the system to be opened by using only positive acting manual shutoff valves. b. Reduce the pressure to zero psig by pumping out or by controlled bleed off of pressure in a manner acceptable to environmental regulations. c. Remove all liquid refrigerant in the portion of the system involved before opening it up. d. Follow only safe practices and procedures to avoid accidents using protective masks, clothing and equipment as appropriate. e. Consult with acknowledged industry experts if at all uncertain of the procedure to follow. 	<ul style="list-style-type: none"> • Attempt repairs contrary to manufacturer's recommendations or warranties. (Ex. Compressors, control valves, pumps, switches, controls.) • Open up section of a refrigeration system before determining that the pressure has been reduced to 0 psi gauge and that liquid refrigerant has been removed.
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Maintenance

- Periodically, at least once a year, have the system(s), including all components and controls, inspected by qualified/certified personnel according to a planned maintenance schedule.
- Regularly inspect and test safety relief valves. Re-certification or replacement of all safety relief valves after no more than five years service is required under the Regulations.
- Return control valves or regulators to the factory for thorough inspection and rebuilding when extensive repairs are required, especially those more than three years old. Spare parts kept in storage should be checked for corrosion and against manufacturer's latest assembly bulletin to be sure current parts are being used.
- Observe the manufacturer's torque requirements for tightening threaded parts of refrigeration system components when servicing, maintaining and/or repairing these items.
- Inspection and cleaning of strainers should be included in the planned maintenance schedule. Should a component downstream of a particular strainer require servicing or repair the companion strainer should also be inspected and cleaned.
- Stop all moving equipment when making adjustments whenever possible. Anything dropped into moving machinery can result in serious injury to the operator and damage to the machinery.

- Whenever maintenance may involve major overhaul and/or repair of system component(s) it may be necessary or advisable to shut down the entire system or at least shut down and isolate the major component(s) to be overhauled/repaired. A review of section 3 - Operation and Repair is suggested plus a review of manufacturer's instructions, system drawings and/or other applicable information as may be required. Refrigerant vapour and/or liquid must be pumped out of the component(s) or otherwise removed and the component(s) must be properly isolated using the appropriate hand shut off valves in the system.
- Before the component(s) are opened to the atmosphere or the environment, a positive determination should be made for the remaining presence of refrigerant vapour and/or liquid. Knowledge of the refrigerant's saturated pressure/temperature characteristics must be known along with the existing pressure and temperature in the component(s) and the ambient temperature in order to determine that all liquid has been removed and that the vapour pressure is 0 psig and safe to vent.
- Local, provincial and/or federal regulations should be reviewed with regard to the release of refrigerants, brine(s) and solvent(s) to the atmosphere or environment.
- Prior consideration should be given to the need for protective equipment and clothing, tools, ladders, platforms, etc.

Handling Refrigerant Cylinders

Do not remove or change the numbers or marks stamped onto cylinders.	
Storage - DO	DO NOT
<ul style="list-style-type: none"> • Store cylinders in a cool, shaded area and/or under a roof, not over 125°F, to protect them against weather extremes. 	<ul style="list-style-type: none"> • Do not remove or change the numbers or marks stamped onto cylinders
<ul style="list-style-type: none"> • Protect cylinders from any object producing a cut or abrasion on the surface of the cylinder material. 	<ul style="list-style-type: none"> • Store cylinders near flammable substances such as oil, gasoline, and waste or in buildings with a definite fire hazard.
<ul style="list-style-type: none"> • Keep valves tightly closed and with valve caps and/or plugs in place when cylinders are not in use. 	<ul style="list-style-type: none"> • Heat a cylinder above 125°F or permit it to stay in the hot sun.
Transportation - DO	DO NOT
<ul style="list-style-type: none"> • Protect against tampering by unauthorized individuals. 	<ul style="list-style-type: none"> • Lift cylinders by the cap.
<ul style="list-style-type: none"> • Strap or chain cylinders to a wall or other fixed restraint. 	<ul style="list-style-type: none"> • Drop cylinders or permit them to strike violently against each other or against other surfaces or roll around in transit.
<ul style="list-style-type: none"> • Use a crane with a safe cradle or platform to handle cylinders. 	<ul style="list-style-type: none"> • Drag or slide cylinders.
<ul style="list-style-type: none"> • Allow handling only by experienced and properly instructed persons. 	<ul style="list-style-type: none"> • Use a lifting magnet or sling (rope or chain) when handling cylinders.
<ul style="list-style-type: none"> • Comply with applicable regulations as they cover "off premises" transportation of refrigerants. 	<ul style="list-style-type: none"> • Use cylinders as rollers or support.

Canada - Transportation of Dangerous Goods Act Regulations 18 January 1985 and amendments.	
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Careful Use

DO	DO NOT
<ul style="list-style-type: none"> Play it safe; to heat a cylinder, use hot water. 	<ul style="list-style-type: none"> Apply an open flame or live steam to a cylinder or cylinder valve.
<ul style="list-style-type: none"> Be aware-some cylinders have fusible metal devices which start to melt at 157 °F. 	<ul style="list-style-type: none"> Tamper with safety devices in valves or cylinders or attempt to repair or alter cylinders or valves.
<ul style="list-style-type: none"> Always use a pressure gauge when charging a system. 	<ul style="list-style-type: none"> Force connections that do not fit.
<ul style="list-style-type: none"> Make sure the threads on regulators or other auxiliary equipment are the same as those on the cylinder valve. 	<ul style="list-style-type: none"> Use a cylinder unless it is properly supported to prevent it from being knocked over.
<ul style="list-style-type: none"> Keep sparks and flames away. 	<ul style="list-style-type: none"> Use compressed gas where the cylinder is apt to be contaminated by the feedback of process materials unless protected by suitable check valves.
<ul style="list-style-type: none"> Blow out charging lines before filling. Plug ends wherever possible when not in use. 	<ul style="list-style-type: none"> Use cylinders as rollers or support.
<ul style="list-style-type: none"> Keep cylinder discharge valves clean. After removing the valve cap, slightly open the valve for just an instant with the valve pointed away from yourself and other persons to remove dirt particles from the openings, before using the refrigerant. 	<ul style="list-style-type: none"> Refill cylinders without the owner's permission.
<ul style="list-style-type: none"> Use approved goggles and gloves when connecting and/or disconnecting cylinders. Keep an approved gas mask available at all times. 	
<ul style="list-style-type: none"> Use connections, regulators, gauges, hoses and other appliances designed specifically and stamped accordingly for the refrigerant(s) with which they will be used. 	
<ul style="list-style-type: none"> Should vapour leak between the stem and packing nut opening, close the valve and tighten the packing nut down (turn counter clockwise) on ammonia cylinders. Reopen the valve. Should leaking persist call the supplier immediately. 	

To Obtain Refrigerant:

Ammonia (liquid): place cylinder on its side with valve outlet up

Ammonia (vapour): leave cylinder in upright position.

Halocarbons: keep cylinder in upright position and open appropriate valve for liquid or vapour.

In the Event of a Leak or Spill**Keep Calm**

1000 ppm (parts per million) of refrigerants R-12, R-22, and R-502, mixed with air, are relatively harmless. However, halocarbon refrigerants decompose in contact with a flame and form highly toxic products. These products can be fatal or cause serious injury in a short time, even when present in low concentrations.

If an electric heating element or open flame is located in a room where any refrigerant has leaked, ventilate the room before entering and turn off the heating element or open flame.

Ventilate the Area

Anhydrous ammonia is not a cumulative poison. It has a distinctive pungent odour that, even at low concentrations, is detectable by most people. No person will voluntarily remain in hazardous concentrations. Since ammonia gas is lighter than air, adequate ventilation is the best means of preventing an accumulation. Halocarbon refrigerants are heavier than air and will displace air at lower levels and in pits.

Call a Doctor

Any person overcome in a space lacking oxygen, due to high concentrations of halocarbon or ammonia refrigerant vapour, should be removed at once from the contaminated atmosphere. Administer artificial respiration, either manually or with a suitable inhalator operated by trained personnel.

Liquid from R-12, R-22, and R-502 refrigerants is -21°F or colder. Should liquid from any of these refrigerants contact the skin, the injury is similar to frost bite. Treat by splashing the affected area with water to raise the temperature above freezing.

Wash the Affected Area

Ammonia liquid splashes or concentrated vapour can cause skin burns. Liquid ammonia at atmospheric pressure is -28°F. Wash a person splashed with liquid or exposed to concentrated vapour immediately with large quantities of water. Continue this procedure for at least 15 minutes, removing all clothing while washing. After washing, apply wet compresses (solution of 2% of boric acid in distilled water) to affected parts until medical advice is available.

If ammonia liquid or vapour gets into a person's eyes, wash the eyes immediately, for at least 30 minutes, with the above solution of boric acid in distilled water.

Wear a Mask & Goggles

Avoid breathing any liquid refrigerant mist into the lungs, it can be fatal.

Always wear goggles when opening any part of a refrigerating system.

When checking for leaks with a halide leak detector avoid fumes produced by the flame in contact with refrigerant. These fumes are toxic. Preferably, use an electronic leak detector.

REFRIGERATION

SAFETY INSPECTION CHECKLIST

OWNER: _____

ADDRESS: _____

PLANT LOCATION: _____

OWNER'S REPRESENTATIVE ON-SITE: _____
(e.g. Manager)

PERSON PERFORMING INSPECTION: _____

DATE OF INSPECTION: _____

NAME OF COMPANY DOING INSPECTION: _____

REFRIGERATION SAFETY INSPECTION CHECKLIST

OWNER: _____

ADDRESS: _____

COMPRESSORS

IDENTIFYING MARK/NO.: _____

EQUIPMENT LOCATION: _____

MANUFACTURER: _____ YEAR MANUFACTURED: _____

MODEL NO: _____

SERIAL NO: _____

REFRIGERANT TYPE: _____

COMPRESSOR TYPE: _____

RECIPROCATING	<input type="checkbox"/>	ROTARY SCREW	<input type="checkbox"/>
ROTARY VANE	<input type="checkbox"/>	VERT RECIPROCATING	<input type="checkbox"/>

TYPE OF RELIEF VALVE:

INTERNAL	<input type="checkbox"/>	EXTERNAL	<input type="checkbox"/>	NONE	<input type="checkbox"/>
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OPERATING RPM: _____ NAMEPLATE MAX. RPM: _____

OPERATING PRESSURES: SUCTION _____ PSIG; DISCHARGE _____ PSIG

RECOMMENDED MAXIMUM DISCHARGE _____ PSIG

OPERATING COMPRESSION RATIO (DISCHARGE PSIA/SUCTION PSIA): _____

MAXIMUM COMPRESSION RATIO: _____

BORE AND STROKE OF MACHINE: _____

SAFETY CUTOUPS:	SETTING	FUNCTIONS PROPERLY?
- HIGH PRESSURE	_____ PSIG	YES NO
- LOW PRESSURE	_____ PSIG	YES NO
- OIL PRESSURE	_____ PSIG	YES NO

REFRIGERATION SAFETY INSPECTION CHECKLIST

OWNER: _____

ADDRESS: _____

COMPRESSORS

IDENTIFYING MARK/NO.: _____

TYPE OF DRIVE:

- BELT
 DIRECT

Circle Yes or No

DOES THE DRIVE MECHANISM/GUARD (BELTS, SHEAVES, COUPLING, ETC.) APPEAR TO COMPLY WITH SAFETY REGULATIONS?	<i>YES or NO</i>
HAS THE COMPRESSOR BEEN ALTERED, MODIFIED, OR REPAIRED IN SUCH A WAY THAT MIGHT AFFECT THE CASING INTEGRITY?	<i>YES or NO</i>
HAS THE CASING BEEN RE-CERTIFIED AND ARE RE-CERTIFICATION PAPERS AVAILABLE AT THE PLANT?	<i>YES or NO</i>
IS THE COMPRESSOR FREE FROM EXCESSIVE VIBRATION?	<i>YES or NO</i>
IS THE COMPRESSOR ANCHORED SECURELY IN PLACE?	<i>YES or NO</i>
ARE THERE ANY OTHER CONDITIONS THAT MIGHT NEGATIVELY AFFECT SAFE COMPRESSOR OPERATION?	<i>YES or NO</i>

IF YES, PLEASE DESCRIBE BELOW:

REFRIGERATION SAFETY INSPECTION CHECKLIST

OWNER: _____

ADDRESS: _____

VESSELS

IDENTIFYING MARK/NO.: _____

LOCATION: _____

MANUFACTURER: _____ YEAR MANUFACTURED: _____

PRESSURE (PSIG): NORMAL OPERATING _____; MAX ALLOWANCE _____

DIAMETER (IN.): _____ LENGTH (FT.): _____

Circle Yes or No

IS VESSEL ASME STAMPED?	YES or NO
REGISTRATION Nos.: OIN _____ CRN _____	
TO YOUR KNOWLEDGE HAS THIS VESSEL EVER BEEN ALTERED OR MODIFIED?	YES or NO
IF ALTERED, WAS VESSEL RE-CERTIFIED?	YES or NO
ARE ASME CERTIFIED PRINTS AVAILABLE?	YES or NO

INSULATION CONDITION:

- | | | |
|---------------|--------------------------|---|
| GOOD | <input type="checkbox"/> | NO SIGN IF VAPOUR BARRIER LEAKS |
| FAIR | <input type="checkbox"/> | SLIGHT SIGN OF VAPOUR BARRIER LEAKS |
| POOR | <input type="checkbox"/> | EXTENSIVE SIGNS OF VAPOUR BARRIER LEAKS |
| NOT INSULATED | <input type="checkbox"/> | |

VESSEL CONDITION:

- | | | |
|-----------|--------------------------|--|
| EXCELLENT | <input type="checkbox"/> | NO VISIBLE CORROSION |
| GOOD | <input type="checkbox"/> | SOME EXTERNAL CORROSION VISIBLE LESS THAN 25% OF SURFACE |
| POOR | <input type="checkbox"/> | EXTENSIVE CORROSION SHOULD BE EXAMINED BY A QUALIFIED ENGINEER |
| UNKNOWN | <input type="checkbox"/> | DUE TO INSULATION |

REFRIGERATION SAFETY INSPECTION CHECKLIST

OWNER: _____

ADDRESS: _____

SHELL & TUBE HEAT EXCHANGERS

IDENTIFYING MARK/NO.: _____

LOCATION: _____

APPLICATION : _____

MANUFACTURER: _____ YEAR MANUFACTURED: _____

PRESSURE (PSIG): NORMAL OPERATING _____; MAX ALLOWANCE _____

DIAMETER (IN.): _____ LENGTH (FT.): _____

Circle Yes or No

IS VESSEL ASME STAMPED?	YES or NO
REGISTRATION Nos. OIN _____ CRN _____	
TO YOUR KNOWLEDGE HAS THIS VESSEL EVER BEEN ALTERED OR MODIFIED?	YES or NO
IF ALTERED, WAS VESSEL RE-CERTIFIED?	YES or NO
ARE ASME CERTIFIED PRINTS AVAILABLE?	YES or NO

INSULATION CONDITION:

- | | | |
|---------------|--------------------------|---|
| GOOD | <input type="checkbox"/> | NO SIGN OF VAPOUR BARRIER LEAKS |
| FAIR | <input type="checkbox"/> | SLIGHT SIGN OF VAPOUR BARRIER LEAKS |
| POOR | <input type="checkbox"/> | EXTENSIVE SIGNS OF VAPOUR BARRIER LEAKS |
| NOT INSULATED | <input type="checkbox"/> | |

VESSEL CONDITION:

- | | | |
|-----------|--------------------------|---|
| EXCELLENT | <input type="checkbox"/> | NO VISIBLE CORROSION |
| GOOD | <input type="checkbox"/> | SOME EXTERNAL CORROSION VISIBLE |
| GOOD | <input type="checkbox"/> | SOME EXTERNAL CORROSION VISIBLE LESS THAN 25% OF SURFACE |
| POOR | <input type="checkbox"/> | EXTENSIVE CORROSION, SHOULD BE EXAMINED BY A QUALIFIED ENGINEER |
| UNKNOWN | <input type="checkbox"/> | DUE TO INSULATION |

- | | | |
|---|-----|----|
| • OIL POT? | YES | NO |
| • IS THERE AN OIL POT RELIEF VALVE? | YES | NO |
| • IS OIL RELIEF VALVE PROPERLY PIPED TO ATMOSPHERE? | YES | NO |

REFRIGERATION SAFETY INSPECTION CHECKLIST

OWNER: _____

ADDRESS: _____

SHELL & TUBE HEAT EXCHANGERS (BRINE CHILLER)

IDENTIFYING MARK/NO.: _____

SAFETY RELIEF VALVE:

- | | | |
|-------|------------------|--------------------------|
| TYPE: | SINGLE | <input type="checkbox"/> |
| | DUAL | <input type="checkbox"/> |
| | NONE | <input type="checkbox"/> |
| | ARE SEALS INTACT | <input type="checkbox"/> |

PRESSURE SETTING: _____ PSIG; RATING _____ LBS. REFRIGERANT FOR EACH VALVE: _____

YEAR OF MANUFACTURE OR RE-CERTIFICATION: _____

RELIEF VALVE OUTLET SIZE: _____ IN. OUTLET PIPE SIZE: _____

INLET SIZE: _____ IN

Circle Yes or No

IS VALVE PROPERLY PIPED TO ATMOSPHERE?	YES or NO
--	------------------

CONDITION:

- | | | |
|-----------|--------------------------|---|
| EXCELLENT | <input type="checkbox"/> | CLEAN, NO VISIBLE RUST, CORROSION |
| GOOD | <input type="checkbox"/> | SOME EXTERNAL RUST/CORROSION VISIBLE LESS THAN 25% OF SURFACE |
| POOR | <input type="checkbox"/> | MUCH SURFACE RUST/ CORROSION VISIBLE |
| UNKNOWN | <input type="checkbox"/> | SURFACE AND INTERNAL RUST/CORROSION |

SIGHT GLASS:

TYPE: **TUBULAR** **BULLS EYE** **NONE**

- | | | |
|--|-----|----|
| • PROTECTED FROM TRAFFIC HAZARDS? | YES | NO |
| • INTERNAL CHECK-TYPE SHUT-OFFS? | YES | NO |
| • 360° GAUGE GLASS GUARDS? | YES | NO |
| • IS HIGH LEVEL SWITCH OPERATIONAL? | YES | NO |
| • ARE THERE ANY OTHER CONDITIONS THAT MIGHT NEGATIVELY AFFECT SAFE HEAT EXCHANGER OPERATION? | YES | NO |

IF YES, PLEASE DESCRIBE:

REFRIGERATION SAFETY INSPECTION CHECKLIST

OWNER: _____

ADDRESS: _____

EVAPORATIVE CONDENSERS

IDENTIFYING MARK/NO.: _____

LOCATION: _____

MANUFACTURER: _____ YEAR MANUFACTURED: _____

MODEL NO: _____

SERIAL NO: _____

CRN NO: _____ (Required on new condensers after Oct. 1, 1989)

Circle Yes or No

IS CONDENSER ADEQUATELY ANCHORED AND SUPPORTED?	YES or NO
IS THERE SAFE ACCESS FOR NORMAL SERVICE AND MAINTENANCE?	YES or NO
IS THE UNIT FREE FROM EXCESSIVE, VISIBLE VIBRATION?	YES or NO
IF ALTERED, WAS VESSEL RE-CERTIFIED?	YES or NO
IS THERE ADEQUATE PROTECTION AGAINST TRAFFIC HAZARDS?	YES or NO
ARE THERE ANY OTHER CONDITIONS THAT MIGHT NEGATIVELY AFFECT SAFE EVAPORATIVE CONDENSER OPERATION?	YES or NO

IF YES, PLEASE DESCRIBE BELOW:

REFRIGERATION SAFETY INSPECTION CHECKLIST

OWNER: _____

ADDRESS: _____

SYSTEM

Circle Yes or No

IS ALL PIPING ADEQUATELY SUPPORTED AND ANCHORED?	YES or NO
IS ALL PIPING ADEQUATELY PROTECTED FROM TRAFFIC HAZARDS?	YES or NO
IS ALL PIPING FREE OF ABNORMAL ICE FORMATIONS?	YES or NO
IS ALL PIPING PROPERLY MARKED (PRESSURE, TEMPERATURE, AND FLOW DIRECTION)?	YES or NO
IS THE SYSTEM FREE OF ABNORMAL SOUNDS AND VIBRATIONS?	YES or NO
IS THE SYSTEM FREE OF REFRIGERANT LEAKS, EXCEPT TRACES IN THE ENGINE ROOM?	YES or NO
IS ALL PERSONAL PROTECTIVE EQUIPMENT AVAILABLE AND IN GOOD WORKING CONDITION, INCLUDING BREATHING APPARATUS WHERE REQUIRED BY THE LOCAL JURISDICTION?	YES or NO
IS AN UP-TO-DATE DETAILED OPERATING PROCEDURES MANUAL RELATING TO PROCEDURES FOR TRAINING AND THE OPERATION OF ALL EQUIPMENT AND SYSTEMS AND ALL EMERGENCY PROCEDURES AND ACCEPTED BY THE CHIEF OPERATOR AVAILABLE ON THE PREMISES?	YES or NO
ARE THERE SIGNS PROVIDING PROPER EMERGENCY INSTRUCTIONS?	YES or NO
IS THERE A WRITTEN EVACUATION PLAN?	YES or NO
IS THERE A SIGN IN THE ENGINE ROOM WITH THE NAME AND ADDRESS OF INSTALLING/SERVICING CONTRACTOR, THE APPROPRIATE AMOUNT OF REFRIGERANT IN THE SYSTEM AND THE FIELD TEST PRESSURE? SYSTEM CHARGE: _____ LBS.	YES or NO
ARE SHOWER HEAD AND EYEWASH AVAILABLE NEAR ENGINE ROOM?	YES or NO
DOES THE ENGINE ROOM EXHAUST FAN WORK?	YES or NO
EXHAUST QUANTITY: _____ CFM	YES or NO
DOES A REFRIGERANT LEAK DETECTOR CONTROL THE FAN?	YES or NO

REFRIGERATION SAFETY INSPECTION CHECKLIST

OWNER: _____

ADDRESS: _____

SYSTEM

Circle Yes or No

ARE AISLES IN THE ENGINE ROOM CLEARLY MARKED AND CLEAR OF OBSTRUCTIONS; IN THE EVENT OF A LEAK, CAN PERSONNEL EXIT QUICKLY AND SAFELY?	YES or NO
IS THERE MORE THAN ONE EXIT FROM THE ENGINE ROOM?	YES or NO
ARE EXIT/EXITS CLEAR OF PIPING/EQUIPMENT?	YES or NO
IS THERE AN UPDATED SYSTEMS SCHEMATIC DRAWING AVAILABLE?	YES or NO
CAN THE MAIN LIQUID REFRIGERANT FEED BE SHUT-OFF FROM OUTSIDE THE ENGINE ROOM?	YES or NO
IS THERE A MSDS PROCEDURE AVAILABLE FOR ALL REFRIGERANTS?	YES or NO
IS THE PIPING ARRANGED SO THAT LIQUID REFRIGERANT CANNOT BE TRAPPED BETWEEN THE PUMP DISCHARGE CHECK VALVE AND SHUT-OFF VALVE?	YES or NO
IF NO, IS THERE A PROPERLY PIPED RELIEF VALVE THERE?	YES or NO
ARE ALL GAUGES IN WORKING ORDER?	YES or NO
ARE ALL REFRIGERANT CYLINDERS DISCONNECTED FROM SYSTEM?	YES or NO
ARE COVERS SECURELY ON ALL ELECTRICAL PANELS/JUNCTION BOXES?	YES or NO
HAS A FORMAL INSPECTION OF THE ENTIRE SYSTEM BEEN COMPLETED BY A COMPETENT PERSON WITHIN THE LAST 12 MONTHS? IF NO, NAME THE SERVICE COMPANY: _____ _____	YES or NO
IS THERE A LOCKOUT PROCEDURE AVAILABLE?	YES or NO
ARE THERE ANY OTHER CONDITIONS THAT MIGHT NEGATIVELY AFFECT SAFE SYSTEM OPERATIONS? IF YES, PLEASE DESCRIBE BELOW: _____ _____ _____	YES or NO