INDUSTRIAL COMMISSION OF WISCONSIN

REFRIGERATING PLANT CODE

Effective June 26, 1918

INTRODUCTION

The Industrial Commission of Wisconsin, by Chapter 101 of the Statutes, is charged with the duty of fixing standards of safety in all places of employment. In performance of this duty the Industrial Commission from time to time has issued general orders establishing standards of safety to guard against hazards of various kinds.

Heretofore there have been no special orders dealing with safety in refrigerating plants. All refrigerating machines work under very high pressure and some of them emit poisonous gases. There are thus two hazards in connection with the operation of refrigerating machines: one from flying parts of ruptured machinery, and the other that of suffocation from poisonous gases.

To eliminate as far as possible the dangers attendant to this class of machinery, the commission in 1917 decided to develop a safety code for refrigerating plants. In accordance with its usual policy of having safety rules prepared by practical men of the industry directly affected, the commission on June 13, 1917, appointed the following Advisory Board:

* Theodore O. Vilter, President Vilter Mfg. Company of Milwaukee, representing manufacturers of refrigerating machinery.
J. A. Weickert, engineer Schlitz Brewing Company, representing the operating engineers in refrigerating plants.
M. A. Edgar, of the Industrial Commission of Wisconsin.

This board after numerous conferences, drafted a code of safety rules for refrigerating plants, upon which a general public hearing was conducted May 10, 1918, at Milwaukee, Wisconsin. At this public hearing some slight modifications were suggested, in the proposed rules, which were accepted by the Advisory Board.

* Deceased

The rules as finally reported by the Advisory Board were unanimously adopted by the commission on May 20, 1918. They were published in the official state paper on May 27, 1918, and by the terms of the Industrial Commission law became effective on June 26, 1918.

As stated above this refrigerating plant code was adopted by the Industrial Commission under authority of Chapter 101, of the Statutes of Wisconsin. These orders have the force and effect of law. Any interested party may petition the commission for hearing on the reasonableness of any of its orders, and, if the petition be denied, he may appeal to the Circuit Court for Dane County. The orders of the commission, however are *prima facie* reasonable and lawful and valid and in force, until they are found otherwise by the courts or until the orders are revoked by the commission. Violation of any order is punishable by a forfeiture of from ten dollars to one hundred dollars per day for each offense.

GENERAL ORDERS

Order 4500—When Effective. These orders shall take effect at once on all refrigerating plants installed after September 1, 1918. All plants heretofore installed shall be made to comply with these orders not later than February 1, 1919, except that where an especially dangerous condition exists the Industrial Commission may require compliance at once.

Order 4501—Application Required. After September 11, 1918, no refrigerating plant shall be installed until the manufacturer shall have filled out and sent to the Industrial Commission an application on the blank form furnished by the commission.

Order 4502—Refrigerating Machine Defined. A refrigerating machine is any device which is designed or used for raising the pressure of any refrigerating agent by mechanical compression, and will be considered to be that portion of the apparatus beginning at the gas intake connection and extending as far as the first stop valve on the discharge pipe.

Order 4503—Safety Valve Defined. A safety valve is an approved sealed mechanical device which will automatically prevent a pressure in excess of these orders, and which operates by allowing the free escape of the released element as outlined in Orders 4504–4506.

Order 4504—Safety Appliances. Safety appliances shall be constructed of materials which are not likely to be corroded by either the gases or the liquids with which they may come in contact.

Order 4505—Liquid Receiver. Each liquid receiver for machines exceeding three tons capacity shall be equipped with a safety valve not less than ½-inch in diameter.

The outlet from the safety valve shall be at least as large as the inlet. There may be a stop valve between the safety valve and the receiver. The stop valve shall be sealed open.

The discharge from such safety valve shall be continuous piping to a point not less than 6 feet above the roof of the building containing the refrigerating apparatus and as remote as practical from the walls of other buildings.

When ammonia is discharged into the atmosphere, a diffuser shall be attached to the upper end of the discharge pipe. The diffuser shall be the same size as the discharge pipe.

The safety valve or valves shall be set to blow freely at or under the following pressures:

Carbon dioxide	1,500 pounds per square inch
Ammonia	350 pounds per square inch
Ethyl chloride	115 pounds per square inch
Sulphur dioxide	115 pounds per square inch

Order 4506—Compressors. Each compressor shall be equipped with one or more safety valves located on the discharge side of the compressor and between the compressor and the first stop valve and there shall be no stop valve of any description between the safety valve or valves and the compressor. In machines not exceeding three tons capacity the safety valve shall be placed between the check valve and the stop valve in the discharge pipe.

The discharge from such safety valve or valves may be conducted to the suction pipe above the stop valve.

The discharge from several safety valves may be conducted to a common discharge pipe, provided the area of the discharge pipe is equal to the sum of the areas of the outlets of the safety valves.

Safety valves on the discharge side of the compressor shall be set to blow freely at or under the following pressures:

Carbon dioxide	1,450 pounds per square inch
Ammonia	300 pounds per square inch
Ethyl chloride	100 pounds per square inch
Sulphur dioxide	100 pounds per square inch

The size of the safety valve for the compressor shall be not less than the following, the tonnage being calculated on the basis of 7,500 cubic inches displacement per minute per ton.

Capacity of Machine.	**Size of Valve.**
Not exceeding 1 ton	Same size as discharge pipe.
Over 1 ton to 10 tons	½ inch
Over 10 tons to 25 tons	¾ inch
Over 25 tons to 40 tons	1 inch
Over 40 tons to 60 tons	1¼ inches
Over 60 tons to 100 tons	1½ inches
Over 100 tons to 140 tons	2 inches
Over 140 tons to 190 tons	2½ inches
Over 190 tons to 300 tons	3 inches

Order 4507—Absorption. A safety valve shall be placed on the pipe from the generator to the absorber or brine cooler between the generator and the first stop valve. This valve shall be set to blow freely at or below 300 pounds per square inch.

The table in Order 4506 shall be used to determine the size of the safety valve and the discharge shall be as set forth in Order 4505.

Order 4508—Check Valves. A check valve shall be placed in the discharge pipe of the compressor as close to the compressor as practical.

Check valves in an absorption plant shall be located between rectifier and condenser, and in the discharge line close to the acqua ammonia pump.

Order 4510—Maintenance. All refrigerating plants shall be maintained in safe condition. If any part of a refrigerating machine, or any piping in connection with such machine becomes dangerous through corrosion or any other cause it shall be replaced forthwith.

Order 4511—Helmets. All large refrigerating plants shall be equipped with helmets or masks, which will permit the wearer without suffocation, to reach any part of the refrigerating system. In plants of 15 to 75 tons refrigerating capacity, there shall be at least one such helmet or mask, and in plants of more than 75 tons capacity there shall be at least two such helmets or masks.

Order 4512—Air Test. Old plants shall not be tested to a greater pressure than 100 pounds per square inch, and the pressure shall be built up slowly.

Order 4513—Surplus Stock. Surplus stock of refrigerating chemical shall be stored in a cool place.

Order 4514—Location of Refrigerating Apparatus. Every refrigerating machine hereafter installed, exceeding three tons capacity, and which uses ammonia or ethyl chloride, shall be placed in a room apart from any other room where more than five persons are assembled or employed.

No such room shall be used as a dressing, lunch or recreation room except by those actively engaged in the operation of the refrigerating machinery.

Machines not exceeding three tons capacity, when installed in a room where more than five persons are assembled or employed, shall be substantially enclosed, with an opening to the outside, if in the judgment of the commission such enclosure is necessary to the safety of such persons.

DEMOCRAT PRINTING COMPANY
MADISON, WISCONSIN

INDUSTRIAL COMMISSION
OF
WISCONSIN

REFRIGERATING PLANT CODE

Effective June 26, 1918

INTRODUCTION

The Industrial Commission of Wisconsin, by Sections 2394—41 to 2394—71 of the Statutes, is charged with the duty of fixing standards of safety in all places of employment. In performance of this duty the Industrial Commission from time to time has issued general orders establishing standards of safety to guard against hazards of various kinds.

Heretofore there have been no special orders dealing with safety in refrigerating plants. All refrigerating machines work under very high pressure and some of them emit poisonous gases. There are thus two hazards in connection with the operation of refrigerating machines: one from flying parts of ruptured machinery, and the other that of suffocation from poisonous gases.

To eliminate as far as possible the dangers attendant to this class of machinery, the commission in 1917 decided to develop a safety code for refrigerating plants. In accordance with its usual policy of having safety rules prepared by practical men of the industry directly affected, the commission on June 13, 1917, appointed the following Board of Rules for Refrigerating Plants:

Theodore O. Vilter, president Vilter Mfg. Company of Milwaukee, representing manufrcturers of refrigerating machines.

J. A. Weickert, engineer Schlitz Brewing Co., representing the operating engineers in refrigtrating plants:

M. A· Edgar, boiler inspector of the Industrial Commission of Wisconsin.

This board, after numerous conferences, drafted a code of safety rules for refrigerating plants, upon which a general public hearing was conducted May 10, 1918, at Milwaukee, Wisconsin. At this public hearing some slight modifications were suggested in the proposed rules, which were accepted by the Board of Rules for Refrigerating Plants.

The rules as finally reported by the advisory committee were unanimously adopted by the commission on May 20, 1918. They were published in the official state paper on May 27, 1918, and by the terms of the Industrial Commission law became effective on June 26, 1918.

As stated above this refrigerating plant code was adopted by the Industrial Commission under authority of Sections 2394—41 to 2394—71, inclusive, of the Statutes of Wisconsin. These orders have the force and effect of law. Any interested party may petition the commission for hearing on the reasonableness of any of its orders, and, if the petition be denied, he may appeal to the Circuit Court for Dane County. The orders of the commission, however, are *prima facie* reasonable and lawful

and valid and in force, until they are found otherwise by the courts or until the orders are revoked by the commission. Violation of any order is punishable by a fine of from ten dollars to one hundred dollars per day for each offense.

GENERAL ORDERS

Order 4500—When Effective. These orders shall take effect at once on all refrigerating plants installed after September 1, 1918. All plants heretofore installed shall be made to comply with these orders not later than February 1, 1919, except that where an especially dangerous condition exists the Industrial Commission may require compliance at once.

Order 4501—Application Required. After September 11, 1918 no refrigerating plant shall be installed until the manufacturer shall have filled out and sent to the Industrial Commission an application on the blank form furnished by the commission.

Note:—Plans should be sent to the Industrial Commission, 62 Mason St., Milwaukee, Wis.

Order 4502—Refrigerating Machine Defined. A refrigerating machine is any device which is designed or used for raising the pressure of any refrigerating agent by mechanical compression, and will be considered to be that portion of the apparatus beginning at the gas intake connection and extending as far as the first stop valve on the discharge pipe.

Order 4503—Safety Valve Defined. A safety valve is an approved sealed mechanical device which will automatically prevent a pressure in excess of these orders, and which operates by allowing the free escape of the released element as outlined in Orders 4504—4506.

Order 4504—Safety Appliances. Safety appliances shall be constructed of materials which are not likely to be corroded by either the gases or the liquids with which thay may come in contact.

Order 4505—Liquid Receiver. Each liquid receiver for machines exceeding three tons capacity shall be equipped with a safety valve not less than 1-2-inch in diameter.

The outlet from the safety valve shall be at least as large as the inlet. There may be a stop valve between the safety valve and the receiver. The stop valve shall be sealed open.

The discharge from such safety valve shall be continuous piping to a point not less than 6 feet above the roof of the building containing the refrigerating apparatus and as remote as practical from the walls of other buildings.

When ammonia is discharged into the atmosphere, a diffuser shall be attached to the upper end of the discharge pipe. The diffuser shall be the same size as the discharge pipe.

The safety valve or valves shall be set to blow freely at or under the following pressures:

Carbon dioxide	1,500 pounds per square inch
Ammonia	350 pounds per square inch
Ethyl chloride	115 pounds per square inch
Sulphur dioxide	115 pounds per square inch

Order 4506—Compressors. Each compressor shall be equipped with one or more safety valves located on the discharge side of the compressor and between the compressor and the first stop valve and there shall be no stop valve of any description between the safety valve or valves and the compressor. In machines not exceeding three tons capacity the safety valve shall be placed between the check valve and the stop valve in the discharge pipe.

The discharge from such safety valve or valves may be conducted to the suction pipe above the stop valve.

The discharge from several safety valves may be conducted to a common discharge pipe, provided the area of the discharge pipe is equal to the sum of the areas of the outlets of the safety valves.

Safety valves on the discharge side of the compressor shall be set to blow freely at or under the following pressures:

Carbon dioxide	1,450 pounds per square inch
Ammonia	300 pounds per square inch
Ethyl chloride	100 pounds per square inch
Sulphur dioxide	100 pounds per square inch

The size of the safety valve for the compressor shall be not less than the following, the tonnage being calculated on the basis of 7,500 cubic inches displacements per minute per ton.

Capacity of Machine.	**Size of Valve.**
Not exceeding 1 ton	Same size as discharge pipe
Over 1 ton to 10 tons	½ inch
Over 10 tons to 25 tons	¾ inch
Over 25 tons to 40 tons	1 inch
Over 40 tons to 60 tons	1 ¼ inch
Over 60 tons to 100 tons	1 ½ inch
Over 100 tons to 140 tons	2 inches
Over 140 tons to 190 tons	2 ½ inches
Over 190 tons to 300 tons	3 inches

Order 4507—Absorption System. A safety valve shall be placed on the pipe from the generator to the absorber or brine cooler between the generator and the first stop valve. This valve shall be set to blow freely at 300 pounds per square inch.

The table in Order 4506 shall be used to determine the size of the safety valve and the discharge shall be as set forth in Order 4505.

Order 4508—Check Valves. A check valve shall be placed in the discharge pipe of the compressor as close to the compressor as practical.

Check valves in an absorption plant shall be located between rectifier and condenser, and in the discharge line close to the aqua ammonis pump.

Order 4509—Emergency Device. Plants exceeding 3 tons refrigerating capacity and using ammonia as a refrigerant shall be equipped with an emergency device which will permit the free escape of the gas to the sewer by mixing with water. The valve controlling such emergency de-

vice shall be plainly marked "For Fire Only." The discharge from the ammonia system shall be taken from the high pressure side and the piping shall be arranged so that there will be no obstruction to prevent the free flow of the gas. A check valve may be placed in the ammonia discharge pipe, to prevent the water from entering the system.

(The enforcement of this order pending further investigation was suspended by an amendment adopted by the Industrial Commission September 27, 1918.)

Order 4510—Maintenance. All refrigerating plants shall be maintained in safe condition. If any part of a refrigerating machine, or any piping in connection with such machine becomes dangerous through corrosion or any other cause it shall be replaced forthwith.

Order 4511—Helmets. All large refrigerating plants shall be equipped with helmets or masks, which will permit the wearer without suffocation, to reach any part of the refrigerating system. In plants of 15 to 75 tons refrigerating capacity, there shall be at least one such helmet or mask, and in plants of more than 75 tons capacity there shall be at least two such helmets or masks.

Order 4512—Air Test. Old plants shall not be tested to a greater pressure than 100 pounds per square inch, and the pressure shall be built up slowly.

Order 4513—Surplus Stock. Surplus stock of refrigerating chemical shall be stored in a cool place.

Order 4514—Location of Refrigerating Apparatus. Every refrigerating machine hereafter installed, exceeding three tons capacity, and which uses ammonia or ethyl chloride, shall be placed in a room apart from any other room where more than five persons are assembled or employed.

No such room shall be used as a dressing, lunch or recreation room except by those actively engaged in the operation of the refrigerating machinery.

Machines not exceeding three tons capacity, when installed in a room where more than five persons are assembled or employed, shall be substantially enclosed, with an opening to the outside, if in the judgment of the commission such enclosure is necessary to the safety of such persons.