INDUSTRIAL COMMISSION OF WISCONSIN

REFRIGERATING PLANT CODE

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REFRIGERATING PLANT CODE

INTRODUCTION

The Refrigerating Plant Code has been adopted by the Industrial Commission in discharge of its duties under Section 101 of the Wisconsin Statutes.

Previous to June 26, 1918, there were no special orders dealing with safety in refrigerating plants. Many refrigerating machines operate under very high pressure and some of them use, as a refrigerant, gases which are either, or both, toxic or flammable. There are, thus, two hazards in connection with the operation of refrigerating machines; one, the hazard of injury to persons from flying parts of ruptured machinery, and the other, that of possible suffocation or extreme illness from breathing escaping gases or the danger of being burned as a result of the flammability of the refrigerant.

In order to eliminate as much as possible the dangers attendant to this class of machinery the Commission, on June 13, 1917, appointed an advisory committee to study the situation and to develop a safety code for refrigerating plants. This committee, after numerous conferences, drafted the Refrigerating Plant Code, which, after a general public hearing, was adopted by the Commission on May 20, 1918. This code was published in the official state paper on May 27, 1918 and became effective June 26, 1918.

Mechanical refrigeration is now being employed in a wider and more diverse field of commercial and industrial activity than at any previous time. New and changing conditions under which refrigeration is now being used have brought into sharper focus, during a comparatively short time, the interests and responsibilities of a larger and more varied group of employees and employers.

Aware of these changing conditions, and also aware of the fact that the June 26, 1918 Refrigerating Plant Code

had become obsolete, the Commission appointed a new advisory committee to effect a complete revision of the present code. The personnel of this new committee and the interests they represent are as follows:

E. F. VILTER, Milwaukee, Wisconsin—*Chairman*—Representing Manufacturers of Refrigerating Equipment and Wisconsin Manufacturers' Association.

R. H. LANGER, Milwaukee, Wisconsin—Representing Users of Refrigerating Equipment and Wisconsin State Association of the National Association of Power Engineers.

J. V. O'NEILL, The Travelers Insurance Co., Milwaukee, Wisconsin—Representing Insurance Interests.

GEORGE SAULT, Milwaukee, Wisconsin—Representing Wisconsin State Federation of Labor.

M. A. EDGAR, Madison, Wisconsin—*Secretary of Committee* —Representing Industrial Commission of Wisconsin.

This advisory committee held a number of meetings, and following the completion of their work, the revised code was submitted to the public at several hearings held throughout the state. This code was formally adopted by the Industrial Commission on April 1, 1949 and published in the official state newspaper on April 11, 1949, becoming effective on May 11, 1949.

These orders have the force and effect of law, but any person who considers any part of the code to be unreasonable may appeal to the Commission to interpret, modify or suspend the same. (Wisconsin Statutes, Sections 101.15 to 101.17)

Section 101.28 of the Wisconsin Statutes provides that any employer or other person who violates an order, or fails or refuses to comply with the requirements of a legal order of the Commission, shall forfeit and pay into the state treasury the sum of not less than ten dollars, nor more than 100 dollars, for each such violation. Every day during which any person, persons, corporation, or any officer, agent or employee thereof, shall fail to observe and comply with any order shall constitute a separate and distinct violation of such order.

REFRIGERATING PLANT CODE

Section 1

PURPOSE, SCOPE, DEFINITIONS

Order 4500. Purpose.

The application of this code is intended to insure the safe design, construction, installation, inspection and operation of every refrigerating system employing a fluid which is vaporized and liquefied in its refrigerating cycle, which may be used for the extraction of heat, including the preparation and preservation of food, the cooling and dehumidification of air for industrial purposes and for comfort, and as an aid to or a part in a chemical process.

Order 4501. Scope.

This code shall apply to all refrigerating machines installed in public buildings and places of employment, except refrigerating systems using air or water as the refrigerant.

Order 4502. Definitions.

1. Check Valve.

A valve which permits a fluid to flow in only one direction.

2. Compressor.

A mechanical device used in a refrigerating system for the purpose of increasing the pressure upon the refrigerant.

3. Condenser.

A vessel or arrangement of pipe or tubing in which vaporized refrigerant is liquefied by the removal of heat.

Double pipe or atmospheric condensers shall be considered as pipe coils.

The gross volume of a shell and tube condenser shall be the entire volume of the vessel including the tubes.

The net volume of a shell and tube condenser shall be the gross volume less the space occupied by the tubes.

Note: For the purpose of this code the net volume of a shell and tube type condenser may be considered as one-half of the gross volume. See Order 4510.

4. Condensing Unit.

A specific refrigerating machine combination for a given refrigerant, consisting of one or more power-driven compressors, condensers, liquid receivers (when required), and the regularly furnished accessories.

5. Diffuser.

A device for use outdoors on the discharge end of a safety or blow-off line, for avoiding straight line discharge, reducing local concentration, and preventing the entrance of foreign matter and water.

6. Evaporator.

That part of the system in which liquid refrigerant is vaporized to procure refrigeration.

7. Liquid Receiver.

A vessel permanently connected to a system by inlet and outlet pipes for storage of a liquid refrigerant.

8. Pressure Gauge.

A dial instrument for registering the pressure of a fluid confined within a pipe or chamber.

9. Pressure Limiting Device.

A pressure responsive mechanism designed to automatically stop the operation of the compressor at a predetermined pressure.

10. Pressure Relief Valve.

A valve held closed by a spring and designed to automatically relieve pressure in excess of its setting.

11. Pressure Vessel.

Any refrigerant containing receptacle of a refrigerating system other than expansion coils, headers and pipe connections.

12. Refrigerant.

A substance used to produce refrigeration by its expansion or vaporization.

13. Refrigerating System.

A combination of interconnected refrigerant containing parts in which a refrigerant is circulated for the purpose of extracting heat.

14. Stop Valve.

A shut-off for controlling the flow of a refrigerant.

15. Tonnage.

For the purpose of this code, the capacity of a refrigerating machine in tons (200 B.t.u. per minute) shall be the manufacturers' rating at plus 5 degrees Fahrenheit evaporating temperature and plus 86 degrees Fahrenheit condensing temperature or may be approximated from Table 3.

Order 4503. Refrigerating Systems, Classification by Type.

Refrigerating Systems shall be divided into classes, descriptive of the method employed for extracting heat as follows:

1. Direct System.

Direct System is one in which the evaporator is in direct contact with the material or space refrigerated or is located in air-circulating passages communicating with such spaces.

2. Indirect System.

Indirect System is one in which a liquid, such as brine or water cooled by the refrigerant, is circulated to the material or space refrigerated or is used to cool air so circulated.

3. Unit System.

Unit or Self-Contained System is one which has been assembled and tested prior to its installation and which can be moved about without disconnecting any refrigerant-containing parts.

4. Remote System.

Remote System is one in which it is necessary for the installer to connect lines to carry the refrigerant between the various parts of the system.

5. Double Refrigerant System.

Double Refrigerant System is one in which a refrigerant is used in the secondary circuit instead of brine or water.

For the purpose of this code, each circuit shall be considered as a separate Direct Refrigerating System.

Note: General Information on Refrigerants. Every fire department should be acquainted with the location of refrigerating systems and with the refrigerants contained therein so that they may prepare themselves against the hazards presented. As indicated in this code, there may be fire and explosion hazards as well as danger from breathing gas. Escape of gas may be caused by a fire to which a fire department has been called, or it may be the result of a mechanical failure. In either case the fire department may need gas masks, and if so, needs to be trained in their use. A heavy concentration of gas will require the use of an oxygen helmet.

It is recommended that an approved mask or helmet be worn by employees or service men, when practical, when major repairs or adjustments are being made to refrigerating equipment.

Section 2

GENERAL REQUIREMENTS

Order 4504. When Effective.

1. New and Old Systems.

These orders shall apply to all refrigerating systems installed on or after the effective date of this code and to parts replaced or added to systems already in service on or after the same date.

Systems installed prior to the effective date of this code and which do not comply with the requirements of the Refrigerating Plant Code effective June 26, 1918 shall be made to comply with the orders of this code with the exception of paragraph 1 of Order 4510.

2. Kind of Refrigerant.

Each refrigerating system shall be provided with a legible metal sign indicating thereon the kind of refrigerant in use. The sign shall be permanently attached to the compressor, or at the liquid receiver or charging valve. If either of the above are not within sight of each other then another sign shall be attached to the system in each of the above locations.

3. Machine Identifying Number.

Each refrigerating machine shall be permanently marked with an identifying number.

4. Registration and Declaration.

New and used remote systems exceeding one and one-half tons capacity or unit systems exceeding three tons capacity shall not be installed until a Registration Form, indicating that the system will be installed to meet the requirements of this code, has been filed with the Industrial Commission by the owner or by the installing contractor in behalf of the owner, and a Declaration to that effect has been conspicuously posted on the premises.

Note: Table 3 in the appendix may be used to determine the approximate capacity in tons for displacement, and forms for Registration and Declaration may be obtained from the Industrial Commission.

Order 4505. Materials.

No materials shall be used in the construction and installation of refrigerating systems that will deteriorate due to the chemical action of the refrigerant or the oil, or the combination of these. Renewals or replacements of materials or appliances shall be in accordance with the requirements set forth in this code.

Order 4506. Supports.

All refrigerant-containing parts and piping shall be securely supported by means of metal hangers, brackets, straps, clamps, or pedestals, in such manner as to relieve joints or piping of harmful strains and vibration.

Order 4507. Maintenance.

All refrigerating systems shall be maintained in safe condition. If any part of a refrigerating system, or any piping in connection with such system, becomes dangerous through corrosion or any other cause, it shall be replaced or satisfactorily repaired.

Order 4508. Test Medium.

No oxygen or any flammable gases or liquids or flammable mixtures of them shall be used within a refrigerating system for testing purposes.

Order 4509. Gauges.

Liquid level gauge glasses, except those of the bulls' eye type or indirect level indicator, shall have automatic closing shut-off devices and all glasses shall be protected against injury by sturdy metal guards.

Order 4510. Pressure Vessels.

1. Construction, Inspection and Stamping.

Refrigerant-containing vessels shall be constructed, inspected and stamped in accordance with the requirements contained in the Unfired Pressure Vessel Code of the American Society of Mechanical Engineers' 1946 edition, the provisions of which are briefed in the appendix to this code.

2. Volume of Shell and Tube Vessel.

The net volume of a shell and tube vessel shall be considered as one-half of the gross volume of the vessel. If no liquid receiver is used, the condenser safety valve size shall be based on the gross volume of the vessel.

3. Pressure Relief Valve.

Each pressure vessel exceeding 5 cubic feet net capacity shall be protected at all times by a pressure relief valve, the diameter of which shall be in accordance with Table 4 in the appendix of this code.

4. Additional Relief Valve Area.

When the required pressure relief valve area exceeds that provided by a 2 inch diameter valve, then an additional pressure relief valve or valves shall be installed to secure the required area.

5. Pressure Actuated Relief Devices.

All pressure relief devices for refrigerant-containing vessels shall be directly pressure actuated.

6. Relief Valve Setting.

All pressure relief valves for refrigerant-containing vessels shall be set to function at a pressure not to exceed the maximum allowable working pressure of the vessel.

7. Relief Valve Marking.

Each pressure relief valve shall be legibly marked to designate its setting in pounds per square inch and with the name of the manufacturer.

8. Dual Relief Valves.

No stop valve shall be located between a pressure relief device or pressure limiting device and the part of the system protected thereby, unless two devices of the required size are used and so arranged that only one can be shut off at any one time.

9. Relief Valve Discharge.

The discharge from such pressure relief valves shall be by unobstructed continuous piping to the outside atmosphere not less than 12 feet above the ground and not closer than 20 feet to any fire escape, doorway, ventilator or other opening. The pipe shall be provided with a diffuser and so positioned that water cannot enter the line.

10. Accumulator Safety Valves.

The discharge from safety valves attached to low pressure accumulators may be connected into the suction line on the machine side of the stop valve or outdoors as provided in paragraph 9 of this order.

11. Common Discharge Pipe.

A common discharge pipe may be used for more than one pressure relief valve. It shall have an area at least equal to the combined net areas of the three largest relief valves discharging into it. A drain shall be provided to remove moisture. The diameter of the outlet pipe shall not be less than that of the inlet pipe. If the length of the relief line exceeds 50 feet, the size of the entire line shall be increased one pipe size for each additional 100 feet of length or fraction thereof.

Order 4511. Compressors and Compressing Units.

1. Pressure Control.

Each compressor or water-cooled condensing unit not exceeding 3 tons capacity and each air-cooled condensing unit exceeding one-half ton capacity but not exceeding 3 tons capacity shall be equipped with a pressure relief valve or a pressure limiting device. Each compressor and condensing unit exceeding 3 tons capacity shall be equipped with adequate pressure relief valve capacity. The location of an internal relief valve shall be permanently indicated by

stamping or casting the words "Relief Valve" at the location of the relief valve.

2. Compressor Relief Valve.

No stop valve or obstruction of any description shall be placed in the pipe line between the compressor and its pressure relief valve, nor in the discharge pipe between the pressure relief valve and the suction pipe.

3. Relief Valve Discharge.

The discharge from the compressor relief devices shall be conducted to a point in the suction line or to the atmosphere as described in Order 4510.

4. Pressure Control Setting.

The pressure relief valve or the pressure limiting device shall relieve the pressure on the discharge side of the compressor or halt the operation of the refrigerating machine at a pressure not exceeding the maximum allowable working pressure.

Order 4512. Check Valves.

1. Where Required.

A check valve shall be placed in the discharge pipe from each refrigerating machine as close to the machine as is practical when the machine exceeds 3 tons capacity and uses a refrigerant classified under Groups 2 or 3 of Table 1 in the appendix.

2. Defrosting Line.

When a hot gas defrosting line is used, there shall be a check valve in the discharge line between the condenser and the point where the hot gas line connects into the discharge line.

3. Absorption System.

Check valves shall be installed in an absorption system exceeding 3 tons capacity and shall be located between the rectifier and the condenser and in the discharge line close to the aqua pump.

Order 4513. Refrigerant Substitutes.

No refrigerant shall be put into any refrigerating equipment not specifically designed for that refrigerant until

the installation has been made to comply with the requirements applicable to the new refrigerant as set forth in these orders.

Order 4514. Purging.

Purge lines from any part of an ammonia refrigerating machine shall be of steel pipe, or steel or aluminum tubing.

Order 4515. Pressure Gauge.

Each refrigerating system of 5 tons capacity and over, using Group 2 or 3 refrigerant or 25 tons or over using Group 1 refrigerant, shall be equipped with a pressure gauge attached to the high pressure side. The dial of the pressure gauge shall be graduated to at least 1½ times the normal operating pressure.

Order 4516. Safety Mask or Helmet.

1. Where Required.

Establishments containing refrigerating systems using refrigerants listed under Group 2, Table 1, shall be equipped with not less than one safety mask or helmet if the amount of refrigerant in the system is more than 100 pounds, but does not exceed 1000 pounds. Not less than two safety masks or helmets shall be provided if the system contains more than 1000 pounds of refrigerant listed under Group 2, Table 1.

2. Type and Location.

Safety masks or helmets shall be as approved by the Industrial Commission for the refrigerant employed, and they shall be kept in a suitable cabinet immediately outside the machinery room or other approved accessible location. They shall be kept in a usable condition.

3. Canister Renewal.

Each safety mask shall have an additional canister or cartridge. Canisters and cartridges shall be renewed immediately after having been used and if unused, must be renewed at least every 2 years. The date of filling shall be marked on each canister or cartridge.

Order 4517. Ventilation.

Refrigeration compressor, condenser and receiving room or rooms containing refrigeration machinery exceeding ½ ton capacity shall, for the safety and health of employees and others, be provided with means of ventilation to the outer air. The ventilation shall consist of window or door openings to the outer air, or shall be by mechanical means as set forth in the Heating, Ventilation and Air Conditioning Code or the General Orders on Dusts, Fumes, Vapors and Gases issued by the Industrial Commission.

Order 4518. Location.

1. Hospitals and Institutions.

No refrigerating system using a refrigerant listed under Groups 2 or 3 of Table 1 shall be located in a hospital or in any other institution or place where persons are helpless or confined.

2. Separate Rooms in Other Places.

In all other places, refrigerating compressors exceeding 5 tons total capacity and using a refrigerant listed under Group 2 or 3 of Table 1 shall not be placed in a room where more than five persons (not including operating or maintenance personnel) assemble or are employed.

3. Prohibited Use.

Refrigeration compressor, condenser or receiver room or rooms shall not be used as dressing, lunch or recreation rooms.

APPENDIX

Table 1

REFRIGERANT CLASSIFICATION

Refrigerants shall, for Safety Code purposes, be divided into groups as follows:

Group 1	*Chemical Formula*
Carbon Dioxide	CO_2
Dichlorodifluoromethane (Freom 12)	CCl_2F_2
Dichloromethane (Carrene No. 1) (Methylene Chloride)	CH_2Cl_2
Dichloromonofluoromethane (Freon 21)	$CHCl_2F$
Difluoromonochloromethane (Freon 22)	CHF_2Cl
Dichlorotetrafluoroethane (Freon 114)	$C_2Cl_2F_4$
Trichloromonofluoromethane (Carrene No. 2) (Freon 11)	CCl_3F
Trifluorotrichloroethane (Freon 113)	$C_2Cl_3F_3$

Group 2	
Ammonia	NH_3
Dichloroethylene	$C_2H_2Cl_2$
Ethyl Chloride	C_2H_5Cl
Methyl Chloride	CH_3Cl
Methyl Formate	$HCOOCH_3$
Sulphur Dioxide	SO_2

Group 3	
Butane	C_4H_{10}
Ethane	C_2H_6
Ethylene	CH_2CH_2
Isobutane	$(CH_3)_3CH$
Propane	C_3H_8

Refrigerants not included in Table 1 shall be classified as set forth in the American Standards Association's "Safety Code" for Mechanical Refrigeration, latest edition.

Table 2

MINIMUM TEST PRESSURES

Every part of a refrigerating system, except pressure gauges and control mechanisms, shall be designed, constructed and assembled to withstand minimum test pressures as specified in this table.

Refrigerant	Minimum Test Pressure Pounds Per Sq. In.	
	High Pressure Side	Low Pressure Side
1. Ammonia	300	150
2. Butane	90	50
3. Carbon Dioxide	1500	1000
4. Dichloroethylene	30	30
5. Ethane*	1500	1000
6. Ethylene*	1500	1000
7. Ethyl Chloride	60	50
8. Freon–11	30	30
9. Freon–12	235	145
10. Freon–21	70	50
11. Freon–22	300	245
12. Freon–113	30	30
13. Freon–114	50	50
14. Isobutane	130	75
15. Methyl Chloride	215	125
16. Methyl Formate	50	50
17. Methylene Chloride	30	30
18. Propane	325	210
19. Sulphur Dioxide	170	95

* The test pressures given here shall apply to parts of the system not protected by safety valves.

Refrigerants not listed.

For refrigerants not listed in Table 2, the test pressure for the high pressure side shall not be less than the saturated vapor pressure of the refrigerant at 150° F. The test pressure for the low pressure side shall not be less than the saturated vapor pressure of the refrigerant at 115° F. In no case shall the test pressure be less than thirty pounds per square inch by gauge.

Table 3

DISPLACEMENT

Refrigerant	Displacement Per Ton Cubic Feet Per Minute at Plus 5°F. to Plus 86°F.	Chemical Symbol
1. Ammonia	3.44	NH_3
2. Butane	16.16	C_4H_{10}
3. Carbon Dioxide	.943	CO_2
4. Dichloroethylene	111.2	$C_2H_2Cl_2$
5. Ethane*	18.8	C_2H_6
6. Ethyl Chloride	20.46	C_2H_5Cl
7. Ethylene*	9.8 (8.8)	C_2H_4
8. Freon–11	36.33	CCl_3F
9. Freon–12	5.82	CCl_2F_2
10. Freon–21	20.43	$CHCl_2F$
11. Freon–22	3.6	$CHClF_2$
12. Freon–113	100.9	$C_2F_3Cl_3$
13. Freon–114	19.59	$C_2Cl_2F_4$
14. Isobutane	11.50	$(CH_3)_3CH$
15. Methyl Chloride	5.95 (6.09)	CH_3Cl
16. Methyl Formate	49.50	$HCOOCH_3$
17. Methylene Chloride	74.45	CH_2Cl_2
18. Propane	4.09	C_3H_8
19. Sulphur Dioxide	9.08	SO_2

* Based on Evaporation at —160° F. Condensation at —50° F.

Table 4

PRESSURE RELIEF VALVES—DIAMETER

Net Capacity	Diameter of Valve
Over 5 to 25 cubic feet	½ inch
Over 25 to 45 cubic feet	¾ inch
Over 45 to 60 cubic feet	1 inch
Over 60 to 100 cubic feet	1¼ inch
Over 100 to 200 cubic feet	1½ inch
Over 200 to 300 cubic feet	2 inch

EXTRACTS FROM UNFIRED PRESSURE VESSEL CODE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

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Construction

For all pressure vessels, the minimum thickness of shell plates, heads, or dome plates, after flanging, shall be 3/32 inches, except that for riveted construction the minimum thickness shall be 3/16 inches. Vessels which are of a size that will not hold their shape without additional support must be provided with stiffeners so designed as to prevent distortion due to their own weight and/or to influences causing stresses other than those due to internal pressure.

Plate material that is not more than 0.01 inch thinner than that calculated from the formula may be used in code constructions provided the material specification permits such plate to be furnished not more than 0.01 inch thinner than ordered.

The minimum thickness of butt straps for double strap riveted joints shall be as given in the following table. Intermediate values shall be determined by interpolation. For plate thicknesses exceeding 1¼ inches, the thickness of the butt straps shall be not less than ⅝ of the thickness of the plate.

MINIMUM THICKNESS OF BUTT STRAPS

Thickness of shell plates, in.	Minimum thickness of butt straps, in.	Thickness of shell plates, in.	Minimum thickness of butt straps, in.
3/16	3/16	1/2	7/16
1/4	1/4	17/32	7/16
9/32	1/4	9/16	7/16
5/16	1/4	5/8	1/2
11/32	1/4	3/4	1/2
3/8	5/16	7/8	5/8
13/32	5/16	1	11/16
7/16	3/8	1 1/8	3/4
15/32	3/8	1 1/4	7/8

Plates for any part of a riveted vessel required to resist stress produced by internal pressure shall be of flange or firebox quality steel conforming to A.S.M.E. specifications.

Cast steel may be used for specially shaped parts of vessels to which the use of rolled plates is not adapted.

Ferrous tubes conforming to A.S.M.E. specifications may be used in unfired pressure vessels.

Open-hearth steel pipe or steel tubing in accordance with A.S.M.E. specifications may be used for the pressure part of an unfired

pressure vessel provided the nominal diameter of the welded pipe or tubing is not greater than 18 inches, or seamless tube or pipe not greater than 24 inches.

Inspection

Every pressure vessel shall be inspected at least twice by a state inspector, a municipal inspector or an inspector employed regularly by an insurance company. These inspectors shall have been qualified by a written examination under the rules of the state. In the case of a riveted vessel one inspection shall be made at the time of reaming rivet holes. In the case of a vessel fabricated in whole or in part by a welding process, one internal inspection shall be made before final closure. A final inspection shall be made at the time of the hydrostatic test.

A data sheet shall be filled out and signed by the manufacturer and the inspector. The manufacturer, in signing each data report, shall state under his signature the expiration date on the certificate of authorization to use the symbol. This data sheet, together with the stamping on the vessel, shall be a guarantee by the manufacturer that he has complied with all the requirements of this section of the code.

Those parts of a pressure vessel requiring code inspection and which are furnished by other than the shop of the manufacturer responsible for the completed vessel shall be fabricated by a manufacturer in possession of a code symbol stamp and shall be inspected by a qualified inspector. The data sheets, in triplicate, covering the part or parts, shall be executed by the manufacturer and the inspector in accordance with the code requirements, and forwarded, in duplicate, to the manufacturer of the finished vessel. This partial data report, together with his own inspection, shall be the final inspector's authority to witness the application of a code stamp to the vessel. The manufacturer who completes the vessel and the shop inspector making the final inspection shall be responsible for its meeting code requirements.

Stamping

The manufacturer shall stamp each pressure vessel constructed in compliance with the code in the presence of the inspector, after the hydrostatic or permissible air test, in the shop of the manufacturer, except that:

(1) In cases where pressure parts cannot be completed and tested before shipment, proper stamping shall be applied at the shop and the data sheets signed by the same or different inspectors who shall indicate the portions of the inspections made at the shop and in the field.

(2) In case of field-erected vessels, the stamping shall be applied by the manufacturer in the presence of the inspector after the final pressure test.

The stamping on the vessel shall consist of the A.S.M.E. code symbol, the manufacturer's name, the manufacturer's serial number, the working pressure, and the year built, denoting that the vessel was constructed in accordance therewith. The maximum temperature corresponding with the maximum allowable working pressure shall also be stamped on the vessel.

If the vessel is of fusion welded construction or if it it has welded pressure parts, the number of the paragraph under which the welding was done shall be stamped under the code symbol.

If the circumferential or longitudinal joint or joints of a vessel are brazed, forge welded, or resistance welded, the letters "BRZ", "FGD", or "RES", as the case may be, shall be stamped under the code symbol. When a vessel is built of a combination of types of construction as mentioned above, or different types of fusion welding, the stamping on the vessel shall indicate the various classes.

The required markings shall be legibly stamped on the vessel with letters and figures at least 5/16 inches high on the vessel near a manhole, if any, or handhole, or in some conspicuous place, except as provided below.

For vessels constructed of plate less than ¼ inch thick, name plates bearing the official marking must be used, excepting the code symbol and serial number, on which the data may be etched, cast or impressed. Name plates may be used on vessels constructed of plate ¼ inch or more in thickness in lieu of stamping applied directly to the vessel. Such plates shall be brazed or otherwise irremovably attached to the vessel and located as described above. The letters and figures on a name plate, if used, shall be not less than 5/32 inches high.

The code symbol and other required data not on the name plate when made must be stamped on these name plates. This stamping may be done prior to its being affixed to the vessel, in which case the inspector shall see that the name plate with the correct stamping is applied to the proper vessel.

When only a "part" of an unfired pressure vessel is supplied and the data are recorded on the manufacturers' data report, unless otherwise specified, it shall be stamped with the A.S.M.E. code symbol and underneath the symbol the word "part", the name of the manufacturer, the manufacturer's A.S.M.E. serial number of that "part", the maximum allowable working pressure, and the year built. This does not apply to such parts as handhole covers, manhole covers, or their parts.

On vessels having two or more separate parts or pressure chambers, the stamping may be grouped in one location and so arranged that the data for the separate parts can be properly identified. Such pressure parts must be stamped sufficiently to identify them with the vessel or chamber of which they form a part.