

**Wisconsin  
Administrative Code**

**DEPARTMENT OF INDUSTRY,  
LABOR AND HUMAN RELATIONS**

**Chapters ILHR 41-42**

**BOILER AND  
PRESSURE VESSEL**

**DEPARTMENT OF INDUSTRY,  
LABOR AND HUMAN RELATIONS  
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## INTRODUCTION

### Purpose and Structure

The Legislature, by s. 35.93 and ch. 227, Stats., directed the publication of the rules of executive agencies having rule-making authority in a loose-leaf, continual revision system known as the Wisconsin Administrative Code. The Code is kept current by means of new and replacement pages. The pages are issued monthly, together with notices of hearings, notices of proposed rules, emergency rules, instructions for insertion of new material, and other information relating to administrative rules. This service is called the Wisconsin Administrative Register, and comes to the subscriber near the middle and at the end of each month. Code pages are issued to subscribers only with the end of the month Register. The editing and publishing of the Register and Code is done by the Revisor of Statutes Bureau, Suite 800, 131 W. Wilson St., Madison, Wisconsin, 53703. (608-266-7275).

### Availability

The complete code and the upkeep service are distributed to the county law libraries; to the libraries of the University of Wisconsin Law School and Marquette University Law School; to the State Historical Society; to the Legislative Reference Bureau and to the State Law Library, and to certain designated public libraries throughout the state.

The sale and distribution of the Register, Code and of its parts is handled by Department of Administration, Document Sales, P.O. Box 7840, Madison, Wisconsin 53707. (608-266-3358 information) (1-800-362-7253 or 608-264-9419 charge card orders).

### Table of Contents

Each code with more than one chapter will have a table of chapters. After the title of each chapter will be the page numbers on which the chapter begins. Each chapter will have a table of sections.

### History Notes

Each page of the code as it was originally filed and printed pursuant to the 1955 legislation, had a date line "1-2-56". A rule which is revised or created subsequent to the original printing date is followed by a history note indicating the date and number of the Register in which it was published and the date on which the revision or creation of the rule became effective. Additions to a section's history note will be shown in **bold face** when those affected code sections are first released. The absence of a history note at the end of a section indicates that the rule has remained unchanged since the original printing in 1956. The date line at the bottom of the page indicates the month in which the page was released, but does not necessarily mean a substantive change has occurred on that page. Some common abbreviations used in the history notes are: cr. - created, am. - amend, r. - repeal, recr. - recreate, renum. - renumber, eff. - effective and emerg. - emergency.

In some instances an *entire* chapter has been repealed and recreated or renumbered subsequent to the original printing date. When this occurs a note has been placed at the beginning of the chapter after the table of sections to contain this information. A separate history note appears after each section indicating the date when the revision or creation became effective.

### Index

The index for the complete Wisconsin Administrative Code will be found in the last volume of the complete set. It will be recompiled, reprinted and distributed at least 3 times a year. Some codes have a separate index prepared by the agency involved. See the Uniform Dwelling Code (chs. ILHR 20-25) and the Building and Heating Code (chs. ILHR 50-64) as examples.

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## Chapter ILHR 41

### ADMINISTRATION, INSPECTION AND GENERAL INSTALLATION REQUIREMENTS

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Note: Chapter ILHR 41 as it existed on February 29, 1988 was repealed and a new chapter ILHR 41 was created effective March 1, 1988.

#### Subchapter I—Scope, Definitions and Administration

**ILHR 41.01 Purpose.** Pursuant to s. 101.17, Stats., the purpose of chs. ILHR 41 and 42 is to protect the health, safety and welfare of the public and employes by establishing minimum standards for the design, construction, installation, operation, inspection, testing, maintenance, alteration and repair of boilers and pressure vessels installed in all public buildings and places of employment.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 41.02 Scope.** (1) Boilers and pressure vessels. The provisions of chs. ILHR 41 and 42 shall apply to boilers and piping components associated with boilers, and to pressure vessels and power piping, in use at places of employment and in public buildings. The provisions of these chapters are not retroactive unless specifically stated in the administrative rule. Where different sections of these chapters specify different requirements, the most restrictive requirement shall govern.

**Note:** Section 101.01 (2), Stats., provides that the phrase place of employment means and includes every place, whether indoors or out or underground and the premises appurtenant thereto where either temporarily or permanently any industry, trade or business is carried on, or where any process or operation, directly or indirectly related to any industry, trade or business, is carried on, and where any person is, directly or indirectly employed by another for direct or indirect gain or profit, but does not include any place where persons are employed in private domestic service which does not involve the use of mechanical power or in farming. Farming includes those activities specified in s. 102.04 (3), Stats., and also includes the transportation of farm products, supplies or equipment directly to the farm by the operator of said farm or his employes for use thereon, if such activities are directly or indirectly for the purpose of producing commodities for market, or as an accessory to such production. When used with relation to building codes, place of employment does not include a previously constructed building used as a community-based residential facility as defined in s. 50.01 (1), Stats., which serves 20 or fewer unrelated residents, except for the purposes of s. 101.11, Stats.

(2) OTHER VESSELS. The provisions of chs. ILHR 41 and 42 shall apply to vessels used for the storage and transportation of flammable liquids, liquefied petroleum gas, liquefied natural gas, compressed natural gas, anhydrous ammonia and refrigerants, unless these vessels are covered by other Wisconsin administrative codes or federal codes.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 41.04 Definitions.** The definitions contained in this section shall be applicable throughout chs. ILHR 41 and 42.

(1) "Alteration" means a change in a boiler or pressure vessel that substantially alters the original design and that requires consideration of the effect of the change on the original design. Alteration does not include the addition to a boiler or pressure vessel of nozzles smaller than an unreinforced opening size.

(2) "Approved" means acceptable to the department.

(3) "ASME code" means the boiler and pressure vessel code published by the American society of mechanical engineers.

(5) "Boiler" means a vessel intended for use in heating water or other fluids or for generating steam or other vapors by the application of heat.

(6) "Boiler external piping" means piping within the scope of ASME code section I and which requires ASME code stamping as specified in section I.

(7) "Certified inspector" means a person who holds a valid credential issued by the department under ch. Comm 5 as a certified boiler-pressure vessel inspector.

(8) "Condemned" means a boiler or pressure vessel declared to be unsafe and which has an applied stamping designating its condemnation.

(9) "Department" means the department of commerce.

(10) "Enforcement authority" means the department.

(11) "External inspection" means an inspection made while the boiler or pressure vessel is in operation.

(12) "Fusion welding" means the melting together of filler metal and base metal, or of base metal only, which results in coalescence.

(13) "High temperature water boiler" means a boiler completely filled with water intended for operation at pressures in excess of 160 psig or temperatures in excess of 250° F.

(14) "Hot water heating boiler" means a boiler in which no steam is generated, from which hot water is circulated for heating purposes and then returned to the boiler, and which operates at a pressure not exceeding 160 psig or a temperature of 250° F at or near the boiler outlet.



(15) "Hot water storage tank" means a tank used to store water that is heated indirectly by a circulating water heater, by steam or hot water circulating through coils, or by other heat exchange methods internal or external to the tank.

(16) "Hot water supply boiler" means a boiler completely filled with water that furnishes hot water to be used externally to itself at pressures not exceeding 160 psig or at temperatures not exceeding 250° F at or near the boiler outlet.

(18) "Insurance company" means a company which has been licensed in this state to write boiler and pressure vessel insurance and which is actively engaged in writing such insurance for the general public.

(19) "Internal inspection" means an inspection made when the boiler or pressure vessel is shut down and handholes and manholes or other inspection openings are opened or removed for inspection of the interior as required by the inspector.

(20) "Low pressure boiler" means a boiler on which the safety valves are set at pressures not exceeding 15 psig.

(21) "Maximum allowable working pressure" means the maximum gage pressure permissible at the top of a completed vessel in its operating position for a designated temperature.

(22) "Miniature boiler" means a power boiler or high temperature water boiler which does not exceed any of the following limits:

- (a) 16 inches inside diameter of shell;
- (b) 20 square feet of heating surface, except for electric boilers;
- (c) 5 cubic feet gross volume exclusive of casing and insulation; and
- (d) 100 psig maximum allowable working pressure.

(24) "National board" means the national board of boiler and pressure vessel inspectors.

(26) "Owner or user" means any person, firm or corporation legally responsible for the safe operation of a boiler or pressure vessel.

(27) "Portable boiler" means an internally fired boiler primarily intended for temporary location and whose construction and usage is of a movable nature.

(28) "Power boiler" means a boiler in which steam or other vapor is generated at a pressure of more than 15 psig.

(29) "Power piping" means any steam piping system beyond the scope of ASME code section I and having an operating pressure in excess of 15 psig, any hot water piping system beyond the scope of ASME code section I and subject to temperatures in excess of 250° F, or any piping system using an organic thermal fluid as a heat transfer media and subject to temperatures in excess of 250° F.

(30) "Pressure-temperature relief valve" means an automatic pressure relieving device actuated by the static pressure upstream of the valve which opens further with the increase in pressure over the opening pressure, or actuated by the temperature of the fluid.

Note: A pressure-temperature relief valve is used primarily for liquid service.

(31) "Pressure vessel" means a container for the containment of internal or external pressure which may be obtained from an external source or by the application of heat from a direct or indirect source, or any combination thereof.

(32) "Relief valve" means an automatic pressure relieving device actuated by the static pressure upstream of the valve which opens further with the increase in pressure over the opening pressure.

Note: A relief valve is used primarily for liquid service.

(33) "Repair" means work necessary to restore a boiler or pressure vessel to a safe operating condition.

(34) "Rupture disk" means a nonmechanical overpressure relief device that releases pressure when its preestablished rating is attained.

(35) "Safety relief valve" means an automatic pressure-actuated relieving device suitable for use either as a safety valve or relief valve, depending upon application.

(36) "Safety valve" means an automatic pressure relieving device actuated by the static pressure upstream of the valve and characterized by full-opening pop action.

Note: A safety valve is used for gas or vapor service.

(37) "Secondhand vessel" means a boiler or pressure vessel that has changed location subsequent to the original installation.

(38) "Water heater" means a closed vessel in which water is heated by the combustion of fuels, electricity or other energy source, and withdrawn for use external to the system at pressures not exceeding 160 psig, including the apparatus by which heat is generated and all controls and devices necessary to prevent water temperatures from exceeding 210° F.

Note: For further explanation of definitions, see the ASME code section VIII, scope and appendix 3.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (37), Register, February, 1990, No. 410, eff. 3-1-90; am. (29), Register, May, 1994, No. 461, eff. 6-1-94; r. (4), (17), (23), (25), r. and recr. (7), Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 41.05 Petition for variance.** (1) PROCEDURE. The department shall consider and may grant a variance to an administrative rule upon receipt of a fee, a completed petition for variance form from the owner and, where applicable, a completed position statement from the chief of the local fire department, provided an equivalency is established in the petition for variance which meets the intent of the rule from which a variance is being petitioned. The department may impose specific conditions in the petition for variance to promote the protection of the health, safety and welfare of the employes or the public. Violation of those conditions under which the variance is granted constitutes a violation of chs. ILHR 41 and 42.

Note: The petition for variance application form (SBD-9890) is available from the Safety and Buildings Division, Customer Service Center, P.O. Box 7969, Madison, Wisconsin 53707, telephone 608/266-3151.

Note: Section 101.02 (6), Stats., and ch. ILHR 3 outline the procedures for submitting petitions to the department and the department's procedures for hearing petitions.

Note: See ch. Comm 2 for fee requirements.

(2) PETITION PROCESSING TIME. Except for priority petitions, the department shall review and make a determination on a petition for variance within 30 business days of receipt of all calculations, documents and fees required to complete the review. The department shall process priority petitions within 10 business days of receipt of the required items.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 41.06 Penalties.** Penalties for violations of chs. ILHR 41 and 42 shall be assessed in accordance with s. 101.02, Stats.

Note: Section 101.02 (13) (a), Stats., indicates penalties will be assessed against any employer, employe, owner or other person who fails or refuses to perform any duty lawfully enjoined, within the time prescribed by the department, for which no penalty has been specifically provided, or who fails, neglects or refuses to comply with any lawful order made by the department, or any judgment or decree made by any court in connection with ss. 101.01 to 101.25, Stats. For each such violation, failure or refusal, such employe, owner or other person must forfeit and pay into the state treasury a sum not less than \$10 nor more than \$100 for each violation.

Note: Section 101.02 (12), Stats., indicates that every day during which any person, persons, corporation or any officer, agent or employe thereof, fails to observe and comply with an order of the department will constitute a separate and distinct violation of such order.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 41.07 Appeals.** (1) Appeal of local order. Any person affected by a local order which may be in conflict with a rule of the department may petition the department for a hearing on the grounds that the local order is unreasonable and in conflict with the rule of the department.

Note: Section 101.01 (1) (g), Stats., defines local order as any ordinance, order, rule or determination of any common council, board of alderperson, board of trustees or the village board, of any village or city, or the board of health of any municipality, or an order or direction of any official of such municipality, upon any matter over which the department has jurisdiction.



(2) PETITION OF ADMINISTRATIVE RULE. Pursuant to s. 227.12, Stats., any municipality, corporation or any 5 or more persons having an interest in an administrative rule may petition the department requesting the adoption, amendment or repeal of that rule.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 41.08 Fees.** Fees for the inspection, certificate of operation and other services performed by the department pertaining to boilers and pressure vessels shall be submitted as specified in ch. Comm 2. The owner shall be responsible for the payment of fees.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. Register, December, 1992, No. 444, eff. 1-1-93; correction made under s. 13.93 (2m) (b) 7., Stats., Register, October, 1996, No. 490.

**ILHR 41.10 Adoption of ASME standards.** (1) CONSENT TO INCORPORATE. Pursuant to s. 227.21, Stats., consent has been granted by the attorney general and the revisor of statutes to incorporate by reference the rules contained in the standards and addenda listed in Table 41.10.

(2) ADOPTION. The standards and addenda listed in Table 41.10 are hereby incorporated by reference into chs. ILHR 41 and 42.

TABLE 41.10

ASME Boiler and Pressure Vessel Code 1995 edition	
1. Section I	Power Boilers
2. Section II	Material Specifications
a.	Part A—Ferrous Material
b.	Part B—Nonferrous Material
c.	Part C—Welding Rods, Electrodes and Filler Metals
d.	Part D—Properties
3. Section III	Nuclear Power Plant Components
a.	Subsection NCA—General Requirements Division 1
a.	Subsection NB—Class 1 Components
b.	Subsection NC—Class 2 Components
c.	Subsection ND—Class 3 Components
d.	Subsection NE—Class MC Components
e.	Subsection NF—Supports
f.	Subsection NG—Core Support Structures
g.	Appendices
a.	Division 2
a.	Concrete Reactor Vessels and Containments
4. Section IV	Heating Boilers
5. Section V	Nondestructive Examination
6. Section VIII	Pressure Vessels
a.	Division 1—Pressure Vessels
b.	Division 2—Alternative Rules
7. Section IX	Welding and Brazing Qualifications
8. Section X	Fiber-Reinforced Plastic Pressure Vessels
9. Section XI	Inservice Inspection of Nuclear Power Plant Components
<b>ANSI/ASME Standards</b>	
10.	Power Piping, ANSI/ASME B31.1—1992 edition

(3) FILING OF STANDARDS. (a) Copies of the standards in reference are on file in the offices of the department, the secretary of state and the revisor of statutes.

(b) Copies may be on file at public and university libraries.

(4) AVAILABILITY OF STANDARDS. Copies of the standards in reference may be procured for personal use from the American

Society of Mechanical Engineers (ASME) Order Department, 22 Law Drive, P.O. Box 2300, Fairfield, New Jersey 07007-2300.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. and rec. Table 41.10, Register, February, 1990, No. 410, eff. 3-1-90; am. Table 41.10, Register, May, 1994, No. 461, eff. 6-1-94; am. Table 41.10, Register, June, 1996, No. 486, eff. 7-1-96.

Subchapter II—Inspections

**ILHR 41.12 Inspector certifications required.** History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 41.13 Certificate of competency as an inspector.** History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 41.14 In-service field inspectors.** History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 41.15 General inspection requirements.**

(1) ALL INSPECTIONS. The certified inspectors of the department, upon presenting appropriate credentials to the owner, operator, or agent in charge, may:

(a) Enter without delay and at reasonable times any factory, plant, establishment, construction site, or other area, workplace or environment where work is performed by an employe of an employer; and

(b) Inspect and investigate during regular working hours and at other reasonable times, and within reasonable limits and in a reasonable manner, any place of employment and all pertinent conditions, structures, machines, apparatus, devices, equipment, and materials therein, and to question privately any employer, owner, operator, agent or employe.

(2) REPRESENTATION. The certified inspector, before making an inspection, shall contact the employer or employer's representative who shall be given an opportunity to accompany the inspector during the physical inspection of any workplace under sub. (1).

Note: The department procedure is not to give advance notice, but in the scheduling and in the act of inspecting it may not always be possible to avoid advance notice or to obtain accompaniment, but otherwise these rules will be diligently observed.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (1) (intro.), (2), Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 41.16 Initial inspections.** (1) BOILER AND PRESSURE VESSEL INSPECTIONS.

(a) Except as provided in par. (b), boilers and pressure vessels shall be inspected by a certified inspector before they are placed in operation.

Note: See s. ILHR 41.41 for installation registration requirements.

(b) The inspections specified in par. (a) are not required for boilers and pressure vessels exempted from periodic inspections in s. ILHR 41.18.

(c) Where the boilers or pressure vessels specified in par. (a) are installed in a city of the first class and inspections are made by the city, the city shall keep a record of the inspections and shall submit a copy to the department.

(d) Where the inspections specified in par. (a) are performed by a certified inspector other than a department inspector, the certified inspector shall file an inspection report with the department and shall affix the Wisconsin registration number as required in s. ILHR 41.36. The inspection report shall be filed with the department within 30 calendar days after completion of the boiler or pressure vessel installation. If the report is not filed within the 30-day period, the department shall perform the inspection.

(e) Required initial inspections shall be reported to the department on forms SBD-7678 and SBD-7679.

Note: Form SBD-7678 is used for reporting inspections of pressure vessels, and Form SBD-7679 is used for reporting inspections of boilers. See Appendix A for copies of these forms.

(2) POWER PIPING INSPECTIONS. (a) Except as provided in par. (b), all power piping systems not covered by ASME code section I and required to be constructed in accordance with the ANSI standard for power piping as listed in Table 41.10, shall receive an initial inspection by a certified inspector.

(b) The inspections specified in par. (a) are not required for:



1. Power piping of 2 inches nominal pipe size and smaller;
2. Power piping replacements, modifications and alterations to existing systems and for new installations, any of which do not exceed 50 feet in length; and
3. Underground power piping systems which are not located in a walk-in tunnel.

(c) The installer shall notify the certified inspector prior to the start of construction of the power piping system so that inspections may be arranged. The department or the city shall be given a minimum of 2 business days notice to arrange for inspection.

(d) A power piping inspection shall be made after the piping material is delivered to the job site and prior to the start of construction of the power piping system. The installer shall complete form SBD-5204 and retain it at the job site prior to the power piping inspection. The certified inspector shall indicate acceptance of the power piping system design by signing form SBD-5204. Power piping systems may not be insulated or placed in service without receiving an inspection.

Note: See Appendix A for a copy of form SBD-5204.

(e) Prefabricated piping that is part of a power piping system shall be inspected by a certified inspector at the fabrication shop. The shop fabricator shall provide a copy of the authorized inspector's report to the installer at the job site verifying that the prefabricated piping complies with the ANSI standard for power piping adopted under s. ILHR 41.10.

(f) The owner of the power piping system may request power piping inspections in addition to the minimum inspections.

(g) Inspection fees for the power piping inspections shall be assessed by the department or by the city of the first class.

Note: For inspection fees, see ch. Comm 2.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (1) (d) and (2) (c), cr. (1) (e), Register, December, 1992, No. 444, eff. 1-1-93; am. (2) (d), r. and recr. (2) (e), Register, May, 1994, No. 461, eff. 6-1-94; am. (1) (a), (d), (2) (a), (c) to (e), Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 41.17 Periodic inspections.** (1) INSPECTION OF POWER BOILERS. (a) Except as provided in s. ILHR 41.18, power boilers and organic fluid heat transfer boilers shall be subjected to either a regular internal or external inspection at least once every 12 months by a certified inspector.

(b) Where an internal inspection of a power boiler is not possible because of the construction of the boiler, an external inspection shall be acceptable.

(2) INSPECTION OF PRESSURE VESSELS. Except as provided in s. ILHR 41.18, pressure vessels shall be subjected to a regular internal or external inspection at least once every 36 months by a certified inspector.

(3) INSPECTION OF LOW PRESSURE STEAM AND HOT WATER HEATING BOILERS. Except as provided in s. ILHR 41.18, low pressure steam boilers and hot water heating boilers shall be subjected to a regular internal or external inspection at least once every 36 months by a certified inspector.

(4) INSPECTION OF SAFETY VALVES AND SAFETY RELIEF VALVES. The certified inspectors shall satisfy themselves that safety valves and safety relief valves have been operated at least once every 12 months.

(5) EXTENSION OF PERIOD BETWEEN INSPECTIONS. If operating conditions require, an extension of periods not to exceed 6 months between inspections of boilers, pressure vessels, safety valves and safety relief valves may be approved by the department upon a written request from the owner or user for an extension.

Note: For inspection fees, see ch. Comm 2.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (1) (a), Register, December, 1992, No. 444, eff. 1-1-93; am. (5), Register, May, 1994, No. 461, eff. 6-1-94; am. (1) (a), (2) to (5), Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 41.18 Exemptions from periodic inspections.** (1) EXEMPTED EQUIPMENT. Except as provided in sub. (2), periodic inspections are not required for:

(a) Boilers or pressure vessels which receive regular inspections by United States government inspectors;

(b) Heating boilers located in private residences or in apartment buildings having less than 3 living units;

(c) Expansion tanks for hot water heating boilers;

(d) Boilers used exclusively for agricultural purposes;

(e) Pressure vessels having an inside diameter not exceeding 6 inches with no limit on pressure;

(f) Pressure vessels having a volume of less than 5 cubic feet and an operating pressure of less than 250 psig;

(g) Pressure vessels with a volume of less than 1-1/2 cubic feet with no limit on pressure;

(h) Pressure vessels having an internal or external operating pressure of not more than 15 psig with no limitations on size;

(i) Hot water supply boilers and water heaters, and hot water storage tanks in which the temperature does not exceed 210° F;

(j) Vessels used for the storage or processing of cold water, including those with air cushions;

(k) Pressure vessels which are used in accordance with the regulations of the United States department of transportation;

(L) Air receivers having a volume of less than 12 cubic feet and an operating pressure of less than 250 psig; and

(m) Pressure vessels used in processing and storing of fermented beverages at temperatures not exceeding 140° F.

(2) EXCEPTIONS. In individual cases, the boilers and pressure vessels exempted in sub. (1) shall be subject to inspection by or on order of the department upon the complaint of any person or upon the initiative of the department when there is reasonable cause to suspect that the construction, installation, maintenance or operation of the vessel is not in keeping with the general purpose and intent of chs. ILHR 41 and 42.

(3) EXEMPTED POWER BOILERS. A power boiler, excluding a chemical recovery boiler, with a rated steam output capacity of 100,000 pounds per hour or greater may be exempted from internal inspection each 12 months, but not to exceed 24 months, provided all the following conditions are met:

(a) A documented boiler maintenance program is available.

(b) A documented boiler water treatment program is available.

(c) The inspection agency of record has verified in writing to the department that the maintenance and treatment programs are adequate for the boiler.

(d) If the internal inspection is completed during the 12 to 24 month period, the boiler shall be subjected to an external inspection at 12 months.

History: Register, February, 1988, No. 386, eff. 3-1-88; cr. (3), Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.19 Preparation for internal inspection.**

(1) GENERAL REQUIREMENTS. The owner or user of a boiler or a pressure vessel subject to inspection shall prepare the vessel for internal inspection after due notice from the certified inspector. To prepare a vessel for an internal inspection all manhole plates, all wash-out plugs, and a sufficient number of handhole plates to permit a satisfactory inspection shall be removed. The shell and heads shall be thoroughly cleaned and exposed when so requested. Each steam boiler shall be thoroughly drained of water and all fire side surfaces cleaned before an internal inspection is made.

(2) PREPARATION PROCEDURE. The following procedure shall be required for preparation for inspection:

(a) Before entering any part of a boiler which is connected to a common header with other boilers, the required steam or water system stop valves shall be closed, tagged and preferably padlocked, and drain valves or cocks between the 2 closed stop valves shall be opened. The feed valves shall be closed, tagged, and preferably padlocked, and drain valves or cocks located between the 2 valves shall be opened.



(b) After draining the boiler, the blowoff valves shall be closed, tagged and preferably padlocked. Blowoff lines, where practicable, shall be disconnected between pressure parts and valves. All drains and vent lines shall be opened.

(3) **RIGHT TO REFUSE ENTRY.** The certified inspector shall have the right to refuse to enter a boiler or pressure vessel if in the inspector's judgement it is unsafe to do so.

**Note:** Confined space rules are contained in ch. ILHR 32 for public sector employees and in section 29 CFR 1910.146 of the federal Occupational Safety and Health Administration for private sector employees.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (1), (3), Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 41.20 Inspections by insurance companies.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 41.21 Inspections by cities.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 41.22 Inspections by companies or corporations.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, October, 1996, No. 490, eff. 11-1-96.

### ILHR 41.23 Reporting of periodic inspections.

(1) **REPORTING PROCESSING TIME.** Reports of periodic internal or external inspections of boilers and pressure vessels shall be sent to the department within 30 calendar days from the date of inspection.

(2) **INSPECTION REPORT FORMS.** (a) Required periodic inspections shall be reported to the department on forms **SBD-7678** and **SBD-7679**.

**Note:** Form SBD-7678 is used for reporting inspections of pressure vessels, and Form SBD-7679 is used for reporting inspections of boilers. See Appendix A for copies of these forms.

(b) A group of pressure vessels of the same design and use that are interconnected or are operated so as to form a unit, machine or apparatus may be included in a single inspection report. The report shall contain the number, description and use of the vessel.

(c) The inspection report shall explain any violation or unsafe condition with references to code section numbers. Recommendations to the owner or user of the vessel, relating to code violations, shall be included in the report to the department.

(d) The inspection report shall be legible and complete.

(3) **EXTERNAL INSPECTIONS.** External inspections shall be reported only when either of the following conditions is found:

(a) An internal inspection is not possible because of the construction of the vessel. In these cases the external inspection shall be reported to the department in the same manner as an internal inspection. The report shall be marked external and the reason for making an external inspection instead of an internal shall be given; or

(b) When violations of chs. ILHR 41 and 42 or unsafe conditions involving the safety of the vessel are found.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 41.24 Certificate of operation.** (1) **RESPONSIBILITY.** (a) The owner or user of the boiler or pressure vessel shall be responsible for obtaining and maintaining a valid certificate of operation.

(b) The certificate of operation shall be posted on the premises by the owner or user of the boiler or pressure vessel.

**Note:** See Appendix A for a copy of the certificate of operation. **SBD-252**

(2) **ISSUANCE.** After each initial or periodic inspection for boilers and pressure vessels found to be in compliance with chs. ILHR 41 and 42, a certificate of operation shall be issued by the department to the owner or user of the boiler or pressure vessel. The department shall issue the certificate within 15 business days of determination of compliance.

(3) **ALLOWABLE PRESSURE.** The certificate of operation shall give the maximum allowable working pressure as determined using the regulations of chs. ILHR 41 and 42.

(4) **EXPIRATION.** The certificate of operation shall be valid until the next required periodic inspection.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88.

### Subchapter III—All Installations

**ILHR 41.27 Application.** The provisions of ss. ILHR 41.27 to 41.39 shall apply to all boilers and pressure vessels existing prior to, or installed after March 1, 1988.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; correction made under s.13.93 (2m) (b) 14, Stats., Register, May, 1994, No. 461.

**ILHR 41.28 Safety rules.** (1) **MAXIMUM ALLOWABLE WORKING PRESSURE.** No boiler or pressure vessel may be operated at a pressure in excess of the maximum allowable working pressure stated on its current certificate of operation.

(2) **ALTERATION TO SAFETY DEVICES.** No unauthorized person may remove or tamper with any connected safety device.

(3) **INSTALLATION LOCATION.** Boilers and pressure vessels shall be so installed that there will be sufficient room between the vessel and any ceiling, wall, partition or floor to facilitate the connection and operation of valves, pipes and other appurtenances, and shall be installed in a manner that will not block any inspection opening.

**Note:** To assure proper installation, alteration or repair of a boiler or pressure vessel, it may be necessary to comply with other applicable Wisconsin Administrative Code sections in addition to the Wisconsin Boiler and Pressure Vessel Code. Some of the Wisconsin Administrative Code sections to be considered are as follows:

Sections ILHR 54.14, 55.29, 56.15, 57.14, 58.24, 58.62, 59.21, 60.25, 60.37, 61.24, 62.32 and 62.78 (boiler room requirements).

Section ILHR 64.09 (combustion air intake requirements).

Sections ILHR 64.20 to 64.23 (installation and safety control requirements).

Sections ILHR 64.45 to 64.50 (chimney and smokestack requirements).

Section ILHR 64.51 (equipment location and protection requirements).

Wisconsin Administrative Codes may be obtained by contacting the State Department of Administration, Document Sales and Distribution, P.O. Box 7840, Mason, Wisconsin 53707.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 41.29 Safety controls.** (1) **GENERAL.** Oil-fired, gas-fired and electrically-heated boilers shall be equipped with primary safety controls, safety limit switches, and burners or electric elements that bear the stamp, monogram or other evidence of compliance with a nationally recognized standard.

**Note:** Typical acceptable stamps are the American Gas Association (AGA) and the Underwriters Laboratories (UL).

(2) **PRESSURE AND TEMPERATURE CONTROLS.** Compliance with the following requirements is optional for boilers installed prior to January 1, 1957:

(a) **Pressure controls.** Each automatically-fired steam boiler or system of commonly connected steam boilers shall have at least one steam pressure control device that will shut off the fuel supply to each boiler or system of commonly connected boilers when the steam pressure reaches a preset maximum operating pressure. In addition to the operating pressure control, each individual automatically-fired steam boiler shall have a high steam pressure limit control that will prevent generation of steam pressure in excess of the maximum allowable working pressure. Each limit control and operating control shall be clearly separated, and have its own sensing element and operating switch. No shut-off valve of any type may be placed in the steam pressure connection between the boiler and the high pressure limit control device.

(b) **Temperature controls.** Each automatically-fired hot water boiler or system of commonly connected hot water boilers shall have at least one temperature actuated control to shut off the fuel supply when the system water reaches a preset operating temperature. In addition to the operating temperature control, each individual automatically-fired hot water boiler unit shall have a high temperature limit control that will prevent the water temperature from exceeding the maximum allowable temperature. Each limit control and operating control shall be clearly separated, and have its own sensing element and operating switch.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (2) (a), Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.30 Low-water cutoff and water feeder.**

(1) **GENERAL REQUIREMENTS.** (a) Every automatically-fired power boiler which does not have a full-time attendant and every automatically-fired low-pressure steam boiler shall be equipped with an automatic low-water fuel cutoff or other device which will perform a similar function, so located as to automatically cut off the fuel supply when the surface of the water falls to the lowest safe water line.

(b) If a water-feeding device is installed, it shall be so constructed that the water inlet valve cannot feed water into the boiler through the float chamber and so located as to supply requisite feed water. The lowest safe water line shall be not lower than the lowest visible part of the water glass.

(c) Boilers which are manually fired and have a residual heat source shall have a fusible plug installed which will extinguish the fire in the event of low water.

(2) **BOWL DESIGNS.** Designs embodying a float and float bowl, or probe control installed in a bowl or chamber externally to the boiler, shall have a vertical straightway valved drain pipe at the lowest point in the water equalizing pipe connections by which the bowl or chamber and the equalizing pipe can be flushed and the device tested.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; cr. (1) (c), Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.31 Boiler blowoff equipment. (1) PRESSURE-**

**TEMPERATURE LIMITS.** The blowdown from a boiler that enters a sewer system or blowdown which is considered a hazard to life or property shall pass through some form of blowoff equipment that will reduce pressure and temperature as specified in pars. (a) and (b).

(a) The temperature of the water leaving the blowoff equipment may not exceed 140° F.

(b) The pressure of the blowdown leaving the blowoff equipment may not exceed 5 psi.

(2) **PIPING AND FITTINGS.** The blowoff piping and fittings between the boiler and the blowoff tank shall comply with the ANSI standard listed in Table 41.10 or the code in effect at the time of construction.

(3) **TANKS AND SEPARATORS.** The blowoff tank or separator shall be designed in accordance with s. ILHR 41.42 or the code in effect at the time of construction for a maximum allowable working pressure of at least 50 psig.

(4) **GENERAL REQUIREMENTS.** All blowoff equipment, except centrifugal blowdown separators, shall be fitted with openings to facilitate cleaning and inspection and shall have:

(a) A pressure gage graduated from 0-50 psi;

(b) A thermometer well located near the water outlet connection and in contact with the retained water in the tank;

(c) A gauge glass at least ½-inch in diameter with the lower connection to the glass at a point about 6 inches below the water line and the upper connection at a point about 6 inches above the water line;

(d) A drain connection of at least 2-inch standard pipe size; and

(e) Connections designed so that freezing will not close the inlet, the outlet or the vent.

(5) **VENT PIPING.** All blowoff equipment shall have vent piping, full size, piped to the outside atmosphere and discharged to a safe location.

**Note:** Blowoff equipment designed in accordance with the boiler blowoff equipment rules issued by the National Board of Boiler and Pressure Vessel Inspectors will meet the requirements of this section. Other methods of designing blowoff equipment may be used if approved by the department.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (4) (d) and (e), r. (4) (f), cr. (5), Register, December, 1992, No. 444, eff. 1-1-93; am. (2), (3), (4) (a), Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.32 Pressure gages for air receivers.**

(1) **GAGE LOCATION.** Air receivers shall be equipped with an indicating pressure gage so located as to be readily visible.

(2) **GAGE DIAL.** The dial of the pressure gage shall be graduated to approximately double the pressure at which the safety valve is set, but may not be less than one and one-half times that pressure.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 41.33 Protection of vessels supplied through pressure reducing stations.**

The following requirements shall be used for determining the sizes of safety valves on pressure vessels such as, but not limited to pressure cookers, indirect hot water heaters and equipment in heating systems, which are supplied through pressure reducing stations from boilers carrying a higher steam pressure. Where a pressure reducing station is supplied from a boiler, the capacity of the safety valves on the low pressure side of the system need not exceed the capacity of the boiler.

(1) **REDUCING STATION CAPACITY.** The following formula shall be used to determine the steam flow rate through the pressure reducing station.

$$W = 1/3 \times OC \times VSPA$$

Where:

W= steam flow in pounds of steam per hour through the pressure reducing valve

OC= orifice capacity in pounds of steam per hour per square inch from Table 41.33-1

VSPA= reducing valve size pipe area in square inches from Table 41.33-2

(a) The critical flow capacity data supplied by the reducing valve manufacturer may be used in place of the above formula to select the required safety valve capacity. The capacity calculations shall be the largest obtainable by internal trim change of the reducing valve.

(b) In using Table 41.33-1, the pressure reducing station inlet pressure is the lowest set pressure of any safety valve on the high pressure side of the pressure reducing station.

(2) **BYPASS CAPACITY.** The following formula shall be used to determine the steam flow rate through the bypass when pressure reducing stations are arranged with a valved bypass which also acts as a potential steam source hazard in case the bypass is left open.

$$W = 1/2 \times OC \times BPA$$

Where:

W= steam flow in pounds of steam per hour through the bypass valve

OC= orifice capacity in pounds of steam per hour per square inch from Table 41.33-1

BPA= bypass pipe area in square inches from Table 41.33-2

(3) **SELECTING SAFETY VALVE.** The larger of the steam flow rates calculated by the formulas in subs. (1) and (2) shall be used for selecting the safety valve on the low pressure side of the system.



TABLE 41.33-1  
ORIFICE RELIEVING CAPACITIES  
(Pounds per hour per square inch)

OUTLET PRESSURE PSIG	PRESSURE REDUCING VALVE INLET PRESSURE, PSIG											
	1500	1450	1400	1350	1300	1250	1200	1150	1100	1050	1000	950
1000	76560	72970	69170	64950	60540	55570	49930	43930	35230	25500	—	—
950	77430	74180	70760	67000	63100	58770	53920	48610	42380	34890	24910	—
900	77750	74810	71720	68340	64870	61040	56820	52260	47050	41050	33490	23960
850	77830	74950	72160	69130	66020	62610	58900	54930	50480	45470	39660	29080
800	—	75070	72330	69490	66700	63680	60390	56910	53060	48800	43980	38340
750	—	—	—	69610	66880	64270	61260	58200	54840	51170	47080	42420
700	—	—	—	—	66900	64270	61520	58820	55870	52670	49170	45230
650	—	—	—	—	—	—	61550	58860	56260	53480	50440	47070
600	—	—	—	—	—	—	—	58980	56270	53660	51020	48470
550	—	—	—	—	—	—	—	—	—	53810	51040	48470
500	—	—	—	—	—	—	—	—	—	—	—	—
450	—	—	—	—	—	—	—	—	—	—	—	—
400	—	—	—	—	—	—	—	—	—	—	—	—
350	—	—	—	—	—	—	—	—	—	—	—	—
300	—	—	—	—	—	—	—	—	—	—	—	—
250	—	—	—	—	—	—	—	—	—	—	—	—
200	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—
150	—	—	—	—	—	—	—	—	—	—	—	—
125	—	—	—	—	—	—	—	—	—	—	—	—
110	—	—	—	—	—	—	—	—	—	—	—	—
100	—	—	—	—	—	—	—	—	—	—	—	—
85	—	—	—	—	—	—	—	—	—	—	—	—
75	—	—	—	—	—	—	—	—	—	—	—	—
60	—	—	—	—	—	—	—	—	—	—	—	—
50	—	—	—	—	—	—	—	—	—	—	—	—
40	—	—	—	—	—	—	—	—	—	—	—	—
30	—	—	—	—	—	—	—	—	—	—	—	—
25	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	—
10	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—

Where capacities are not shown for inlet and outlet conditions, use the highest capacity shown under the applicable inlet pressure column.

TABLE 41.33-1 (continued)  
ORIFICE RELIEVING CAPACITIES  
(Pounds per hour per square inch)

OUTLET PRES., PSIG	PRESSURE REDUCING VALVE INLET PRESSURE, PSIG												
	900	850	800	750	700	650	600	550	500	450	400	350	300
1000	---	---	---	---	---	---	---	---	---	---	---	---	---
950	---	---	---	---	---	---	---	---	---	---	---	---	---
900	---	---	---	---	---	---	---	---	---	---	---	---	---
850	23190	---	---	---	---	---	---	---	---	---	---	---	---
800	31610	22550	---	---	---	---	---	---	---	---	---	---	---
750	37110	30600	21800	---	---	---	---	---	---	---	---	---	---
700	40860	35730	29420	21020	---	---	---	---	---	---	---	---	---
650	43400	39200	34250	28260	20190	---	---	---	---	---	---	---	---
600	45010	41500	37470	32800	27090	19480	---	---	---	---	---	---	---
550	45800	42840	39850	35730	31310	25940	18620	---	---	---	---	---	---
500	45850	43330	40530	37610	33880	29760	24630	17720	---	---	---	---	---
450	45870	43330	40730	38150	35260	31980	28080	23290	16680	---	---	---	---
400	---	---	40760	38220	35680	33050	29980	26380	21870	15760	---	---	---
350	---	---	---	---	---	33120	30690	27910	24570	20460	14790	---	---
300	---	---	---	---	---	33240	---	28140	25610	22620	18860	13630	---
250	---	---	---	---	---	---	---	28150	25650	23200	21000	17100	10800
200	---	---	---	---	---	---	---	---	---	---	21350	18250	15350
175	---	---	---	---	---	---	---	---	---	---	---	18250	16000
150	---	---	---	---	---	---	---	---	---	---	---	18250	16200
125	---	---	---	---	---	---	---	---	---	---	---	18780	---
110	---	---	---	---	---	---	---	---	---	---	---	---	---
100	---	---	---	---	---	---	---	---	---	---	---	---	---
85	---	---	---	---	---	---	---	---	---	---	---	---	---
75	---	---	---	---	---	---	---	---	---	---	---	---	---
60	---	---	---	---	---	---	---	---	---	---	---	---	---
50	---	---	---	---	---	---	---	---	---	---	---	---	---
40	---	---	---	---	---	---	---	---	---	---	---	---	---
30	---	---	---	---	---	---	---	---	---	---	---	---	---
25	---	---	---	---	---	---	---	---	---	---	---	---	---
15	---	---	---	---	---	---	---	---	---	---	---	---	---
10	---	---	---	---	---	---	---	---	---	---	---	---	---
5	---	---	---	---	---	---	---	---	---	---	---	---	---

Where capacities are not shown for inlet and outlet conditions, use the highest capacity shown under the applicable inlet pressure column.

TABLE 41.33-1 (continued)  
ORIFICE RELIEVING CAPACITIES  
(Pounds per hour per square inch)

OUTLET PRES., PSIG	PRESSURE REDUCING VALVE INLET PRESSURE, PSIG												
	250	200	175	150	125	100	85	75	60	50	40	30	25
1000	---	---	---	---	---	---	---	---	---	---	---	---	---
950	---	---	---	---	---	---	---	---	---	---	---	---	---
900	---	---	---	---	---	---	---	---	---	---	---	---	---
850	---	---	---	---	---	---	---	---	---	---	---	---	---
800	---	---	---	---	---	---	---	---	---	---	---	---	---
750	---	---	---	---	---	---	---	---	---	---	---	---	---
700	---	---	---	---	---	---	---	---	---	---	---	---	---
650	---	---	---	---	---	---	---	---	---	---	---	---	---
600	---	---	---	---	---	---	---	---	---	---	---	---	---
550	---	---	---	---	---	---	---	---	---	---	---	---	---
500	---	---	---	---	---	---	---	---	---	---	---	---	---
450	---	---	---	---	---	---	---	---	---	---	---	---	---
400	---	---	---	---	---	---	---	---	---	---	---	---	---
350	---	---	---	---	---	---	---	---	---	---	---	---	---
300	---	---	---	---	---	---	---	---	---	---	---	---	---
250	---	---	---	---	---	---	---	---	---	---	---	---	---
200	10900	---	---	---	---	---	---	---	---	---	---	---	---
175	12600	7250	---	---	---	---	---	---	---	---	---	---	---
150	13400	9540	6750	---	---	---	---	---	---	---	---	---	---
125	13600	10800	8780	6220	---	---	---	---	---	---	---	---	---
110	13600	11000	9460	7420	4550	---	---	---	---	---	---	---	---
100	13600	11000	9760	7970	5630	---	---	---	---	---	---	---	---
85	13600	11000	---	8480	6640	4070	---	---	---	---	---	---	---
75	13600	11000	---	---	7050	4980	3150	---	---	---	---	---	---
60	13630	11000	---	---	7200	5750	4540	3520	---	---	---	---	---
50	---	11000	---	---	---	5920	5000	4230	2680	---	---	---	---
40	---	11000	---	---	---	---	5140	4630	3480	2470	---	---	---
30	---	11050	---	---	---	---	---	---	3860	3140	2210	---	---
25	---	---	---	---	---	---	---	---	---	3340	2580	1485	---
15	---	---	---	---	---	---	---	---	---	---	2830	2320	1800
10	---	---	---	---	---	---	---	---	---	---	---	---	2060
5	---	---	---	---	---	---	---	---	---	---	---	---	---

Where capacities are not shown for inlet and outlet conditions, use the highest capacity shown under the applicable inlet pressure column.



**TABLE 41.33-2  
INTERNAL PIPE AREA**

Nominal pipe size, inches	STANDARD WEIGHT PIPE		
	Actual External Diameter, Inches	Approx. Internal Diameter, Inches	Approx. In- ternal Area, Square In- ches
3/8 .....	0.675	0.49	0.19
1/2 .....	0.840	0.62	0.30
3/4 .....	1.050	0.82	0.53
1 .....	1.315	1.05	0.86
1-1/4 .....	1.660	1.38	1.50
1-1/2 .....	1.900	1.61	2.04
2 .....	2.375	2.07	3.36
2-1/2 .....	2.875	2.47	4.78
3 .....	3.5	3.07	7.39
3-1/2 .....	4.0	3.55	9.89
4 .....	4.5	4.03	12.73
5 .....	5.563	5.05	19.99
6 .....	6.625	6.07	28.89
8 .....	8.625	8.07	51.15
10 .....	1.750	10.19	81.55
12 .....	12.750	12.09	114.80

Note: In applying Table 41.33-2, the area of the pipe is always based upon standard weight pipe and the inlet size of the pressure reducing valve.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. intro., (1)(intro.), (2), r. and recr. (1) (a) and (b), Register, May, 1994, No. 461, eff. 6-1-94; am. (1) (a), Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.34 Portable boilers. (1) CERTIFICATE REQUIRED.** The owner or user of a portable boiler located in Wisconsin or brought into Wisconsin for use, shall possess a certificate of operation issued by the department prior to use.

**(2) BOILER REQUIREMENTS.** The certificate of operation shall be issued only after the following requirements are met:

- (a) The boiler is of ASME construction;
- (b) The boiler is installed according to the applicable requirements of chs. ILHR 41 and 42; and
- (c) An internal or external inspection of the boiler has been made which is acceptable to the department.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 41.35 Interconnected boilers.** When boilers of different maximum allowable working pressures with minimum safety valve settings varying more than 6% are so connected that steam can flow toward the lower pressure units, the latter shall be protected by additional safety valve capacity, if necessary, on the lower pressure side of the system. The additional safety valve capacity shall be based upon the maximum amount of steam which can flow into the lower pressure system. The additional safety valves shall have at least one valve set at a pressure not to exceed the lowest allowable pressure and the other valves shall be set within a range not to exceed 3% above that pressure.

History: History: Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 41.36 Identification of boilers and pressure vessels. (1) PERMANENT NUMBER.** The owner or user of a boiler or pressure vessel shall number each vessel in some permanent manner and in an accessible location.

**(2) REGISTRATION NUMBER.** Boilers and pressure vessels subject to periodic inspections shall be identified by a registration number supplied by the department. The registration number shall be affixed to the vessel by a certified inspector at a location which can be easily viewed.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (2), Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 41.37 Maintenance. (1) CORROSION PREVENTION.** All boilers and pressure vessels shall be installed and maintained in such a manner as to prevent excessive corrosion and deterioration.

**(2) SAFE CONDITIONS.** The certified inspector shall note conditions during internal inspection, external inspection, or hydrostatic pressure test and shall order changes or repairs which will place the boiler or pressure vessel in a safe working condition.

Note: Sections VI and VII of the ASME boiler and pressure vessel code, Recommended Rules for Care and Operation of Heating Boilers and Recommended Rules for Care of Power Boilers, are excellent guides for boiler owners and operators.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (2), Register, 1996, No. 490, eff. 11-1-96.

**ILHR 41.38 Reporting accidents, repairs and alterations. (1) ACCIDENTS.** Whenever a boiler or pressure vessel fails and causes injury to any person, the owner or user shall report the facts involved to the department within the following 24 hours. The owner or user may not remove or disturb the boiler or pressure vessel or any of its parts nor permit any such removal or disturbance prior to receiving authorization from the department, except for the purpose of saving human life or further property damage.

**(2) REPAIRS AND ALTERATIONS.** The owner or user shall report any repairs or alterations of a boiler or pressure vessel as required in ch. ILHR 42.

**(3) FUEL CONVERSIONS.** The owner or user shall report conversions of boilers to other fuels.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 41.39 Condemnation. (1) AUTHORITY.** Only the department may condemn a boiler or pressure vessel. Any boiler or pressure vessel declared by a certified inspector to be unsafe and beyond repair shall be referred to the department for condemnation proceedings.

**(2) SYMBOL.** (a) Any boiler or pressure vessel confirmed by the department to be unsafe for further use shall be stamped as follows:

“CONDEMNED”

“Arrowhead Stamp x Wisconsin x Arrowhead Stamp”

(b) Letters used for the stamp shall be at least 3/8-inch high and arrowheads shall be at least 1/2-inch wide.

**(3) UNLAWFUL USE.** It shall be unlawful for any person, firm, partnership or corporation to use, operate, or offer for sale for operation within the state any condemned boiler or pressure vessel.

History: Register, February, 1988, No. 386, eff. 3-1-88; am. (1), Register, October, 1996, No. 490, eff. 11-1-96.

**Subchapter IV—New Installations**

**ILHR 41.40 Application.** The provisions of ss. ILHR 41.40 to 41.48 shall apply to all boilers and pressure vessels installed after the effective date of this section.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 41.41 Installation registration. (1) BOILER OR PRESSURE VESSEL INSTALLATION REGISTRATION.** (a) Except as provided in par. (b), the installation of any boiler or pressure vessel shall be registered with the department by the installer before the operation of the boiler or pressure vessel. Registration shall be in writing on form SBD-6314.

Note: See Appendix A for a copy of form SBD-6314.

(b) Registration with the department is not required for:

- 1. Boilers and pressure vessels exempted from periodic inspections in s. ILHR 41.18; and
- 2. Installations in cities of the first class if an installation registration form has been filed with the appropriate city official.

**(2) POWER PIPING INSTALLATION REGISTRATION.** (a) Except as provided in par. (b), the installation of any power piping system shall be registered with the department by the installer before the



operation of the piping system. Registration shall be in writing on form SB-5204.

Note: See Appendix A for a copy of form SB-5204.

(b) Registration is not required for:

1. Power piping of 2 inches nominal pipe size and smaller;
2. Installations in cities of the first class if an installation registration form has been filed with the appropriate city official;
3. Underground power piping systems which are not located in a walk-in tunnel; and
4. Replacements, modifications and alterations to existing systems and for new installations, any of which do not exceed 50 feet in length.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (1) (a) and (2) (a), Register, December, 1992, No. 444, eff. 1-1-93.

**ILHR 41.42 ASME code vessels.** (1) ASME CODE COMPLIANCE. Except as provided in ss. ILHR 41.43, 41.44 and 41.45, boilers and pressure vessels shall be constructed and installed in accordance with the ASME standards adopted under s. ILHR 41.10. Boilers and pressure vessels designed to other national or international standards may be approved if the design has been accepted by a nationally recognized independent third party.

Note: The department will recognize the applicable case interpretations of the ASME boiler and pressure vessel code as being acceptable.

(2) FILING WITH NATIONAL BOARD. Boilers and pressure vessels constructed and installed in accordance with the ASME standards adopted in s. ILHR 41.10 shall have the manufacturer's data report filed with the National Board and shall bear a National Board number.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (1), Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.43 Wisconsin special vessels.** Where it is not possible or practical to construct a boiler or pressure vessel in strict compliance with s. ILHR 41.42, the department may grant a variance to the owner or user to permit the installation of the boiler or pressure vessel as a Wisconsin special within the state of Wisconsin. The department shall consider a variance request upon receipt of a completed petition for variance form and the required fee. The variance may be granted under the following conditions:

Note: See s. ILHR 41.05 for further explanatory information.

(1) COMPARABLE SAFETY. (a) When the method of designing or constructing the boiler or pressure vessel is not covered by the ASME codes listed in s. ILHR 41.10, the department may approve the installation provided adequate proof of comparable safety of the design or construction is shown.

(b) Complete plans, calculations and specifications in duplicate shall be submitted to and approved by the department before installation.

(c) The boiler or pressure vessel shall be stamped "Wisconsin Special" if approved by the department.

(d) All other applicable requirements of the ASME code listed in s. ILHR 41.10 shall be met.

(2) OWNER-BUILT. (a) When the boiler or pressure vessel is to be built by an owner for the owner's use, the department may waive the stamping required by the ASME codes listed in s. ILHR 41.10.

(b) Complete plans, calculations and specifications in duplicate shall be submitted to and approved by the department before installation.

(c) The boiler or pressure vessel shall be stamped "Wisconsin Special" if approved by the department.

(d) All other applicable requirements of the ASME code listed in s. ILHR 41.10 shall be met.

(3) LIMITED QUANTITY. (a) When a small number of boilers or pressure vessels is to be built by a manufacturer, the department may waive the stamping required by the ASME codes listed in s. ILHR 41.10.

(b) Complete plans, calculations and specifications in duplicate shall be submitted to and approved by the department before installation.

(c) The boiler or pressure vessel shall be stamped "Wisconsin Special" if approved by the department.

(d) All other applicable requirements of the ASME code listed in s. ILHR 41.10 shall be met.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 41.44 U.S. department of transportation vessels.** Pressure vessels bearing the stamping of the United States department of transportation are not permitted as permanent storage containers, but may be used as replaceable service cylinders and as cylinders for storage of compressed natural gas.

Note: Complete requirements for storage of compressed natural gas are contained in the National Fire Protection Association (NFPA) standard number NFPA 52, available from the NFPA, Batterymarch Park, Quincy, MA 02269.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 41.45 Noncode vessels.** (1) EXEMPTED VESSELS. The following vessels are not required to be constructed and installed in accordance with the ASME codes listed in Table 41.10:

(a) Water heaters and hot water storage tanks, provided water temperatures do not exceed 210° F;

Note: See ch. ILHR 84 for requirements relating to water heaters and hot water storage tanks.

(b) Vessels for containing water under pressure for domestic supply, including those having an air space for expansion;

(c) Pressure vessels used for the processing or storage of water at water temperatures not exceeding 210° F. These vessels may contain a steam or hot water coil or heat exchanger, provided the steam is at or below a pressure of 15 psig and the hot water is at or below a pressure of 160 psig and a temperature of 250° F;

(d) Pressure vessels used for water conditioning and filtration; and

(e) Pressure vessels used in processing and storing of fermented beverages at temperatures not exceeding 140° F.

(2) VESSEL IDENTIFICATION. The vessels listed in sub. (1) (b) to (e) shall be identified with the manufacturer's name, a serial number, the allowable working pressure, and the year fabricated.

(3) PRESSURE RELIEF REQUIREMENTS. (a) Except as provided in par. (b), the vessels listed in sub. (1) shall meet the pressure relief device requirements of the ASME codes listed in Table 41.10.

Note: Pressure relief devices are not required on each vessel of a system if the system is properly equipped with pressure relief devices. For systems containing unheated water storage tanks, a pressure relief device is needed when the pressure-inducing source is capable of imposing a pressure greater than the design pressure of the tanks.

(b) Water heaters and hot water storage tanks shall be equipped with pressure-temperature relief devices in accordance with ch. ILHR 84.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. and recr. (1) (a) and (3) (b), Register, December, 1992, No. 444, eff. 1-1-93.

**ILHR 41.46 Power piping.** (1) GENERAL. Power piping shall be installed in accordance with the ANSI standard for power piping, including addenda, listed in Table 41.10. The use of slip-on flanges exceeding 4-inches nominal pipe size shall not be permitted on power piping.

(2) BOILER EXTERNAL PIPING. Boiler external piping within the scope of section I of the ASME code shall be installed in accordance with the ANSI standard for power piping, including addenda, listed in Table 41.10.

(3) APPLICATION. This section applies to new systems as well as all replacements, modifications, and alterations to existing systems.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. and recr. Register, February, 1990, No. 410, eff. 3-1-90.

**ILHR 41.47 Multi-boiler installations.** When hot water heating boilers are installed in multiples with a common header



and a common return, isolation valves may be eliminated between units and the units may be considered as one boiler provided:

(1) **OUTPUT LIMIT.** No single unit exceeds 500,000 Btu per hour output;

(2) **PRESSURE RELIEF.** Each unit has a pressure relief device as required by the ASME code, or the common header has a pressure relief device with sufficient relieving capacity for all units in the installation;

(3) **CONTROLS.** Each unit has operating controls and safety controls acceptable to the department; and

(4) **LOW-WATER CUTOFF.** The fuel supply to each unit is shut off by a low-water cutoff in the event of low water in the system.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88.

#### ILHR 41.48 Organic fluid heat transfer systems.

Boilers and coil type heaters which utilize organic thermal fluids as a heat transfer media shall be designed, constructed and installed in accordance with the ASME standards adopted under s. ILHR 41.10. Piping for organic thermal fluids used as a heat transfer media and subject to temperatures in excess of 250° F shall be installed in accordance with the ANSI standard for power piping adopted under s. ILHR 41.10.

**Note:** See s. ILHR 41.16 for inspection requirements.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. Register, May, 1994, No. 461, eff. 6-1-94.

**ILHR 41.49 Wood-burning boilers.** This section applies to hand-fired wood-burning boilers that are used for space heating and that are not constructed and installed in accordance with the ASME code.

(1) **DESIGN.** (a) The boiler shall be constructed with self-contained weatherproofing with no additional structure enclosing the fired unit.

(b) The boiler shall be listed by a nationally recognized testing laboratory acceptable to the department.

**Note:** Examples of acceptable testing laboratories include, but are not limited to, PFS Corporation, UL and Factory Mutual.

(c) The boiler shall be designed for operation at atmospheric pressure and be properly vented to prevent a positive pressure condition.

(2) **INSTALLATION REGISTRATION.** The installation of the boiler shall be registered with the department by the installer using form SBD-6314.

**Note:** See Appendix A for a copy of form SBD-6314

(3) **INSTALLATION.** (a) The boiler shall be located away from other structures in accordance with the manufacturer's recommendation.

(b) The boiler shall be enclosed by fencing or other barriers to prevent access by unauthorized persons.

(c) The boiler shall be manually fired and shall be limited to using wood or other solid fuels as the source of energy.

(d) The installation shall be provided with means to prevent freezing of the water supply and return lines.

(4) **INSPECTION.** (a) The installation shall be inspected by the department for compliance with this section before the boiler is placed in operation.

**Note:** Periodic inspections will not be performed on wood-burning boilers.

(b) Fees for the installation inspection shall be charged in accordance with s. Comm 2.03.

(5) **REPAIRS.** (a) Repairs to the boiler shall be made in accordance with the manufacturer's recommendations.

(b) Welded repairs to the boiler shall be made by welders qualified in accordance with s. ILHR 53.53 or the ASME Code section IX.

(c) The department shall be notified by the contractor of any welded repairs to the boiler.

**History:** Cr. Register, December, 1992, No. 444, eff. 1-1-93; r. and recr. (2), (3) (a), am. (4) (a), Register, June, 1996, No. 486, eff. 7-1-96; correction in (4) (b) made under s. 13.93 (2m) (b) 7., Stats., Register, October, 1996, No. 490.

### Subchapter V—Nuclear Power Plants

**ILHR 41.53 Application.** The provisions of ss. ILHR 41.53 to 41.57 shall apply to all existing nuclear power plants and to all nuclear power plants constructed after March 1, 1988.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 41.54 Installation registration.** (1) **OWNER REPORT FILING BEFORE OPERATION.** The owner of any nuclear class pressure vessel within the scope of ASME code section III, except those vessels exempted from periodic inspections in s. ILHR 41.18, shall file a copy of form N-3, ASME data report, with the department before operating the pressure vessel.

**Note:** Form N-3 is available from the American Society of Mechanical Engineers.

(2) **REGISTRATION OF BOILERS, PRESSURE VESSELS AND POWER PIPING.** All non-nuclear class boilers, pressure vessels and power piping at nuclear power plants shall be registered with the department as required by s. ILHR 41.41. The installation inspection shall meet the requirements of s. ILHR 41.16.

**Note:** Large groups of vessels may be reported in summary form in lieu of individual reports for each vessel.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 41.55 Periodic inspections.** (1) **IN-SERVICE INSPECTION PROGRAM.** The owner or user shall file with the department an in-service inspection plan as required by section XI of the ASME code. The department shall be notified at least 10 business days prior to all planned shutdowns which include in-service inspections.

**Note:** A copy of the in-service inspection plan accepted by the nuclear regulatory commission will be acceptable to the department in satisfying the filing of an in-service inspection plan.

(2) **STATEMENT OF INSPECTION SERVICE CONTRACT.** The owner or user shall file a statement with the department indicating possession of an arrangement with a certified inspector to provide inspection services under section XI of the ASME code. The statement shall include the name and address of the current authorized inspection agency.

(3) **IN-SERVICE INSPECTION REPORT.** Within 90 calendar days after each in-service inspection, the owner or user shall submit to the department a copy of form NIS-1, owner's data report for in-service inspection, describing the inspections performed under section XI of the ASME code.

**Note:** Form NIS-1 is available from the American Society of Mechanical Engineers.

(4) **FREQUENCY OF INSPECTION.** Pressure vessels located within a nuclear containment may be inspected as part of the in-service inspection. The vessels shall be inspected at least once every 36 months. If operating conditions require, longer periods not to exceed 3 months between inspections may be approved by the department upon receipt of a written request for an extension.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (2), (4), Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 41.56 Welded repair.** (1) **RECORD OF REPAIR.** Except as provided in sub. (3), the owner or the owner's agent shall furnish the department, within 90 calendar days, a record of repair, form SB-190, R-1 or NR-1, when any component within the scope of ASME code section XI is repaired by welding. Form SB-190 shall be filed by organizations who do not possess an ASME certificate of authorization or a national board R or NR certificate.

**Note:** No other supporting documents are required to be submitted to meet this requirement.

**Note:** Multiple repairs to the same object may be reported on a single report form.

**Note:** See Appendix A for copies of forms SB-190, R-1 and NR-1.

**(2) RECORD OF MODIFICATIONS, REPLACEMENT, ADDITIONS OR ALTERATIONS.** Except as provided in sub. (3), when modifications, replacements, additions or alterations are made by welding, the requirement stated in sub. (1) shall apply.

**(3) EXEMPTION.** Piping, valves and fittings of 2-inch nominal pipe size and smaller are exempt from the requirements of this section.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 41.57 Report of incidents.** The owner or the owner's agent shall report to the department any incident involving pressure-retaining components within the scope of section XI of the ASME code which requires notification to the U.S. nuclear regulatory commission. The report shall be filed coincident with the report to the U.S. nuclear regulatory commission.

**Note:** It is the intent of the department to avoid conflicts with the requirements of the U.S. nuclear regulatory commission.

**ILHR 41.60 Application.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.61 Maximum allowable working pressures.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.62 Code constructed vessels.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.63 Pressure calculations for shells.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.64 Pressure calculations for flat heads and flat surfaces.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.65 Pressure calculations for dished heads.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.66 Dished head restrictions.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.67 Pressure calculation for furnaces and circular flues.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.68 Boiler plate thickness.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.69 Safety devices and other appliances.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.70 Factor of safety.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.71 Strength of materials.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.72 Shearing strength of rivets.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.73 Efficiency of joint.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.74 Ligament between parallel tube holes.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.75 Ligament between parallel tube holes.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.76 Maximum pressure for cast iron boilers.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.77 Safety or relief valves required on boilers.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.78 Safety valves for low pressure steam, miniature and power boilers.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.79 Safety relief valves for hot water boilers.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.80 Thermometers for hot water boilers.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.81 Water glass.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.82 Gage cocks.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.83 Water column piping.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.84 Pressure gages.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.85 Stop valves on discharge outlets.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.86 Steam mains.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.87 Bottom blowoff or drain.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.88 Feed pipe.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.89 Combustion regulators for boilers.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.90 Washout and inspection openings.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.91 Threaded openings.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.92 Boiler setting and installation.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.93 Boiler doors.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

**ILHR 41.94 Pressure relief devices required for unfired pressure vessels.** **History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88, r. Register, June, 1996, No. 486, eff. 7-1-96.

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## Chapter ILHR 42

### REPAIRS, ALTERATIONS AND MISCELLANEOUS REQUIREMENTS

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**Note:** Chapter ILHR 42 as it existed on February 29, 1988, was repealed and a new chapter ILHR 42 was created effective March 1, 1988.

#### Subchapter I— Welded Repairs and Alterations

**ILHR 42.01 General requirements. (1) ACCEPTABLE METHODS.** Welded repairs or alterations to any boiler or pressure vessel or their fittings, settings, or appurtenances shall be completed in accordance with the requirements of ss. ILHR 42.01 to 42.20. Other methods may be acceptable provided they are approved by the department. In the absence of specific rules, the rules for new construction shall apply. Except as provided in s. ILHR 42.02 (1), no welded repair or alteration may be made without the prior approval of a certified inspector who shall, if it is considered necessary, inspect the object before granting an approval.

**(2) ACCEPTANCE OF REPAIRS AND ALTERATIONS.** Repairs or alterations shall be acceptable to the certified inspector responsible for the inservice inspection of the boiler or pressure vessel. It shall be the responsibility of the organization making the repair or alteration to provide for inspection, documentation and certification of the work and to ensure prior acceptance of the procedures for the work by the inspector responsible for inservice inspection of the boiler or pressure vessel.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (1), (2), Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 42.02 General rules for repairs. (1) AUTHORIZATION.** Except as provided in sub. (1m), repairs to boilers and pressure vessels shall be performed by an organization in possession of a valid National Board repair "R" certificate of authorization, a valid ASME certificate of authorization containing provisions for welded repairs or a boiler repairer registration from the department. The repair organization shall have a documented quality control program containing a description of the scope of work they intend to perform with supporting welding procedures and qualification reports in accordance with the ASME Code Section IX. Welded repairs of a routine nature as specified in the scope of the repair organization's quality control program may be performed without prior approval of the certified inspector.

**Note:** See s. ILHR 41.06 for penalties for violations of these rules.

**(1m) EXCEPTION.** A person or entity that holds a valid authorization issued by the department to perform boiler or pressure

vessel repairs may continue to repair boilers or pressure vessels until one year after the effective date of these rules.

**(2) EXAMPLES OF REPAIRS.** Repairs shall be work such as, but not limited to, the following examples:

(a) Welded repairs or replacements of pressure parts or attachments that have failed in a weld or in the base material;

(b) The addition of welded attachments to pressure parts such as, but not limited to:

1. Studs for insulation or refractory lining,
2. Hex steel or expanded metal for refractory lining,
3. Ladder clips,
4. Brackets,
5. Tray support rings,
6. Corrosion-resistant strip lining,
7. Corrosion-resistant weld overlay, and
8. Weld build-up of wasted areas.

(c) Replacement of heat exchanger tube sheets in accordance with the original design;

(d) Replacement of boiler or heat exchanger tubes where welding is involved;

(e) In a boiler, a change in the arrangement of tubes in furnace walls, economizer or superheater sections;

(f) Replacement of pressure retaining parts identical to those existing on the boiler or pressure vessel and described on the original manufacturer's data report such as, but not limited to:

1. Replacement of furnace floor tubes or sidewall tubes, or both, in a boiler,
2. Replacement of a shell or head in accordance with the original design,
3. Rewelding a circumferential or longitudinal seam in a shell or head, and
4. Replacement of nozzles;

(g) Installation of new nozzles or openings of such a size that reinforcement is not a consideration, such as the installation of a 3-inch pipe size nozzle to a shell or head of 3/8-inch or less in thickness, or the addition of a 2-inch pipe size nozzle to a shell or head of any thickness;

(h) The addition of a nozzle where reinforcement is a consideration may be considered to be a repair provided the nozzle is identical to one in the original design, is located in a similar part of the



vessel, and is not closer than 3 times its diameter from another nozzle. The addition of such a nozzle shall be restricted by any service requirements;

- (i) The installation of a flush patch to a boiler or pressure vessel;
- (j) The replacement of a shell course in a cylindrical pressure vessel;
- (k) Welding of gage holes;
- (L) Welding of wasted or distorted flange faces;
- (m) Replacement of slip-on flanges with weld neck flanges or vice versa; and
- (n) Seal welding of butt straps and rivets.

**History:** Cr. (2) Register, February, 1988, No. 386, eff. 3-1-88; cr. (1) eff. 12-1-88; am. (1), Register, February, 1990, No. 410, eff. 3-1-90; am. (1), cr. (1m), Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 42.03 General rules for alterations. (1) AUTHORIZATION.** Alterations to boilers and pressure vessels, with the exception of rerating as specified in s. ILHR 42.30, shall be performed by an organization in possession of a valid ASME certificate of authorization, provided the alterations are within the scope of the authorization. The required engineering calculations shall be provided by the ASME certificate holder. When welding is necessary to complete the alteration, it shall be performed by the ASME certificate holder or an organization qualified under s. ILHR 42.02 (1).

**(2) NAMEPLATE.** (a) The organization responsible for the preparation of the report of alteration shall also be responsible for adding a stamping or nameplate to the boiler or pressure vessel.

(b) The stamping or nameplate shall be applied adjacent to the original manufacturer's stamping or nameplate in letters at least 5/32 inch high.

(c) The stamping or nameplate for all alterations to a boiler or pressure vessel shall be as follows:

ALTERED BY _____	
_____ PSIG AT _____ °F	
(MAWP)	(Temp)
_____	
(Manufacturer's Alteration Number, if used)	
_____	
(Date Altered)	

**(3) REPORTS.** A copy of the original manufacturer's data report and any required manufacturer's partial data reports shall be a part of the completed report of alteration and shall be attached thereto. Where the manufacturer's data report is unavailable, documentation acceptable to the department shall be submitted.

**(4) TEST.** A pressure test shall be applied after the alteration has been completed, at a pressure of at least the operating pressure, but not to exceed 150% of the maximum allowable working pressure. In lieu of a pressure test, if approved by the certified inspector, radiographic testing or ultrasonic testing may be utilized.

**Note:** Where water is used in a hydrostatic test, the temperature of the water should not be less than 70°F and the maximum temperature during inspection should not exceed 120°F. If a test is conducted at 1½ times the maximum allowable working pressure (MAWP) and the owner specifies a temperature higher than 120°F, the pressure should be reduced to the MAWP and the temperature should be reduced to 120°F for the close examination.

**(5) EXAMPLES OF ALTERATIONS.** Alterations shall be work such as, but not limited to the following examples:

- (a) To increase the maximum allowable working pressure or temperature of a boiler or pressure vessel regardless of whether or not a physical change was made to the boiler or pressure vessel;
- (b) The addition of new nozzles or openings in a boiler or pressure vessel except those classified as repairs;
- (c) A change in the dimensions or contour of a pressure vessel;

(d) In a boiler, an increase in any heating surface which results in increasing the heat output or the final temperature above that specified in the original design;

(e) The addition of a pressurized jacket to a pressure vessel;

(f) Replacement of a pressure retaining part in a boiler or pressure vessel with a material of different nominal strength or nominal composition from that used in the original design; and

(g) A decrease in the minimum temperature such that additional mechanical tests are required as specified in ASME code section VIII.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (1), Register, December, 1992, No. 444, eff. 1-1-93; am. (4), Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 42.04 Reports. (1) GENERAL.** Except as provided in sub. (2), anyone making welded repairs or alterations in accordance with these rules shall furnish the department with a report of every welded repair or alteration. The report shall be signed by the certified inspector who inspected or approved the repair or alteration. The owner of the equipment shall retain a copy of the report for review by a certified inspector. The report shall contain the information indicated on department form SB-190 or National Board Form R-1. Form SB-190 shall be filed by organizations who do not possess an ASME certificate of authorization or a National Board R certificate.

**Note:** See Appendix A for sample copies of forms SB-190 and R-1.

**(2) EXEMPTIONS.** The following items require the prior approval of the certified inspector but are exempt only from the reporting requirements of sub. (1):

(a) The welded repair or replacement of tubes in boilers or pressure vessels; and

(b) The welded repair or replacement of piping, nozzles, valves and fittings of 2-inch nominal pipe sizes and smaller.

**(3) OTHER REQUIREMENTS.** All other requirements of this subchapter shall apply.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (1), (2) (intro.), Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 42.05 Hydrostatic and nondestructive tests.** If, in the opinion of the certified inspector, a hydrostatic test is necessary, the test shall be applied at a pressure of at least the operating pressure, but not to exceed 150% of the maximum allowable working pressure. In lieu of a hydrostatic test, if approved by the certified inspector, radiographic testing, ultrasonic testing, or other applicable nondestructive testing of the repair may be utilized. All tests shall be applied after the repair has been completed.

**Note:** Where water is used in a hydrostatic test, the temperature of the water should not be less than 70°F and the maximum temperature during inspection should not exceed 120°F. If a test is conducted at 1N times the maximum allowable working pressure (MAWP) and the owner specifies a temperature higher than 120°F, the pressure should be reduced to the MAWP and the temperature should be reduced to 120°F for the close examination.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 42.06 Welding procedure specifications.** Anyone undertaking repairs or alterations shall have available at the job site a written welding procedure specification acceptable to the certified inspector that shall be followed in making the necessary repair and also a record of procedure qualification tests. Welding procedure specifications shall have been prepared and qualified in accordance with the requirements of section IX of the ASME code.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 42.07 Welders. (1) WELDER QUALIFICATIONS.** Anyone undertaking repairs or alterations shall have available at the job site records of welder qualification tests showing that each welder to be employed on the work has satisfactorily passed tests as prescribed in section IX of the ASME code.

(2) **WELDING TESTS.** Preparation of welding procedure specifications and the conducting of tests of procedures and welders shall be the responsibility of the party undertaking repairs or alterations. Before repairs or alterations are started, the certified inspector shall examine the written welding procedure and records of qualification tests to determine if procedures and welders have been properly qualified as required in section IX of the ASME code. Witnessing of the tests by the certified inspector is not mandatory, but the inspector shall have the right to call for and witness the making of test coupons by any welder, at any time, and to observe the physical testing of the coupons.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (2), Register, October, 1996, No. 490, eff. 11-1-96.

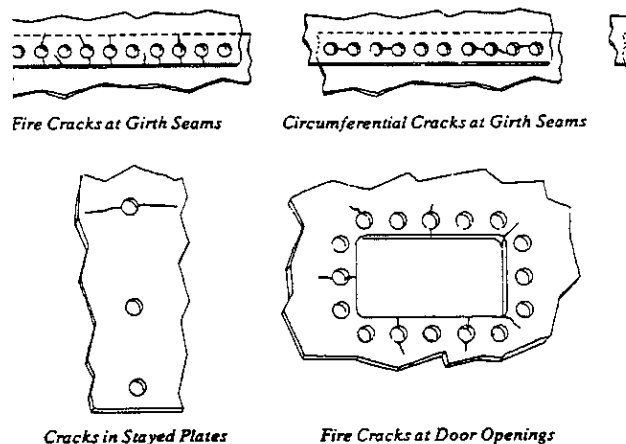
**ILHR 42.08 Welded repairs of cracks. (1) REMOVAL OF DEFECTS.** A repair of a defect, such as a crack in a welded joint or base material, may not be made until the defect has been removed. A suitable nondestructive examination method shall be used to assure complete removal of the defect. If the defect penetrates the full thickness of the material, the repair shall be made with a complete penetration weld such as a double butt weld or a single butt weld with or without backing.

Note: Before repairing a cracked area, care should be taken to investigate its cause and to determine its extent. Where circumstances indicate that the crack is likely to recur, consideration should be given to removing the cracked area and installing a patch or other corrective measures.

(2) **CRACKS IN UNSTAYED AREAS.** Cracks in unstayed shells, drums or headers of boilers or pressure vessels may be repaired by welding, providing the cracks do not extend between rivet holes in a longitudinal seam or parallel to a rivet seam within 8 inches, measured from the nearest caulking edge. The total length of any one such crack may not exceed 8 inches. Cracks of a greater length may be welded, provided the complete repair is radiographed and stress relieved in accordance with s. ILHR 42.16. Cracks in unstayed areas shall be repaired as specified in Figure 42.08-1 or by other equivalent methods.

(3) **CRACKS IN STAYED AREAS.** Cracks of any length in stayed areas may be repaired by fusion welding except that multiple or star cracks radiating from rivet or staybolt holes shall not be welded. Cracks in stayed areas shall be repaired as specified in Figure 42.08-1 or by other equivalent methods.

Figure 42.08-1  
RIVET AND STAYBOLT HOLE CRACKS



Cracks radiating from rivet or staybolt holes may be repaired if the plate is not seriously damaged. If the plate is seriously damaged, it shall be replaced. The repair method shall be as follows:

- Prior to welding, the rivets or staybolts from which the cracks extend and the adjacent rivets or staybolts shall be removed.
- In riveted joints, tack bolts shall be replaced in alternate holes to hold the plate laps firmly.
- The cracks shall then be prepared for welding by chipping, grinding or gouging.
- In riveted joints, cracks which extend past the inner edge of the plate lap shall be welded from both sides

- Rivet holes shall be reamed before new rivets are driven.
- Threaded staybolt holes shall be retapped and new staybolts properly driven and headed.

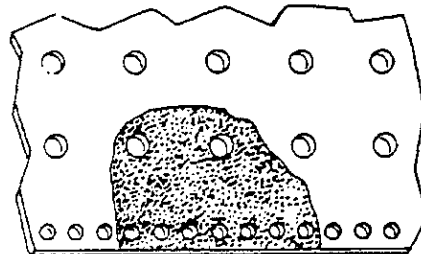
(4) **CRACKS IN UNSTAYED FURNACES.** Cracks of any length in unstayed boiler furnaces may be welded, provided the welds are thermally stress relieved in accordance with s. ILHR 42.16. Welds applied from one side only shall be subject to the approval of the certified inspector. Field repair of cracks at the knuckle or the turn of the flange of the furnace opening are prohibited unless specifically approved by the department.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (4), Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 42.09 Wasted areas. (1) SHELLS, DRUMS AND HEADERS.** Wasted areas in stayed and unstayed shells, drums and headers may be built up by welding provided that in the judgment of the certified inspector the strength of the structure will not be impaired. Where extensive weld build-up is employed, the authorized inspector may require an appropriate method of nondestructive examination for the complete surface of the repair. Wasted areas shall be built up by welding as specified in Figure 42.09-1 or by other equivalent methods.

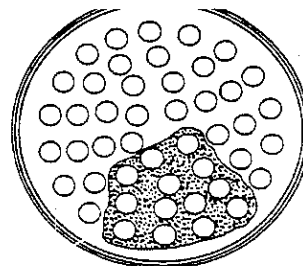
(2) **ACCESS OPENINGS.** Wasted areas around access openings may be built up by welding provided that in the judgment of the certified inspector the strength of the structure will not be impaired, or they shall be repaired as specified in Figure 42.09-2 or by other equivalent methods. In boilers, the area to be repaired may not be closer than 2 inches from any knuckle.

Figure 42.09-1  
WELD BUILD-UP OF WASTED AREAS



RIVETS AND STAYBOLTS

- Prior to welding, the rivets or staybolts in the wasted area shall be removed.
- Threaded staybolt holes shall be retapped after welding.
- Rivet holes shall be reamed after welding.
- Welding may not cover rivet or staybolt heads.



TUBESHEET

- Prior to welding, the tubes in the wasted area shall be removed.
- After welding, the tube holes may be reamed before new tubes are installed. Wasted areas in stayed and unstayed surfaces may be built up by welding provided that in the judgment of the authorized inspector the strength of the structure will not be impaired. Where extensive weld build-up is employed, the authorized inspector may require an appropriate method of nondestructive examination for the complete surface of the repair.

(3) **FLANGES.** (a) Wasted flange faces may be cleaned thoroughly and built up with weld metal. Built-up flange faces should be machined in place, if possible, and shall be machined to a thickness not less than that of the original flange or that required by calculations in accordance with the provisions of the applicable section of the ASME code.

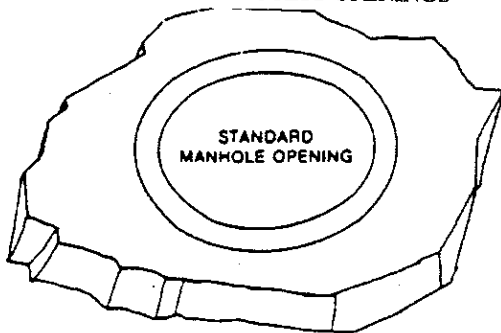


(b) Wasted flange faces may also be remachined in place without building up with weld metal provided the metal removed in the process does not reduce the thickness of the flange to a measurement below that calculated in par. (a).

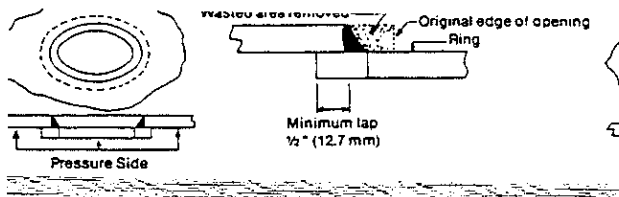
(c) Flanges that leak because of warpage or distortion and that cannot be repaired shall be replaced with new flanges that have at least the dimensions conforming to the applicable section of the ASME code.

(4) TUBES. Wasted areas on tubes may be repaired by welding provided that in the judgement of the certified inspector the strength of the tube has not been impaired. Where deemed necessary, competent technical advice shall be obtained from the manufacturer or from another qualified source. This may be necessary when considering such items as size limitations of repaired areas, minimum tube thickness to be repaired, tube environment, location of the tube in the boiler and other similar conditions.

Figure 42.09-2  
REPAIRS FOR ACCESS OPENINGS



A badly wasted manhole flange may be removed and replaced with a ring-type frame as shown above. The requirements of s. ILHR 42.17 (1) for flush patches shall be met. A full penetration weld shall be required. The weld may either be double welded or welded from one side with or without a backing ring.



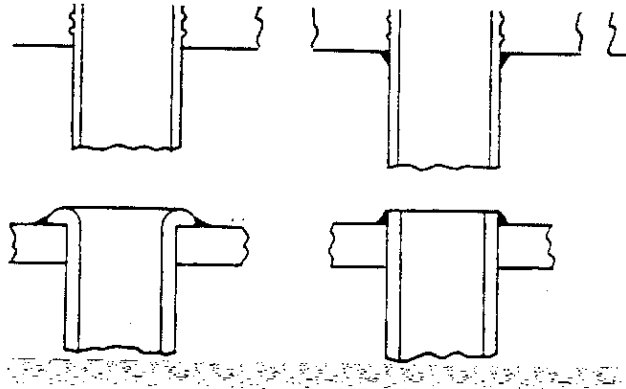
A badly wasted area around a handhole opening shall be repaired by adding a ring as shown above on the inside of the object.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (1), (2), (4), Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 42.10 Seal welding. (1) SEAL WELDING OF TUBES.** Tubes may be seal welded provided the ends of the tube have sufficient wall thickness to prevent burn-through and the requirements of the appropriate sections of the ASME code are satisfied. Seal welding of tubes shall be done as specified in Figure 42.10-1 or by other equivalent methods.

**(2) SEAL WELDING OF RIVETED JOINTS.** Edges of butt straps or of plate laps and nozzles or connections attached by riveting may be restored to original dimensions by welding. Seal welding may not be used except with the special approval of the certified inspector, and in no case where cracks are present in riveted areas. Seal welding shall be done as specified in Figure 42.10-2 or by other equivalent methods.

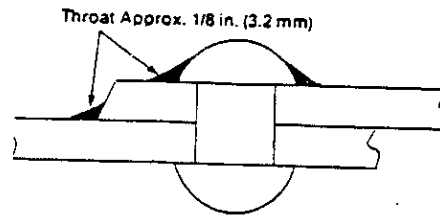
Figure 42.10-1  
SEAL WELDING OF TUBES



Tubes may be seal welded provided the ends of the tubes have sufficient wall thickness to prevent burn through. Seal welding shall be applied with a maximum of three light layers in lieu of one or two heavy layers.

In watertube boilers, tubes may be seal welded on the inside or outside of the tube-sheet.

Figure 42.10-2  
SEAL WELDING OF RIVETED JOINTS



TYPICAL RIVET JOINT SHOWING SEAL WELD TYPE

Seal welding of riveted joints requires the approval of the department. Seal welding may not be considered a strength weld. Seal welding shall be applied in one light layer if practicable, but not more than two layers shall be used.

Prior to welding, the area shall be examined by an appropriate method of nondestructive examination to assure that there are no cracks radiating from the rivet holes. If necessary, the rivets shall be removed to assure complete examination of the area. Seal welding may not be performed if cracks are present in riveted areas.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (2), Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 42.11 Re-ending and piecing tubes.** Re-ending or piecing of tubes or pipes in either fire tube or water tube boilers is permitted provided the thickness of the remaining tube or pipe is not less than 90% of that required by the applicable section of the ASME code.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 42.12 Materials.** The materials used in making repairs or alterations shall conform to the requirements of the applicable section of the ASME code. Materials shall be of known weldable quality, have at least the minimum physical properties of the material to be repaired and be compatible with the original material. The thickness of any patch shall be at least equal to, but not more than 1/8-inch greater than, the material being patched. Carbon or alloy steel having a carbon content of more than 0.35% may not be welded.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 42.13 Replacement pressure parts.** Replacement parts shall be classified as follows:

**(1) PARTS ASSEMBLED BY FORMING.** Replacement parts which will be subject to internal or external pressure and that consist of materials which may be formed or assembled to the required shape by bending, forging or other forming methods, but on which no shop fabrication welding is performed, may be supplied as material. Material and part identification shall be supplied in the form

of bills of materials and drawings with ASME code compliance certified in a statement by the parts supplier.

**Note:** Examples include seamless or welded tubes or pipe supplied separately or in bundles; forged nozzles; heads or tube sheets forged or machined from a single piece of material; subassemblies of tubes or pipe attached together mechanically.

**(2) WELDED PARTS NOT REQUIRING INSPECTION.** Replacement parts which will be subject to internal or external pressure and that are preassembled by welding, but on which shop inspection is not required by the ASME code, shall have the welding performed in accordance with section IX and other applicable sections of the ASME code. The replacement part assembly identification shall be supplied in the form of bills of material and drawings. The supplier or manufacturer shall certify that the material, design and fabrication are in accordance with the applicable section of the ASME code.

**Note:** Examples include boiler furnace panel wall or floor assemblies; prefabricated openings in boiler furnace walls such as burner openings, air ports, inspection openings or soot blower openings.

**(3) WELDED PARTS REQUIRING INSPECTION.** Replacement parts which will be subject to internal or external pressure and that are fabricated by welding and which require shop inspection by a certified inspector, shall be fabricated by a manufacturer having an ASME certificate of authorization and the appropriate code symbol stamp. The item shall be inspected, and stamped with the applicable code symbol and the word "PART". A completed manufacturer's partial data report shall be supplied by the manufacturer.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (3), Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 42.14 Welding procedures.** Groove welds shall completely penetrate the thickness of the material being welded. If possible, welding shall be applied from both sides of the plate or a backing strip or ring may be used to ensure complete penetration. Manually applied welds shall have a convex surface on both sides if applied on both sides of the plates being joined, or on one side if welding is applied from one side only. Valleys and undercutting at edges of welded joints are not permitted. The reinforcement may be chipped, ground, or machined off flush with the base metal, if so desired, after the welding has been completed.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 42.15 Preheating. (1) GENERAL.** Preheating may be required during welding to assist in completion of the welded joint. Where deemed necessary, advice shall be sought from a qualified source.

**Note:** See ASME code section VIII Appendix R for further explanatory information.

**(2) PREHEAT AND INTERPASS TEMPERATURES.** The welding procedure specification and qualification for the material being welded shall specify the preheat and interpass temperature requirements.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 42.16 Postweld heat treatment. (1) GENERAL.** In repairing carbon or low alloy steels, postweld heat treatment shall be required if it would be required for new construction by the ASME code.

**Note:** Under certain conditions, postweld heat treatment as outlined in sub. (1) may be inadvisable or impractical. In these instances, any other method of postweld heat treatment or special welding method acceptable to the certified inspector may be used. Examples of special welding methods for P1 and P3 materials are described in sub. (3). Where deemed necessary, competent technical advice should be obtained from the manufacturer of the object or from another qualified source.

**(2) ALTERNATIVE METHODS.** When methods other than postweld heat treatment are used, the certified inspector shall be assured that the requirements of sub. (3) are met.

**(3) WELDING METHODS AS ALTERNATIVES TO POSTWELD HEAT TREATMENT.** Two welding methods that may be used as alternatives to postweld heat treatment are given in pars. (a) and (b) as a general guide. The use of these alternatives is limited to P1 and P3 steels, and to the more routine required in boiler and pressure vessel maintenance. They may not be used in highly stressed

areas, or if service conditions are conducive to stress corrosion cracking or, in some cases, to hydrogen embrittlement.

**(a) Method 1, higher preheat temperature.** 1. Material applicability. The use of method 1 shall be limited to P1 groups 1, 2 and 3 steels and P3 groups 1 and 2, except Mn-Mo, steels.

2. Method details. The materials to be welded shall be preheated to at least 300°F and maintained at this temperature during welding. The 300°F temperature shall be checked to assure that 4 inches of the steel on each side of the joint, or 4 times the plate thickness, whichever is greater, will be maintained at the minimum preheat temperature. The maximum interpass temperature shall be 450°F.

**Note:** In the use of this method it should be ascertained that the notch ductility in the as-welded condition is adequate at operating and pressure test temperatures. When this alternative meets the above requirements, any code credit for postweld heat treatment can be continued.

**(b) Method 2, half bead welding technique.** 1. Material applicability. The use of method 2 shall be limited to groups 1, 2 and 3 for both P1 and P3 steels.

2. Limitations. a. The weld metal shall be deposited by the manual shielded metal arc process using low hydrogen electrodes. The maximum bead width shall be 4 times the electrode core diameter.

b. The depth of the repair may not be greater than  $\frac{3}{8}$ -inch or 10% of the base metal thickness, whichever is less, and the individual area may not be greater than 10 square inches.

c. When this method is used, it shall require the approval of the department. The certified inspector shall assure that the method has been qualified in accordance with the guidelines of section IX of the ASME code.

3. Method details. a. Step 1. The weld area shall be preheated and maintained at a minimum temperature of 350°F during welding. The maximum interpass temperature shall be 450°F.

b. Step 2. The initial layer of weld metal shall be deposited over the entire area with a  $\frac{1}{8}$ -inch maximum diameter electrode. Approximately one-half the thickness of this layer shall be removed by grinding before depositing subsequent layers. Subsequent layers shall be deposited with a  $\frac{5}{32}$ -inch maximum diameter electrode in a manner to ensure tempering of the prior beads and their heat affected zones. Partial removal of these subsequent layers is not required. A final temper bead weld shall be applied to a level above the surface being repaired without contacting the base material but close enough to the edge of the underlying weld bead to assure tempering of the base material heat affected zone.

c. Step 3. The weld area shall be maintained at a temperature of 400-500°F for a minimum period of 4 hours after completion of the weld repair. The final temper bead reinforcement layer shall be removed substantially flush with the surface of the base material.

**(4) JOINTS BETWEEN AUSTENITIC STAINLESS STEELS.** Postweld heat treatment is neither required nor prohibited for joints between austenitic stainless steels. It may not be attempted except in accordance with the recommendations of the manufacturer of the material or the requirements of the applicable section of the ASME code.

**Note:** See ASME code, section VIII, division 1, paragraph UHA-105.

**(5) PEENING.** In lieu of postweld heat treatment of carbon steels, peening or other methods acceptable to the certified inspector may be used.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (2), (3) (b) 2, c., (5), Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 42.17 Welded patches. (1) FLUSH PATCHES.** The weld around a flush patch shall be a full penetration weld and the accessible surfaces shall be ground flush where required by the applicable section of the ASME code. The welds shall be subjected to the nondestructive examination method used in the original construction or an acceptable alternate. Flush welded patches

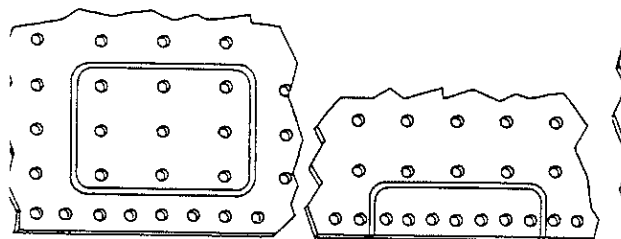
shall be applied as specified in Figure 42.17-1 or by other equivalent methods.

(2) **TUBE PATCHES.** In some situations it is necessary to weld a flush patch on a tube, such as when replacing tube sections and accessibility around the complete circumference of the tube is restricted, or when it is necessary to repair a small bulge. This is referred to as a window patch. Window patches shall be applied as specified in Figure 42.17-2 or by other equivalent methods.

Figure 42.17-1  
FLUSH PATCHES



FLUSH PATCHES IN UNSTAYED AREAS



FLUSH PATCHES IN STAYED AREAS

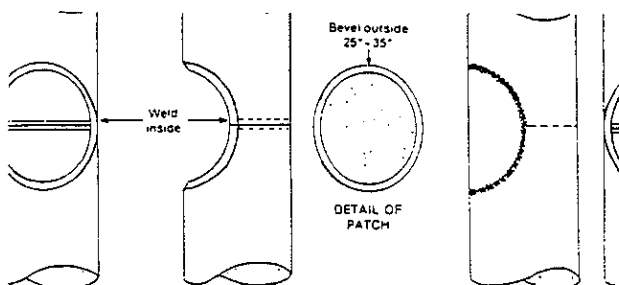
Before installing a flush patch, the defective metal shall be removed until sound metal is reached. The patch shall be rolled or pressed to the proper shape or curvature. The edges shall align without overlap.

In stayed areas, the weld seams shall come between stayboltrows or riveted seams. Patches shall be made from material that is at least equal in quality and thickness to the original material.

Patches may be of any shape or size. Corners of patches shall have a radius of such size as is necessary to avoid creating a stress point.

Figure 42.17-2

TUBE WINDOW PATCHING METHOD



FRONT AND SIDE VIEW OF TUBE

SIDE VIEW SHOWING PATCH FIT AND WELDED

It may be necessary to weld a flush patch on a tube, since in some situations, accessibility around the complete circumference of the tube is restricted. Window patches shall be applied as follows:

- a. The patch shall be made from tube material of the same type, diameter and thickness as the one being repaired.
- b. Fitup of the patch is important to weld integrity. The root opening shall be uniform around the patch.
- c. The gas tungsten arc welding process shall be used for the initial pass on the inside of the tube and for the initial pass joining the patch to the tube.
- d. The balance of the weld may be completed by any appropriate welding process.

(3) **LAPPED AND FILLET WELDED PATCHES.** Lapped and fillet welded patches may be applied provided they are not exposed to radiant heat. Lapped and fillet welded patches may be applied on the pressure side of the sheet. The maximum diameter of the open-

ing repaired may not exceed 8 inches or 16 times the thickness of the plate. Lapped and fillet welded patches shall have a minimum lap of 1/2-inch. If the area to be patched includes a riveted seam, rivets shall be removed before the patch is applied and new rivets driven before the patch is welded at the edges. New staybolts shall be installed in the patched area, and the heads of the staybolts shall not be covered by welding.

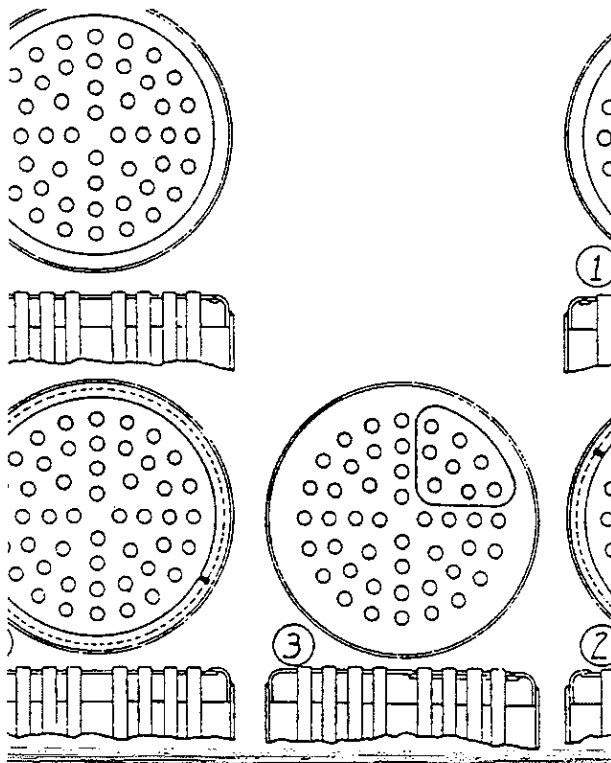
**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (3), Register, December, 1992, No. 444, eff. 1-1-93.

**ILHR 42.18 Stays.** Threaded stays may be replaced by welded-in stays provided that in the judgment of the certified inspector the plate adjacent to the staybolt has not been materially weakened by wasting away. All requirements of the ASME code governing welded-in stays shall be met, except that stress relieving other than thermal may be used as provided in s. ILHR 42.16.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 42.19 Additional acceptable repair methods.** Repairs and repair methods not covered in this chapter may be used if acceptable to the certified inspector. Additional methods illustrated in Figures 42.19-1 and 42.19-2 are acceptable if performed as specified in the figures.

Figure 42.19-1  
ACCEPTABLE REPAIRS FOR CORRODED OR WORN HEADS OF VERTICAL TUBE OR SIMILAR TYPE BOILERS



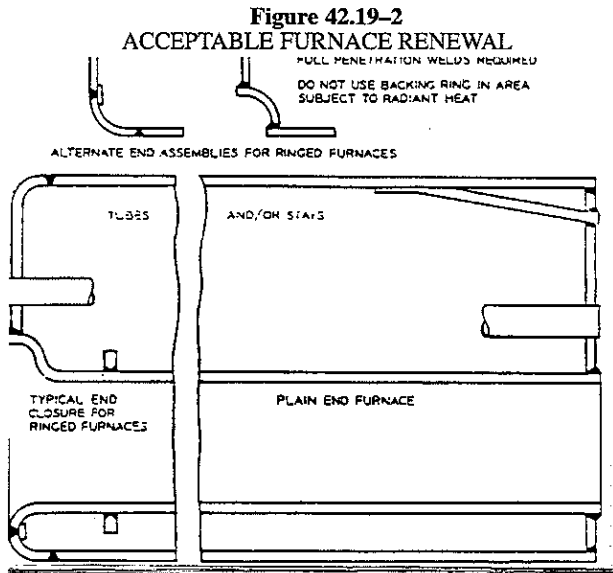
1. Flush Butt Welded Head

With this repair, the old head shall be cut close to the point of tangency of the knuckle of the flange, and the new head, previously drilled for tube holes and beveled for adequate welding groove, shall be butt welded to the flanged section of the old head. A back up ring, inserted in sections if necessary, shall be used to ensure weld penetration for the full head thickness.

2. Lapped and Fillet Welded Head

With this repair, the new head shall be lapped under the flange knuckle of the old head, previously slotted as shown to admit the new head, and then fillet welded at the edge.

3. Segmental or Pie-Shaped Butt Welded Patch



**Longitudinal seam in furnace double butt-welded and thermally stress-relieved**

For repair, the final joint to each head may be stress-relieved by peening. The furnace may be welded into a riveted boiler by using adaptable end closures. Ringed furnaces shall be thermally stress-relieved after longitudinal seam and rings have been applied.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 42.20 Repairs to noncode vessels.** Welded repairs or alterations to pressure vessels not covered by section VIII of the ASME code shall be performed in accordance with the pressure vessel manufacturer's recommendations and section IX of the ASME code. If the pressure vessel manufacturer is no longer in business, recommendations of a pressure vessel design engineer may be acceptable.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**Subchapter II—  
Riveted Repairs**

**ILHR 42.25 Riveted patches.** (1) **GENERAL.** When riveted patches are used, they shall be designed and applied using methods acceptable to the department.

**Note:** Information regarding the use of riveted patches is available from the department and may be found in Wisconsin Administrative Code chapters Ind 41-42, Boiler and Pressure Vessel Code, Register, May, 1974, No. 221.

(2) **MATERIALS FOR RIVETED PATCHES.** Patch material shall meet the applicable requirements of s. ILHR 42.12.

(3) **REPORT OF RIVETED REPAIR.** Anyone making a riveted repair shall furnish the department and the owner of the equipment with a report of the repair as specified under s. ILHR 42.04.

(4) **PRESSURE TEST.** The certified inspector may require a pressure test, as specified in s. ILHR 42.05, after completion of a riveted repair.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (4), Register, October, 1996, No. 490, eff. 11-1-96.

**Subchapter III—  
Rerating and Derating**

**ILHR 42.30 Rerating of a boiler or pressure vessel.**

(1) **GENERAL REQUIREMENTS.** Rerating of a boiler or pressure vessel by increasing the maximum allowable working pressure or temperature shall be considered an alteration and may be done only after the requirements of pars. (a) to (d) have been met.

(a) Revised calculations verifying the suitability of the vessel for the new service conditions shall be requested from the original manufacturer and shall be made available to its certified inspector.

Where these calculations cannot be obtained from this source, they shall be prepared by an organization in possession of a valid ASME certificate of authorization, provided the alterations are within the scope of the authorization, and they shall be made available to its certified inspector.

(b) All reratings shall be established in accordance with the requirements of the code to which the boiler or pressure vessel was built, or by computation using the appropriate formulas in the edition of the ASME code listed in Table 41.10, if all essential details are known to definitely comply with this edition of the code.

(c) Current inspection records shall verify that the boiler or pressure vessel is satisfactory for the proposed service conditions.

(d) The boiler or pressure vessel rerating shall be acceptable to the certified inspector performing the periodic inspections of the object under chs. ILHR 41 and 42.

(2) **NAMEPLATE AND REPORT REQUIREMENTS.** The requirements of s. ILHR 42.03 (2)-(4) shall be met and an alteration report shall be submitted in accordance with s. ILHR 42.04.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (1) (a), (d), Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 42.31 Derating of a boiler or pressure vessel.**

(1) **GENERAL REQUIREMENTS.** Derating of a boiler or pressure vessel by decreasing the maximum allowable working pressure may be done only after the requirements of subs. (2) to (4) have been met. Derating may be initiated by the owner or the certified inspector.

(2) **NAMEPLATE REQUIREMENTS.** When a boiler or pressure vessel is derated, an additional nameplate shall be permanently attached. The nameplate for derating shall be as follows:

DERATED
_____ PSIG AT _____ °F
_____ (Wisconsin Registration Number)
_____ (Date Derated)

(3) **NAMEPLATE ATTACHMENT.** Attachment of the nameplate shall be witnessed by the certified inspector.

(4) **REPORTS.** The certified inspector shall report the derating to the department.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (1), (3), (4), Register, October, 1996, No. 490, eff. 11-1-96.

**Subchapter IV—  
Safety and Safety Relief Valve Repairs**

**ILHR 42.35 Safety and safety relief valve repairs.**

(1) **DEFINITIONS.** (a) Repair of a safety valve or safety relief valve means the replacement, remachining or cleaning of any critical part; lapping of seat and disc or any other operation which may affect the flow passage, capacity, function or pressure retaining integrity; and disassembly, reassembly and adjustments which affect the safety valve or safety relief valve function.

(b) Safety valves and safety relief valves on which the seals have been broken shall be subject to the requirements for repairs.

(c) The initial adjustments of a new safety valve or safety relief valve on a boiler or pressure vessel are not considered a repair if made by the manufacturer or assembler of the valve.

(2) **AUTHORIZED REPAIRS.** Repairs to safety valves and safety relief valves shall be performed by an organization in possession of one or more of the following:

- (a) ASME V, HV or UV code symbol stamp; or
- (b) National Board VR stamp covering the work to be performed.

**Note:** Repairs made in accordance with par. (c) may void original valve manufacturer's warranty.

(3) **AUTHORIZED ADJUSTMENTS.** Properly trained and qualified employes of boiler or pressure vessel users to make external adjustments to set pressure and blowdown to safety valves and safety relief valves owned by them provided the adjusted settings and capacities and the date of the adjustment are recorded on a metal tag secured to the seal wire. All external adjustments shall be resealed showing the identification of the organization making the adjustments.

(4) **NAMEPLATES.** (a) Except as provided in sub. (3), when a safety valve or safety relief valve is repaired, a metal repair nameplate stamped with the information required by par. (b) shall be welded or otherwise permanently attached to the valve either above, adjacent to or below the original stamping. On small valves, a metal tag showing the repair nameplate information may be securely attached to the repaired valve.

(b) The information on the valve repair nameplate shall include the name of the repair organization, the symbol stamp and symbol stamp number, and the date of repair. The nameplate shall be as shown in Figure 42.35. If the set pressure has been changed, the new set pressure and capacity shall be indicated and the original nameplate or stamping shall be modified by marking out, although leaving legible, the prior set pressure and capacity. The new capacity shall be based on that for which the valve was originally certified. Only the current repair nameplate need be attached to the valve with the original or duplicate nameplate.

(5) **ILLEGIBLE OR MISSING NAMEPLATES.** (a) When the information on the original manufacturer's nameplate or stamping is illegible, the manufacturer's nameplate or stamping shall be augmented by a nameplate stamped "duplicate" which contains all information required by the applicable section of the ASME code, except the "V" or "UV" symbol and the NB mark. The repair organization nameplate, with the serialized "VR" stamp and other required data specified in sub. (4) (b), shall make the repairer responsible to the owner and the department that the information on the duplicate nameplate data is correct. If the owner specifies a set pressure or blowdown change, these new parameters and new capacity shall be stamped on the duplicate nameplate in addition to appearing on the valve repairer's nameplate.

(b) When the original valve manufacturer's nameplate is missing, the repair organization may not perform repairs to the valve under the "VR" program unless the valve can be positively identified and original nameplate data can be obtained from the original valve manufacturer, the repairer's inhouse sources or the National Board capacity certification. Valves that can be positively identified shall be equipped with a duplicate nameplate as described in par. (a) as well as the repairer's "VR" stamped nameplate. The repairer's responsibilities for data accuracy as identified in par. (a) shall apply.

Figure 42.35  
VALVE REPAIR NAMEPLATE

(name of valve repair firm)	
(set pressure)	(capacity)
(date of repair)	
No.	
(Symbol stamp no.)	

Note: The nameplate should be stamped with the valve repair symbol stamp.

Note: Capacity should be indicated only when set pressure has been changed.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (2) (a), (b), r. (2) (c), em. (3), Register, October, 1996, No. 490, eff. 11-1-96.

**Subchapter V—  
Secondhand Vessels**

**ILHR 42.40 Application.** Sections ILHR 42.40 to 42.46 shall apply to secondhand boilers and secondhand pressure vessels.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 42.41 Existing vessels.** Secondhand boilers and secondhand pressure vessels, originally installed in Wisconsin and not constructed and stamped according to some edition of the ASME Code, may be reinstalled if the maximum allowable working pressure is recalculated with a factor of safety of 6.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 42.42 Vessels from out-of-state.** Secondhand boilers and secondhand pressure vessels, from out-of-state, shall be constructed and stamped according to some edition of the ASME Code. A copy of the manufacturer's data report shall be furnished to the department for each vessel indicating that it was manufactured originally to the requirements of an earlier edition of the applicable ASME code. If a vessel has been repaired or altered since its fabrication, a copy of the manufacturer's data report, welded repair report or alteration report shall be furnished to the department.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 42.43 Lap seam boilers.** Secondhand boilers which have lap seam construction and which are larger than 36 inches in diameter shall be limited to a maximum allowable working pressure of not more than 15 pounds per square inch.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 42.44 Prohibited boilers.** The installation of secondhand boilers which have the longitudinal joint exposed to the intense heat of the furnace is prohibited. The locomotive or inside butt strap may not be considered as strengthening or changing the original type of boiler joint.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 42.45 Inspection and testing.** (1) **HYDROSTATIC PRESSURE TEST.** Every secondhand vessel shall be inspected and given a hydrostatic pressure test at one and one-half times the maximum allowable working pressure at its new point of installation location before it is placed in operation. The test shall be witnessed by a certified inspector.

(2) **ALTERNATE TESTS.** When the certified inspector determines that a hydrostatic test at one and one-half times the maximum allowable working pressure is not possible or desirable, the authorized inspector may accept alternate means to determine if the vessel is safe for its intended use.

Note: Where water is used in a hydrostatic test, the temperature of the water should not be less than 70°F and the maximum temperature during inspection should not exceed 120°F. If a test is conducted at 1 1/2 times the maximum allowable working pressure (MAWP) and the owner specifies a temperature higher than 120°F, the pressure should be reduced to the MAWP and the temperature should be reduced to 120°F for the close examination.

(3) **EXEMPT VESSELS.** Boilers and pressure vessels used for portable or emergency use shall be exempt from secondhand vessel test requirements.

History: Cr. Register, February, 1988, No. 386, eff. 3-1-88; cr. (3), Register, February, 1990, No. 410, eff. 3-1-90; am. (1), (2), Register, October, 1996, No. 490, eff. 11-1-96.

**ILHR 42.46 Installation.** Except for vessels exempted in s. ILHR 41.18, all secondhand vessels when reinstalled, shall comply with the ASME codes listed in s. ILHR 41.10 in regard to fittings, appliances, valves, connections, settings and supports.

These vessels shall also comply with the installation and certificate of operation requirements in chs. ILHR 41 and 42.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88.

#### **Subchapter VI— Pressure Vessels in Petroleum Refineries**

**ILHR 42.50 General requirements.** Pressure vessels in petroleum refineries shall comply with the standards specified in the American Petroleum Institute (API) Standard ANSI/API 510—Pressure Vessel Inspection Code, as adopted by reference in s. ILHR 42.51.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88.

**ILHR 42.51 Adoption of API standard.** (1) CONSENT TO INCORPORATE. Pursuant to s. 227.21, Stats., the attorney general

and the revisor of statutes have consented to the incorporation by reference of the American Petroleum Institute (API) Pressure Vessel Inspection Code, ANSI/API 510-1992.

(2) INTERIM AMENDMENTS. Interim amendments of the standard in reference shall have no effect in the state until the time that this section is revised to reflect those changes.

(3) AVAILABILITY OF STANDARDS. The standard in reference may be obtained at a reasonable cost from the American Petroleum Institute, 1220 L Street, Northwest, Washington, D.C. 20005.

(4) FILING OF STANDARDS. The standard in reference is on file in the offices of the department, the secretary of state and the revisor of statutes.

**History:** Cr. Register, February, 1988, No. 386, eff. 3-1-88; am. (1), Register, May, 1994, No. 461, eff. 6-1-94.

