CR 86-135

RULES CERTIFICATE

STATE OF WISCONSIN)
) SS
DEPT. OF INDUSTRY,)
LABOR & HUMAN RELATIONS)

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Bureau

TO ALL TO WHOM THESE PRESENTS SHALL COME, GREETINGS:

I, John T. Coughlin, Secretary of the Department of Industry, Labor and Human Relations, and custodian of the official records of said department, do hereby certify that the annexed rule(s) relating to boilers and pressure vessels (Subject) were duly approved and adopted by this department on 11/24/87 (Date).

I further certify that said copy has been compared by me with the original on file in this department and that the same is a true copy thereof, and of the whole of such original.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the official seal of the department at 10:00 a.m. in the city of Madison, this 24th day of November A.D. 1987.

John T. Coughlin
Secretary

2-1-88

ORDER OF ADOPTION

Pursuant to authority vested in the Department of Industry, Labor and Human Relations by section(s) 101.02 (1) and (15) and 101.17, Stats., the Department of Industry, Labor and Human Relations ☐ creates; ☐ amends; ☒ repeals and recreates; ☐ repeals and adopts rules of Wisconsin Administrative Code chapter (s):

ILHR 41-42 (Number) Boiler and Pressure Vessel Code (Title)

The attached rules shall take effect on the first day of the month following publication in the Wisconsin Administrative Register pursuant to section 227.22, Stats.

Adopted at Madison, Wisconsin, this

date: November 24, 1987

DEPARTMENT OF INDUSTRY, LABOR AND HUMAN RELATIONS

John T. Coughlin
Secretary

State of Wisconsin \ Department of Industry, Labor and Human Relations

RULES in FINAL DRAFT FORM

Rule: Chapters ILHR 41-42

Relating to: Boilers and Pressure Vessels

Clearinghouse Rule No.: 86-135

AN ORDER to repeal and recreate chapters ILHR 41 and 42, relating to boilers and pressure vessels.

* *

ANALYSIS OF PROPOSED RULES

The Division of Safety and Buildings within the department is responsible for adopting and enforcing rules relative to the protection of the life, health, safety and welfare of employes and frequenters in public buildings and places of employment. The current rules of chapters ILHR 41-42 contain safety and health rules related to the design, construction, installation, operation and inspection of boilers and pressure vessels. The Wisconsin Boiler and Pressure Vessel Code has been in effect since September 1, 1914. The department has updated the code on a regular basis over the years to keep it current with national standards and developments.

The last comprehensive update of the Boiler and Pressure Vessel Code took effect on May 1, 1961. Since that time, numerous additions and amendments have been made to the code. The proposed rules developed at this time consist again of a complete revision of chapters ILHR 41-42. In this revision, the code is being reorganized and clarified so that it will be more clearly understood as to what requirements apply to a specific installation. Numerous other changes have also been made in the code. Some of the more significant changes contained in the proposed rules are as follows:

1. Definitions of terms not used in the code were deleted. The definition of "boiler" was rewritten, as was the definition of "owner or user". New definitions were added for "insurance company" and "maximum allowable working pressure". [ILHR 41.04]

2. The in-service field inspector rules were modified to allow the applicant for a certificate of competency to receive credit for experience gained with more than one employer. [ILHR 41.14 (6)]

3. The rules for power piping inspections were clarified regarding the acceptance of documented inspections by authorized inspectors not employed by the department. [ILHR 41.16 (2) (a)]

4. All expansion tanks for hot water heating boilers will be exempt from periodic inspections. The operating pressure limit was deleted. [ILHR 41.18 (1) (c)]

5. A new rule was added to clarify the exemption from periodic inspections for pressure vessels used in processing and storing of fermented beverages. These vessels will also be exempt from ASME code construction rules. [ILHR 41.18 (1) (m) and 41.45 (1) (e)]

6. Specific requirements were added detailing the procedures to be followed for the preparation for internal inspections. Also, a rule was added stating that an inspector has the right to refuse entry into a boiler or pressure vessel if it is judged to be unsafe to enter. [ILHR 41.19 (2) and (3)]

7. The requirements for reporting of periodic inspections and the forms to be used were consolidated and clarified. [ILHR 41.23]

8. The rules for safety controls were rewritten and specific pressure and temperature control requirements were added. [ILHR 41.29]

9. The requirements related to pressure reducing valves were revised and updated to be consistent with the current National Board Inspection Code. [ILHR 41.33]

10. A new rule section was added specifying the safety valve capacity for interconnected boilers. [ILHR 41.35]

11. The rule was deleted which required owners of boilers and pressure vessels to retain manufacturer's data reports. [current code, ILHR 41.15]

12. The acceptance of vessels carrying the stamping of the U.S. Department of Transportation was revised to allow DOT vessels to be used only as replaceable service cylinders and as cylinders for storage of compressed natural gas. [ILHR 41.44]

13. The exemption from ASME code construction for water heaters and hot water storage tanks was rewritten to clarify the intent of the rule relative to compliance with nationally recognized standards. [ILHR 41.45 (1) (a)]

14. The rules covering extensions between inspections were modified by adding a 3 month limitation and concurrence of the authorized inspection agency. [ILHR 41.17 (5) and 41.55 (4)]

15. The rules covering pre-1957 installations were clarified as to application, and they were updated to current administrative code format requirements. [Chapter ILHR 41, Subchapter VI]

16. The use of the National Board's repair forms (R-1 and NR-1) were added as acceptable forms in addition to the department's record of repair form (SB-190). [ILHR 42.04 (1)]

17. Two new rules were added covering repairs and alterations. For ASME code constructed boilers and pressure vessels, repairs must be made by an organization holding an ASME certificate of authorization, a National Board "R" certificate or a weld repair program which has been accepted by the department or an authorized inspection agency. For noncode pressure vessels, repairs and alterations must be made in accordance with the vessel manufacturer's recommendations and section IX of the ASME code. [ILHR 42.02 (1) and 42.20]

18. The rules covering rerating were modified by deleting the option of allowing the rerating calculations to be prepared by a professional engineer and forwarded to the department. The proposed rules require the calculations to be prepared by an organization in possession of an ASME certificate of authorization and forwarded to its authorized inspection agency. [ILHR 42.30 (1) (a)]

19. New rules were added covering derating of a boiler or pressure vessel. The proposed rules require adding a nameplate and reporting to the department. [ILHR 42.31]

20. The rules covering safety valve and safety relief valve repairs were modified to clarify that an owner's program of repair is limited to adjustments of set pressure and blowdown. [ILHR 42.35 (2) (c)]

21. The rules covering pressure vessels in petroleum refineries were deleted and replaced with the adoption by reference of the American Petroleum Institute standard ANSI/API 510. [Chapter ILHR 42, Subchapter VI]

The proposed rules were developed with the assistance of the following members of the Boiler and Pressure Vessel Code Advisory Committee:

Name	Representing
Kim E. Aslaksen	Boiler and Pressure Vessel Repairers Assoc.
Robert L. Bock	Gas Appliance Manufacturers Association
James F. Brengosz	City of Milwaukee
William Degenhardt	Wisconsin Assoc. of Manufacturers and Commerce
Steven Derenne	Wisconsin Utilities Association
Robert C. Henry	Mechanical Contractors Assoc. of Wisconsin
David J. Lehtola	Uniform Boiler & Pressure Vessel Laws Society
Edward V. Molineaux	American Insurance Association
Ernest J. Spring	State Division of Facilities Management
Paul G. Vaher	Wisconsin Boiler Inspectors Association
Gordon Westergard	Wisconsin Association of the National Association of Power Engineers

* *

Pursuant to the authority vested in the state of Wisconsin, Department of Industry, Labor and Human Relations by ss. 101.02 (1), 101.02 (15) (h) to (j) and 101.17, Stats., the department hereby repeals and recreates rules interpreting s. 101.17, Stats., as follows:

SECTION 1. Chapters ILHR 41 and 42 are repealed and recreated to read:

Note: The numbers in brackets [] refer to the current code section numbers.

[Note to Revisor: Please delete the numbers in brackets and the notes in brackets when printing the adopted rules.]

CHAPTER ILHR 41

ADMINISTRATION, INSPECTION AND GENERAL INSTALLATION REQUIREMENTS

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.

ILHR 41.02 [41.01] 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.

ILHR 41.04 [41.02] 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.

(4) "Authorized inspector" means a boiler or pressure vessel inspector who holds a valid certificate of competency issued by the department.

(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) "Certificate of competency" means a certificate issued to a boiler or pressure vessel inspector by the department.

(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 industry, labor and human relations.

(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.

(17) "Incompetence" means conduct which evidences a lack of ability to discharge the duty required to protect the health, safety and welfare of the public, lack of knowledge of the fundamental principles of inspection services or an inability to apply those principles, or failure to maintain competency in the current practices and methods applicable to inspection services and the rules of chs. ILHR 41 and 42.

(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.

(23) "Misconduct" means an act performed in the discharge of enforcement duties which jeopardizes the interests of the public, including violation of federal or state laws, local ordinances or administrative rules relating to the position, preparation of deficient or falsified reports, failure to submit information or reports requested by the municipality or the department, conduct which evidences a lack of trustworthiness, misrepresentation of qualifications such as education, experience or certification, illegal entry of premises, misuse of funds, or misrepresentation of authority.

(24) "National Board" means the National Board of Boiler and Pressure Vessel Inspectors.

(25) "Negligence" means failure entirely by omission, commission or both to discharge the duty required of a reasonable person to protect the health, safety and welfare of the public.

(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 or any hot water piping system beyond the scope of ASME code section I 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 activated 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 both location and ownership 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.

ILHR 41.05 [41.015] 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 #1: Copies of the petition for variance form (SB-8) and the position statement (form SB-8A) are available from the Division of Safety and Buildings, P.O. Box 7969, Madison, Wisconsin 53707.

Note #2: 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 #3: See ch. Ind 69 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.

ILHR 41.06 [41.016] PENALTIES. Penalties for violations of chs. ILHR 41 and 42 shall be assessed in accordance with s. 101.02, Stats.

Note #1: 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 #2: 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.

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 aldermen, 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.

ILHR 41.08 [41.17] FEES. Fees for the registration, inspection, certificate of operation and other services performed by the department pertaining to boilers and pressure vessels shall be submitted as specified in ch. Ind 69. The owner shall be responsible for the payment of fees.

ILHR 41.10 [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.

(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.

TABLE 41.10

As amended by Summer Addenda issued June 30th and Winter Addenda issued December 31st of each respective year; S-Summer; W-Winter.

ASME			1983		1984		1985	
1. Section	I	Power Boilers, 1983 Edition	S	W	S	W	S	W
2. Section	II	Material Specifications, 1983 Edition						
	a.	Part A - Ferrous Material	S	W	S	W	S	W
	b.	Part B - Nonferrous Material	S	W	S	W	S	W
	c.	Part C - Welding Rods, Electrodes and Filler Metals	S	W	S	W	S	W
3. Section	III	Nuclear Power Plant Components, 1983 Edition Divisions 1 and 2						
	a.	Subsection NCA - General Requirements Division 1	S	W	S	W	S	W
	a.	Subsection NB - Class 1 Components	S	W	S	W	S	W
	b.	Subsection NC - Class 2 Components	S	W	S	W	S	W
	c.	Subsection ND - Class 3 Components	S	W	S	W	S	W
	d.	Subsection NE - Class MC Components	S	W	S	W	S	W
	e.	Subsection NF - Component Supports	S	W	S	W	S	W
	f.	Subsection NG - Core Support Structures	S	W	S	W	S	W
	g.	Appendices	S	W	S	W	S	W
		Division 2						
	a.	Concrete Reactor Vessels and Containments	S	W	S	W	S	W
4. Section	IV	Heating Boilers, 1983 Edition	S	W	S	W	S	W
5. Section	V	Nondestructive Examination, 1983 Edition	S	W	S	W	S	W
6. Section	VIII	Pressure Vessels, 1983 Edition						
	a.	Division 1 - Pressure Vessels	S	W	S	W	S	W
	b.	Division 2 - Alternative Rules	S	W	S	W	S	W
7. Section	IX	Welding and Brazing Qualifications, 1983 Edition	S	W	S	W	S	W
8. Section	X	Fiberglass-Reinforced Plastic Pressure Vessels, 1983 Edition	S	W	-	W	S	W
9. Section	XI	Rules for Inservice Inspection of Nuclear Power Plant Components, Division 1, 1983 Edition	S	W	S	W	S	W
		ANSI/ASME						
10. Power Piping (ANSI/ASME B31.1 - 1983 edition)								

Subchapter II
Inspections

ILHR 41.12 INSPECTOR CERTIFICATIONS REQUIRED. Any person performing an inspection and submitting an inspection report for the purpose of meeting inspection requirements covering a boiler or pressure vessel shall hold a valid certificate of competency or in-service field inspector authorization issued by the department.

ILHR 41.13 [41.08] CERTIFICATE OF COMPETENCY AS AN INSPECTOR. (1) ELIGIBILITY. An applicant for a certificate of competency as a boiler or pressure vessel inspector shall be an employe of the department, a municipality, an insurance company, or owners or operators of boilers and pressure vessels authorized to make their own inspections.

(2) QUALIFICATIONS. An applicant shall have one of the following combinations of education and experience requirements:

(a) A degree in engineering plus one year experience in design, construction, operation or inspection of high pressure boilers and pressure vessels; or

(b) An associate degree in mechanical technology plus 2 years experience in design, construction, operation or inspection of high pressure boilers and pressure vessels; or

(c) Three years experience in high pressure boiler and pressure vessel construction or repair, in supervision of high pressure boiler and pressure vessel operation, or in the inspection of high pressure boilers and pressure vessels.

(3) APPLICATION. (a) All applications for certification or recertification shall be made to the department together with the payment of the application and examination fees.

Note #1: Application form no. SB-37 is available from the Division of Safety and Buidings, P.O. Box 7969, Madison, Wisconsin 53707.

Note #2: See ch. Ind 69 for fee requirements.

(b) Upon receipt of the application form, the department shall review and evaluate the application and make all necessary notifications to the applicant.

(4) ISSUANCE OF CERTIFICATE. Certificates of competency for a boiler or pressure vessel inspector shall be issued by the department to eligible applicants who have received a grade of 70% or greater on the examination prescribed by and conducted by the department. The department shall issue the certificate within 15 business days of passage of the examination.

(a) The certificate shall bear the name of the applicant, certificate number and expiration date. The certificate shall be valid for the remainder of the calendar year in which it is issued.

(b) Applicants failing the examination may apply to retake the examination.

(c) Holders of certificates who do not apply for renewal in any 5-year period may be required to pass a scheduled examination.

(5) RENEWAL OF CERTIFICATE. Upon receipt of written notice of expiration, certification may be renewed. The request for renewal, together with the payment of the renewal fee, shall be filed with the department on or before January 1 of the calendar year for which the certificate is to be valid.

Note: See ch. Ind 69 for fee requirements.

(6) DENIAL OF CERTIFICATE. (a) Upon denial of certification or recertification, the department shall notify the applicant within 15 business days in writing stating the reasons for denial. The notice of denial shall be made by certified mail sent to the address filed with the application. Service shall be verified by the certified mail receipt.

(b) Upon receipt of the notice of denial, the applicant may submit a written request for hearing. The right to hearing shall be waived if the applicant fails to submit the request within 30 business days of receipt of the notice of denial. Hearings shall be conducted by the department and the proceedings recorded.

(7) SUSPENSION OR REVOCATION OF CERTIFICATION. The department may suspend or revoke the certification of any inspector for:

(a) Fraud or deceit in obtaining certification;

(b) Any negligence, incompetence or misconduct in the discharge of the duties required under chs. ILHR 41 and 42; or

(c) Conviction of a criminal charge, misdemeanor or violation of a local regulation substantially related to the circumstances of the certified inspection activity or adjudication of mental incompetence by the courts.

(8) SUSPENSION AND REVOCATION PROCEEDINGS. (a) The department shall investigate alleged violations at its own initiative or upon the filing of a complaint. If it is determined that no further action is warranted, the department will notify the persons affected. If the department determines that there is probable cause for suspension, it shall order a hearing and notify, by mail, the persons affected.

(b) Upon receipt of hearing notice, the charged party may respond to the charges in writing. Failure to respond within 30 business days or failure to appear at the hearing may result in the charges being taken as true.

(c) All hearings shall be conducted by persons selected by the department.

(d) Any findings shall be in writing and shall be binding unless appealed to the secretary of the department.

(e) All arguments shall be submitted in writing.

(9) RECIPROCITY. A certificate of competency may be granted by the department to a boiler or pressure vessel inspector who holds a certificate issued by the national board of boiler and pressure vessel inspectors and a certificate of competency from a city or state which has adopted the ASME boiler and pressure vessel code and which requires a written examination similar to that required by the department.

ILHR 41.14 [41.09] IN-SERVICE FIELD INSPECTORS. (1) ELIGIBILITY. An applicant for an in-service field inspector authorization shall be an employe of the department, a municipality, an insurance company, or owners or operators of boilers and pressure vessels authorized to make their own inspections.

(2) QUALIFICATIONS. An applicant shall have one of the following education and experience qualifications:

(a) A bachelor's degree in engineering from a an accredited college or university, which is deemed to be the equivalent of 2 years experience in design, construction, operation or inspection of high pressure boilers and pressure vessels; or

(b) An associate degree in mechanical technology plus one year of actual experience in design, construction, operation or inspection of high pressure boilers and pressure vessels; or

(c) Two years of practical experience in the construction, installation, repair, maintenance, operation or inspection of high pressure boilers and pressure vessels.

(3) APPLICATION. (a) All applications for an in-service field inspector authorization shall be made to the department together with the payment of the application and examination fees.

Note #1: Application form no. SB-37 is available from the Division of Safety and Buildings, P.O. Box 7969, Madison, Wisconsin 53707.

Note #2: See ch. Ind 69 for fee requirements.

(b) Upon receipt of the application form, the department shall review and evaluate the application and make all necessary notifications to the applicant.

(4) ISSUANCE OF AUTHORIZATION. In-service field inspector authorizations shall be issued by the department to eligible applicants who have received a grade of 70% or greater on the examination prescribed by and conducted by the department. The department shall issue the authorization within 15 business days of passage of the examination.

(a) The authorization shall bear the name of the applicant, authorization number and expiration date. The authorization shall be valid for a period of 15 months from the date of issuance.

(b) Applicants failing the examination may apply to retake the examination.

(c) The authorization shall be nonrenewable.

(5) INSPECTION WORK. (a) The in-service field inspector authorization may be utilized by the holder only while in the continous employ of the authorized inspection agency by whom employed at the time of application.

(b) The authorized in-service field inspector may perform only field inspection work and the work shall be performed while accompanied by an authorized field inspector during the first 3 months of employment and under the direct supervision of an authorized field inspector for the following 12 months.

(c) If the authorized inspection agency specified in par. (a) is an insurance company, then the authorized in-service field inspector may perform field inspection work only upon objects covered by the insurance company.

(d) Inspection of repairs and alterations shall be performed by an authorized inspector in possession of a certificate of competency.

(6) APPLICATION FOR CERTIFICATE OF COMPETENCY. Upon completion of one year of experience as an authorized in-service field inspector while in the continuous employ of the authorized inspection agency by whom employed at the time of application, the holder of a valid authorization, through the employer, may apply for a certificate of competency. In the event the applicant's experience is with more than one authorized inspection agency, the department may accept the accumulated inspection experience.

ILHR 41.15 [41.20 (1) + (2)] GENERAL INSPECTION REQUIREMENTS. (1) ALL INSPECTIONS. The authorized 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 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.

ILHR 41.16 [41.19] INITIAL INSPECTIONS. (1) BOILER AND PRESSURE VESSEL INSPECTIONS. (a) Except as provided in par. (b), boilers and pressure vessels shall be inspected by an authorized 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 an authorized inspector other than a department inspector, the authorized inspector shall file an inspection report with the department and shall affix the Wisconsin registration number as required in s. ILHR 41.36. Inspection reports shall be made 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 an authorized inspector employed by the department or, if installed in a city of the first class, by the city. Documented inspections, including the initial inspection, made by authorized inspectors not employed by the department shall be acceptable to the department.

(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 installing contractor shall notify the department, the city of the first class or the authorized inspector employed by an insurance company 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. Power piping systems may not be insulated or placed in service without receiving an inspection.

(e) Evidence shall be provided to the authorized inspector that all prefabricated piping complies with the ANSI standard for power piping as listed in Table 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. Ind 69.

ILHR 41.17 [41.20 (3) - (7)] PERIODIC INSPECTIONS. (1) INSPECTION OF BOILERS. (a) Except as provided in sub. (3) and s. ILHR 41.18, boilers shall be subjected to either a regular internal or external inspection at least once every 12 months by an authorized 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 an authorized 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 an authorized inspector.

(4) INSPECTION OF SAFETY VALVES AND SAFETY RELIEF VALVES. The authorized 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 3 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. The authorized inspection agency shall concur with the owner's request for extension by letter to the department.

Note: For inspection fees, see ch. Ind 69.

ILHR 41.18 [41.21] 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.

ILHR 41.19 [41.22] 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 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 authorized 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.

ILHR 41.20 [41.23] INSPECTIONS BY INSURANCE COMPANIES. Inspections of boilers and pressure vessels by insurance companies may be accepted by the department under the following conditions:

(1) AUTHORITY. The boiler and pressure vessel inspectors employed by the insurance company shall hold certificates of competency or in-service field inspector authorizations issued by the department.

(2) REPORTS. The insurance company shall report inspections of boilers and pressure vessels to the department as required in s. ILHR 41.23.

(3) PROCEDURES. The inspection procedures used by the insurance company shall conform to the regulations of chs. ILHR 41 and 42.

(4) COVERAGE. The insurance company shall report to the department within 30 calendar days when insurance coverage is started or discontinued on a boiler or pressure vessel. The reason for discontinuing the coverage shall be given on the report. If the boiler or pressure vessel is installed in a city of the first class which provides boiler and pressure vessel inspections, the report shall also be provided to the city.

ILHR 41.21 [41.24] INSPECTIONS BY CITIES. Inspections of boilers and pressure vessels by cities of the first class may be accepted by the department under the following conditions:

(1) AUTHORITY. The boiler and pressure vessel inspectors employed by the city shall hold certificates of competency or in-service field inspector authorizations issued by the department.

(2) REPORTS. The city shall keep a record of the inspections and shall submit a copy to the department.

(3) PROCEDURES. The inspection procedures used by the city shall conform to the regulations of chs. ILHR 41 and 42.

ILHR 41.22 [41.25] INSPECTIONS BY COMPANIES OR CORPORATIONS. Inspections by companies or corporations of boilers or pressure vessels which they own or operate may be accepted by the department under the following conditions:

(1) AUTHORITY. The boiler and pressure vessel inspectors employed by the company or corporation shall hold certificates of compentency or in-service field inspector authorizations issued by the department.

(2) REPORTS. The company or corporation shall report inspections of boilers and pressure vessels to the department as required in s. ILHR 41.23.

(3) PROCEDURES. The inspection procedures used by the company or corporation shall conform to the regulations of chs. ILHR 41 and 42.

ILHR 41.23 [41.26 and 41.27] 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.

ILHR 41.24 [41.28] 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.

(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.

Subchapter III
General Rules for 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, the effective date of this section.

ILHR 41.28 [41.03 (1)-(3)] 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, 202 South Thornton Avenue, Madison, Wisconsin 53702.

ILHR 41.29 [41.03 (4)] 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.

(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.

ILHR 41.30 [41.16] 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 cut-off 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.

(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.

ILHR 41.31 [41.11] 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 s. ILHR 41.42 or the code in effect at the time of construction.

(3) TANKS. The blowoff tank shall be designed in accordance with s. ILHR 41.42 or the code in effect at the time of construction for a working pressure of at least one-fourth the maximum allowable working pressure of the boiler to which it is connected.

(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 0-25 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 1/2-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;

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

(f) 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.

ILHR 41.32 [41.55] 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.

ILHR 41.33 [41.12] PROTECTION OF VESSELS SUPPLIED THROUGH PRESSURE REDUCING VALVES. 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 valves from boilers carrying a higher steam pressure. Where a pressure reducing valve 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 VALVE CAPACITY. The following formula shall be used to determine the steam flow rate through the pressure reducing valve.

W = 1/3 X OC X 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 actual flow coefficient provided by the pressure reducing valve manufacturer may be used in place of the coefficient 1/3 in the above formula. The coefficient used shall be the largest obtainable by internal trim change of the valve.

(b) In using Table 41.33-1, the pressure reducing valve inlet pressure is the maximum allowable working pressure of the piping system to the inlet side of the pressure reducing valve.

(2) BYPASS CAPACITY. The following formula shall be used to determine the steam flow rate through the bypass when pressure reducing valves 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 X OC X 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 pres., 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)

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	18520	-----	-----	-----	-----	-----	-----
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)

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. Internal Area, Square Inches
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	10.750	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.

ILHR 41.34 [42.33] 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.

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.

ILHR 41.36 [41.06] 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 an authorized inspector at a location which can be easily viewed.

ILHR 41.37 [41.13] 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 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.

ILHR 41.38 [41.04] 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.

ILHR 41.39 [41.29] CONDEMNATION. (1) AUTHORITY. Only the department may condemn a boiler or pressure vessel. Any boiler or pressure vessel declared by an authorized 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" high and arrowheads shall be at least 1/2" 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.

Subchapter IV
General Rules for 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.

ILHR 41.41 [41.05] 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 owner or user 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 owner or user 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.

ILHR 41.42 [41.50] 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. Electric boilers shall be constructed and installed in accordance with ASME section I or IV as applicable.

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.

ILHR 41.43 [41.51] 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.

ILHR 41.44 [41.52] 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.

ILHR 41.45 [41.53] 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 used exclusively for hot water service and hot water storage tanks, provided they bear the stamp, monogram or other evidence of compliance with a nationally recognized standard. Water heaters or hot water storage tanks not so identified shall:

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

1. Have their design submitted to the department for approval;

2. Withstand a hydrostatic test pressure of 1-1/2 times the maximum allowable working pressure without developing leakage or permanent distortion; and

3. Be equipped with approved primary safety controls, limit switches, and burners or electric elements.

(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.

(b) Water heaters and hot water storage tanks shall be equipped with pressure-temperature relief devices:

1. Listed by the American Gas Association (AGA), Underwriters Laboratories (UL) or ASME when heat inputs are less than or equal to 200,000 Btu per hour and temperatures do not exceed 210° F; and

2. Listed by ASME when heat inputs exceed 200,000 Btu per hour.

ILHR 41.46 [41.56] POWER PIPING. Power piping, and 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. This section applies to new systems as well as all replacements, modifications and alterations to existing systems.

ILHR 41.47 [41.54] 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.

ILHR 41.48 [41.57] 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.

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 the effective date of this section.

ILHR 41.54 [41.30] 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.

ILHR 41.55 [41.35] 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 an authorized inspection agency 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. The authorized inspection agency shall concur with the owner's request for extension by letter to the department.

ILHR 41.56 [41.40] 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 #1: No other supporting documents are required to be submitted to meet this requirement.

Note #2: Multiple repairs to the same object may be reported on a single report form.

Note #3: 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.

ILHR 41.57 [41.45] 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.

Subchapter VI
General Rules for Pre-1957 Installations

ILHR 41.60 [41.60] APPLICATION. The provisions of ss. ILHR 41.60 to 41.94 shall apply to all boilers and pressure vessels installed prior to January 1, 1957.

ILHR 41.61 [41.61] MAXIMUM ALLOWABLE WORKING PRESSURES. The maximum allowable working pressure on a boiler or pressure vessel shall be the maximum pressure at which the boiler or pressure vessel may be operated as determined by the provisions of ss. ILHR 41.60 to 41.94.

ILHR 41.62 [41.62] CODE CONSTRUCTED VESSELS. Any boiler or pressure vessel that has been constructed and stamped in accordance with the rules and regulations of the ASME boiler and pressure vessel code, or other recognized codes, or has the standard stamping of another state that has adopted the standard of construction of the ASME boiler and pressure vessel code, shall be allowed and may be operated at the maximum allowable working pressure stamped on its shell providing the boiler or pressure vessel is unaltered, in good working order, and not deteriorated by age or corrosion. For unstamped boilers or pressure vessels, the maximum allowable working pressure shall be determined by using ss. ILHR 41.63 to 41.76.

ILHR 41.63 [41.63] PRESSURE CALCULATIONS FOR SHELLS. The maximum allowable working pressure on the shell of a boiler or pressure vessel shall be determined by the following formula:

$$P = \frac{T.S. \times t \times E}{R \times F.S.}$$

where P = maximum allowable working pressure, pounds per square inch
T.S. = tensile strength of shell plate, pounds per square inch
t = minimum thickness of shell plates, inches
E = efficiency of longitudinal joint as determined in s. ILHR 41.73
R = inside radius of the outside course of the shell, inches
F.S. = lowest factor of safety allowed by s. ILHR 41.70

ILHR 41.64 [41.64] PRESSURE CALCULATIONS FOR FLAT HEADS AND FLAT SURFACES. The maximum allowable working pressure on flat heads and flat surfaces of a boiler or pressure vessel shall be determined by the following formula:

$$P = \frac{T.S. \times t^2}{0.5 \times d^2 \times F.S.}$$

where P = maximum allowable working pressure, pounds per square inch
T.S. = tensile strength of plate, pounds per square inch
t = thickness of plate, inches
d = diameter of head or shortest unsupported span of head or maximum pitch between stays, inches
F.S. = lowest factor of safety allowed by s. ILHR 41.70

Note: No allowance will be made for the holding power of flanges.

ILHR 41.65 [41.65] PRESSURE CALCULATIONS FOR DISHED HEADS. The maximum allowable working pressure on unstayed dished heads of a boiler or pressure vessel shall be determined by the following formulas:

Pressure on concave side (plus head):

$$P = \frac{2 \times T.S. \times E \times t}{8.33 \times L}$$

Pressure on convex side (minus head):

$$P = \frac{2 \times T.S. \times E \times t \times 0.6}{8.33 \times L}$$

where P = maximum allowable working pressure, pounds per square inch
T.S. = tensile strength, pounds per square inch
L = radius to which the head is dished, measured on the concave side of the head, inches
t = thickness of plate, inches
E = efficiency of weakest joint used in forming the head, exclusive of the joint to the shell; For seamless heads, E = 1.00

ILHR 41.66 [41.66] DISHED HEAD RESTRICTIONS. Dished heads without skirts or flanges may not be used for any pressure.

ILHR 41.67 [41.67] PRESSURE CALCULATION FOR FURNACES AND CIRCULAR FLUES. The maximum allowable working pressure on furnaces of vertical boilers and on circular flues shall be determined as indicated in the code in effect at the time of construction or in s. ILHR 41.43.

ILHR 41.68 [41.68] BOILER PLATE THICKNESS. (1) GENERAL. Except as provided in sub. (2), the minimum thickness of any boiler plate under pressure shall be 1/4 inch except that boiler plate in stayed surfaces shall be 5/16 inch thick minimum.

(2) MINIATURE BOILERS. Shells for miniature boilers shall be at least 3/16 inch thick minimum.

ILHR 41.69 [41.69] SAFETY DEVICES AND OTHER APPLIANCES. Where the ASME code listed in s. ILHR 41.10 permits other methods of installing safety devices and other appliances, these methods may be used on existing boilers or pressure vessels.

ILHR 41.70 [41.70] FACTOR OF SAFETY. Maximum allowable working pressure shall be determined by using a factor of safety of at least 5 except as provided in s. ILHR 42.41.

ILHR 41.71 [41.71] STRENGTH OF MATERIALS. When the tensile strength of materials is not known, it shall be taken as 55,000 pounds per square inch for steel, 45,000 pounds per square inch for wrought iron, 30,000 pounds per square inch for copper and 10,000 pounds per square inch for cast iron. The resistance to crushing of mild steel shall be taken as 95,000 pounds per square inch of cross sectional area.

ILHR 41.72 [41.72] SHEARING STRENGTH OF RIVETS. (1) MAXIMUM STRENGTH. The maximum shearing strength of rivets in pounds per square inch of cross-sectional area shall be taken as follows:

	Pounds per Square Inch
Iron rivets in single shear	38,000
Iron rivets in double shear	76,000
Steel rivets in single shear	44,000
Steel rivets in double shear	88,000

(2) RIVET DIMENSIONS AFTER DRIVING. When the diameter of the rivet holes in the longitudinal joints of a boiler or pressure vessel is not known, the diameter and cross-sectional area of rivets, after driving, shall be taken from Table 41.72.

TABLE 41.72
DIAMETER AND AREA OF RIVETS

Thickness of Plate, in Inches	1/4 0.25	9/32 0.2812	5/16 0.3125	11/32 0.34375	3/8 0.375	3/8 0.375	13/32 0.40625
Diameter of Rivet after Driving, in Inches	11/16	11/16	3/4	3/4	3/4 up to and including 2" pitch	13/16 Over 2" pitch	13/16
Cross Sectional Area of Rivet after Driving, in Square Inches	0.3712	0.3712	0.4418	0.4418	0.4418	0.5185	0.5185

Thickness of Plate, in Inches	7/16 0.4375	7/16 0.4375	15/32 0.46875	1/2 0.5	9/16 0.5625	5/8 0.625
Diameter of Rivet after Driving, in Inches	7/8 up to and including 2-1/4" pitch	15/16 over 2-1/4" pitch	15/16	15/16	1-1/16	1-1/16
Cross Sectional Area of Rivet after Driving, in Square Inches	0.6013	0.6903	0.6903	0.6903	0.8866	0.8866

ILHR 41.73 [41.73] EFFICIENCY OF JOINT. The efficiency of a joint is the ratio which the strength of the joint bears to the strength of the solid plate, and shall be determined as follows:

(1) RIVETED JOINTS. For riveted joints, the efficiency shall be calculated according to the code in effect at the time of construction or s. ILHR 41.43 using the values stated in ss. ILHR 41.71 and 41.72.

(2) WELDED JOINTS. For welded joints, the efficiency shall be determined from Table 41.73.

TABLE 41.73
MAXIMUM ALLOWABLE EFFICIENCIES FOR FUSION WELDED JOINTS

Type of Joint	Limitations	Maximum Joint Efficiency (Per Cent)
Double-Welded Butt Joint	None	80
Single-Welded Butt Joint with Backing Strip	Longitudinal joints not over 1-1/4" thick. No thickness limitations on circumferential joints.	80
Single-Welded Butt Joint without Backing Strip	Circumferential joints only not over 5/8" thick.	70
Double-Welded Full-Fillet Lap Joint	Longitudinal joints not over 3/8" thick. Circumferential joints not over 5/8" thick.	60
Single-Welded Full-Fillet Joint with Plug Welds	Circumferential joints only not over 5/8" thick and for attachments of heads not over 24" outside diameter to shells not over 5/8" thick.	50
Single-Welded Full-Fillet Joint without Plug Welds	For attachments to heads convex to pressure to shell not over 5/8" thick, only with use of fillet weld on inside shell; for attachments to heads having pressure on either side, with fillet weld on outside of head flange only, to shells not over 24" inside diameter and not over 1/4" required thickness.	50
Forged Weld	None	70
Brazed Steel	None	80
Brazed Copper	None	90

ILHR 41.74 [41.74] LIGAMENT BETWEEN PARALLEL TUBE HOLES. When a shell or drum is drilled for tube holes in a line parallel to the axis of the shell or drum, the efficiency of the ligament between the tube holes shall be determined according to the code in effect at the time of construction or s. ILHR 41.43.

ILHR 41.75 [41.75] LIGAMENT BETWEEN DIAGONAL TUBE HOLES. When a shell or drum is drilled for tube holes in a line diagonal with the axis of the shell or drum, the efficiency of the ligament between the tube holes shall be determined according to the code in effect at the time of construction or s. ILHR 41.43.

ILHR 41.76 [41.76] MAXIMUM PRESSURE FOR CAST IRON BOILERS. (1) CAST IRON STEAM BOILERS. The maximum allowable working pressure on a steam boiler constructed wholly or principally of cast iron may not exceed 15 pounds per square inch.

(2) CAST IRON HEADERS. The maximum allowable working pressure on boilers, the tubes of which are secured to cast iron headers, may not exceed 160 pounds per square inch.

ILHR 41.77 [41.77] SAFETY OR RELIEF VALVES REQUIRED ON BOILERS. Every boiler shall have one or more safety valves or relief valves set at or below the maximum allowable working pressure. On power boilers, the remaining valves may be set at a higher pressure in accordance with s. ILHR 41.78.

ILHR 41.78 [41.78] SAFETY VALVES FOR LOW PRESSURE STEAM, MINIATURE AND POWER BOILERS. (1) VALVE CAPACITY. Every boiler shall be provided with safety valve capacity sufficient to discharge all the steam that can be generated without an increase over the maximum allowable working pressure or the pressure to which the valve is set, except that a 6% increase is allowed while the valve is discharging for power and miniature boilers, and a 5 pound per square inch increase is allowed while the valve is discharging for low pressure steam boilers.

(2) STEAM GENERATING CAPACITY. The steam generating capacity of a boiler in pounds of steam per hour may be determined by one of the following:

(a) Manufacturer's maximum output rating.

(b) Pounds of steam per hour = $\frac{\text{Maximum Btu input per hour X } 0.75}{1000}$

(c) Actual evaporation test.

(d) For power boilers, heating boilers and miniature boilers on the basis of boiler heating surface or waterwall heating surface as given in Table 41.78.

TABLE 41.78
MINIMUM POUNDS OF STEAM PER HOUR
PER SQUARE FOOT OF SURFACE[1]

Surface	Firetube Boilers	Watertube Boilers
Boiler heating surface		
Hand-fired[2]	5	6
Stoker-fired	7	8
Oil, gas, or pulverized fuel fired	8	10
Waterwall heating surface		
Hand-fired[2]	8	8
Stoker-fired	10	12
Oil, gas, or pulverized fuel fired	14	16

[1] The minimum safety valve or safety relief valve relieving capacity for electric boilers shall be 3-1/2 lb/hr/KW input.

[2] When a boiler is fired only by a gas having a heat value not in excess of 200 Btu/cu. ft., the minimum safety valve or safety relief valve relieving capacity may be based on the values given for hand-fired boilers.

(3) SETTING OF VALVES. On power boilers, one or more safety valves on the boiler proper shall be set at or below the maximum allowable working pressure. The remaining valves may be set within a range of 3% above the maximum allowable working pressure, but the range of setting of all of the valves on a boiler may not exceed 10% of the highest pressure to which any valve is set.

(4) CONSTRUCTION OF VALVES. Safety valves shall be ASME code-stamped.

(5) MOUNTING AND SIZE OF VALVES. When 2 or more safety valves are used on a boiler, they may be mounted either separately or as twin valves made by placing individual valves on Y-bases, or duplex, triplex, or multiplex valves having 2 or more valves in the same body casing. The valves shall be made of equal sizes, if possible, and if not of the same size, the smaller of the 2 valves shall have a relieving capacity of at least 50% of that of the larger valve.

(6) LOCATION AND POSITION OF VALVES. The safety valves shall be connected to the boiler independent of any other steam connection, and attached as close as practical to the boiler, without any unnecessary intervening pipe or fitting. Every safety valve shall be connected so as to stand in an upright position with the spindle vertical when possible.

(7) VALVE DISCHARGE. (a) The opening or connection between the boiler and the safety valves shall have at least the area of the inlet of the valves. No valve of any description may be placed between the required safety valves and the boiler, nor on the discharge pipe between the safety valve and the atmosphere. When a discharge pipe is used, the cross-sectional area shall be not less than the full area of the safety valve outlet or of the total of the areas of the safety valve outlets discharging thereinto, and shall be as short and straight as possible and so arranged to avoid undue stresses on the safety valves.

(b) All safety valve discharges shall be so located or piped as to be carried clear from running boards, platforms, or otherwise carried to a safe location.

(c) Provision for gravity drain shall be made in the discharge pipe, at or near each safety valve, and where water or condensation may collect.

(8) VALVE SPRING. (a) The spring in a safety valve in service for pressures up to and including 250 pounds per square inch may not be used for any pressure more than 10% above or 10% below that for which it was designed. For pressures greater than 250 pounds per square inch, the spring may not be used for any pressure more than 5% above or 5% below that for which it was designed.

(b) If the operating conditions of a safety valve are changed so as to require a new spring for a different pressure, the valve shall be adjusted by the manufacturer or their authorized representative who shall furnish and install a new name plate.

(9) SUPERHEATERS. Every superheater shall have one or more safety valves near the outlet. The discharge capacity of the safety valves on an attached superheater may be included in determining the number and size of the safety valves for the boiler, provided there are no intervening valves between the superheater safety valve and the boiler, and provided the discharge capacity of the safety valves on the boiler, as distinct from the superheater, is at least 75% of the aggregate safety valve capacity required. A soot-blower connection may be attached to the same outlet from the superheater that is used for the safety valve connection.

(10) BOILER OPENINGS. (a) Every boiler shall have outlet connections for the required safety valves, independent of any other outside steam connection. The area of the boiler openings shall be at least equal to the aggregate areas of inlet connections of all of the safety valves to be attached to the openings. An internal collecting pipe, splash plate or pan may be used, provided the total area for inlet of steam thereto is not less than twice the aggregate areas of the inlet connections of the attached safety valves. The holes in the collection pipes shall be at least 1/4-inch in diameter and the least dimension in any other form of opening for inlet of steam shall be 1/4-inch.

(b) If safety valves are attached to a separate steam drum or dome, the opening between the boiler proper and the steam drum or dome shall be not less than required by par. (a).

(11) COMMON STEAM MAIN INSTALLATIONS. (a) When boilers of different maximum allowable working pressures are connected to a common steam main and all safety valves are not set at the lowest maximum allowable working pressure, no safety valve may be set to exceed by more than 50% the lowest maximum allowable working pressure.

(b) For conditions exceeding those specified in par. (a), the case shall be referred to the department for decision.

ILHR 41.79 [41.79] SAFETY RELIEF VALVES FOR HOT WATER BOILERS. (1) TYPE AND SETTING. Each hot water boiler shall have one or more safety relief valves of the spring loaded type, without disk guides on the pressure side of the valve. The valves shall be set to relieve at a pressure at or below the maximum allowable working pressure of the boiler.

(2) CONSTRUCTION OF VALVES. Safety relief valves shall be ASME code-stamped.

(3) LOCATION AND POSITION OF VALVES. Safety relief valves shall be attached directly or as close as possible to the boiler without any unnecessary intervening pipe or fitting. A safety relief valve may not be connected to an internal pipe in the boiler. A safety relief valve shall be connected so as to stand upright with the spindle vertical when possible.

(4) SHUT-OFFS. No shut-off of any description may be placed between the safety relief valve and the boiler, nor on discharge pipes between the valve and the atmosphere.

(5) DISCHARGE PIPE. When a discharge pipe is used, its area shall be not less than the area of the safety relief valve or aggregate area based on the nominal diameters of the safety relief valves with which it connects. The discharge pipe shall be pitched away from the safety relief valve to prevent water from lodging in the upper part of the valve or in the pipe. The safety relief valve shall be so located and piped that there will be no danger of scalding persons.

(6) REQUIRED CAPACITY OF VALVES. The required safety relief valve capacity for any hot water boiler shall be equal to the maximum Btu output at the boiler nozzle or shall be equal to the boiler heating surface multiplied by 5000.

(7) PRESSURE RELIEF CAPACITY. The safety relief valve capacity for each hot water boiler shall be such that the valves will relieve all the pressure that can be generated by the boiler without allowing the pressure to rise more than 3 pounds per square inch above the maximum allowable working pressure of the boiler.

(8) BOILER OPENINGS. Every boiler shall have outlet connections for the required safety relief valves, independent of any other connection outside the boiler. The area of the openings shall be at least equal to the aggregate area based on the nominal diameters of all of the safety relief valves with which the openings connect.

ILHR 41.80 [41.80] THERMOMETERS FOR HOT WATER BOILERS. Every hot water boiler shall have a thermometer so located and connected as to be easily readable when observing the water pressure or altitude. The thermometer shall indicate the temperature in degrees Fahrenheit of the water in the boiler, at or near the outlet.

ILHR 41.81 [41.81] WATER GLASS. Every low pressure steam, miniature and power boiler shall have at least one water glass equipped with a valved drain, the lowest visible part of which shall be at or above the locations specified in subs. (1) to (7) except that in all cases it shall be so placed as to give adequate protection to those parts of a boiler proper subject to the heat of the products of combustion.

(1) HORIZONTAL RETURN TUBULAR BOILERS. For horizontal return tubular boilers, the water glass shall be located not less than 4 inches above the upper surface of the upper row of tubes except, when the distance between the uppermost surface of the tubes and the top of the steam space is 13 inches or less, the distance may be reduced to not less than 2 inches.

(2) LOCOMOTIVE TYPE BOILERS. For locomotive type boilers, the water glass shall be located 3 inches above the highest part of the crown sheet.

(3) VERTICAL FIRE TUBE BOILERS. For vertical fire tube boilers, the water glass shall be located not less than 1/3 the length of the tube above the lower tube sheets.

(4) WATER TUBE BOILERS. For water tube boilers, the water glass shall be located as specified by the manufacturer.

(5) SCOTCH MARINE TYPE BOILERS. For scotch marine type boilers, the water glass shall be located 3 inches above the combustion chamber top.

Note: For dry back, see sub. (1).

(6) CAST IRON BOILERS. For cast iron boilers, the water glass shall be located as specified by the manufacturer.

(7) OTHER TYPES AND DESIGNS. For other types of boilers and new designs, the location of the water glass shall be fixed by the manufacturer subject to approval by the department.

ILHR 41.82 [41.82] GAGE COCKS. (1) GENERAL. Except as provided in subs. (2) and (3), every steam boiler shall have 3 gage cocks located within the range of the visible portion of the water glass.

(2) GAGE COCKS NOT REQUIRED. The following boilers are not required to have gage cocks:

(a) Boilers which do not have a definite water level;

(b) Boilers which have 2 water glasses spaced not less than 2 feet apart on the same horizontal line;

(c) Boilers which have 2 remote water level indicators in addition to the required water glass; and

(d) Miniature boilers.

(3) TWO GAGE COCKS REQUIRED. The following boilers shall be required to have only 2 gage cocks:

(a) Low pressure steam boilers;

(b) Locomotive type boilers not over 36 inches in diameter; and

(c) Firebox or water leg boilers in which the water heating surface does not exceed 50 square feet.

ILHR 41.83 [41.83] WATER COLUMN PIPING. (1) PROHIBITED CONNECTIONS. No connections may be placed on pipes connecting the water column to the boiler, except connections for the damper regulator, feed water regulator, steam gage or drains.

(2) PIPE SIZE. The minimum size of the pipes connecting the water column to a boiler shall be one inch. Water glass fittings or gage cocks may be connected directly to the boiler.

(3) CLEANING. The water connections to the water column of a boiler, when practicable, shall be provided with a cross at each right-angle turn to facilitate cleaning. The water column shall be fitted with a drain cock or drain valve with a suitable connection to the ashpit or other safe point of waste, and if the water connection thereto has a rising bend or pocket which cannot be drained by means of the water column drain, an additional drain shall be placed in this connection in order that it may be blown off to clear any sediment from the pipe.

(4) STEAM AND WATER CONNECTIONS. (a) The steam connection to the water column of a horizontal return tubular boiler shall be taken from the top of the shell or the upper part of the head; the water connection shall be taken from the front head at a point not less than 6 inches below the center line of the shell.

(b) For firebox type boilers, the water connection to the water column shall be taken at a point not less than 6 inches below the lowest water line or as near thereto as possible, and in no case less than 18 inches above the mud ring.

(5) SHUT-OFFS. When shut-offs are used on the connections to a water column, they shall be either outside-screw-and-yoke type valves or stop cocks with levers permanently fastened thereto and marked in line with their passage. Where stop cocks are used, they shall be of a type with the plug held in place by a guard or gland.

ILHR 41.84 [41.84] PRESSURE GAGES. (1) GENERAL REQUIREMENTS. (a) Every boiler shall be provided with a pressure gage connected to the upper part of the boiler and so arranged that the gage cannot be shut off from the boiler except that a shut-off valve or cock shall be placed close to the gage or a second shut-off valve or cock close to the boiler to permit removal for testing while the boiler is in operation.

(b) For steam boilers, the gage may also be connected to the water column or water column steam connection. For steam boilers, a siphon or equivalent device of sufficient capacity to keep the gage tube filled with water shall be provided.

(2) GAGE DIAL. (a) Except as provided in pars. (b) and (c), the dial of the pressure gage shall be graduated to at least one and one-half times the pressure at which the safety valve or relief valve is set.

(b) On low pressure steam boilers the gage shall be graduated to at least 30 pounds per square inch.

(c) On hot water boilers the pressure or altitude gage shall be graduated to at least one and one-half times the maximum allowable working pressure.

(3) GAGE POINTER TRAVEL. (a) For low pressure steam boilers, the travel of the pointer from zero to 30 pounds per square inch shall be at least 4 inches.

(b) Effective stops shall be provided for the indicating pointer at the lowest and highest pressure points.

(4) GAGE VISIBILITY. The pressure gage dial shall be protected by a transparent cover which shall be kept clear at all times. The gage shall be so located as to be readily visible to the operator.

ILHR 41.85 [41.85] STOP VALVES ON DISCHARGE OUTLETS. (1) WHERE REQUIRED. Each discharge outlet on miniature and power boilers, except safety valve or relief valve outlets, shall be fitted with one or more stop valves located as near to the boiler as practicable. When 2 or more low pressure steam boilers are connected to a common header, a stop valve shall be provided in the steam outlet of each boiler as near to the boiler as practicable.

(2) BLOW DRAIN. When 2 stop valves are placed in the steam connection between a power boiler and the steam main there shall be a free blow drain between them. The discharge of this drain valve shall be visible to the operator while manipulating the valve.

(3) WATER DRAIN. (a) When a stop valve is so located that water can accumulate, drains shall be provided.

(b) Each dry pipe or similar apparatus shall have 2 holes drilled into it. These holes shall be not less than 1/2-inch in diameter each and shall be kept open so that the condensation can escape.

(4) SUPERHEATER DRAIN. Each drainable-type superheater shall be equipped with at least one drain so located to provide for the proper operation of the superheater.

ILHR 41.86 [41.86] STEAM MAINS. Provision shall be made for the expansion and contraction of steam mains connected to boilers by providing substantial anchorage at suitable points so that there shall be no undue strain transmitted to the boiler. Steam reservoirs shall be used on steam mains when heavy pulsations of the steam currents cause vibration of the boiler shell plates.

ILHR 41.87 [41.87] BOTTOM BLOWOFF OR DRAIN. (1) BLOWOFF PIPE AND VALVE. Connected to the lowest water space practicable of each boiler, there shall be a bottom blowoff pipe fitted with a valve or cock. The valve shall be of straightway or angle construction, and the cock shall have the plug held in place with a gland or guard. Straightway globe valves of the ordinary type or valves of the type that dams or pockets can exist for the collection of sediment, may not be used on the connections.

(2) SURFACE BLOWOFF. A surface blowoff may not exceed 2-1/2-inch pipe size and the internal and external pipes, when used, shall form a continuous passage, but with clearance between their ends and arranged so that the removal of either will not disturb the other. A properly designed steel bushing or a flanged connection shall be used.

(3) PIPE SIZE. (a) Each boiler shall have a bottom blowoff pipe, fitted with a valve or cock, in direct connection with the lowest water space practicable. The maximum size of pipe and fittings shall be 2-1/2-inches and the minimum size shall be one inch, except that for boilers with 100 square feet of water heating surface or less and low pressure steam boilers, the minimum size of pipe and fittings may be 3/4-inch. Straightway globe valves of the ordinary type or valves of the type that dams or pockets can exist for the collection of sediment, may not be used on the connections.

(b) The bottom blowoff pipe for low pressure steam, miniature and hot water boilers may be connected to return connections which are the same size or larger than the size specified in par. (a). In this case, the blowoff shall be so located that the connection may be completely drained.

(4) BLOWOFF COCK. A bottom blowoff cock shall have the plug held in place by a guard or gland. The end of the plug shall be distinctly marked in line with the passage.

(5) PIPE AND FITTING MATERIALS. (a) For power boilers, the bottom blowoff pipe shall be of wrought iron or steel and shall be of at least extra heavy construction.

(b) For pressures not exceeding 150 pounds per square inch, the fittings between a power boiler and the required bottom blowoff valve shall be of steel, cast steel or malleable iron and shall be of at least extra heavy construction.

(c) For pressures exceeding 150 pounds per square inch, the fittings between a power boiler and the required bottom blowoff valve shall be of steel and of at least extra heavy construction.

(d) Cast iron pipe and fittings may not be used in the bottom blowoff pipe between the boiler and the bottom blowoff valve.

(6) MULTIPLE VALVES. (a) On all boilers except those used for traction and portable purposes, when the maximum allowable working pressure exceeds 125 pounds per square inch, each bottom blowoff pipe shall have 2 slow-opening valves, or one slow-opening valve and a cock, and the valves or valve and cock shall be of at least extra heavy construction. On a boiler having multiple blowoff pipes, a single master valve may be placed on the common blowoff pipe from the boiler, in which case only one valve on each individual blowoff is required. Two independent valves, or a valve and a cock, may be combined in one body provided the combined fitting is the equivalent of 2 independent valves, or a valve and a cock, so that the failure of one to operate could not affect the operation of the other.

(b) Every traction and portable boiler shall have a bottom blowoff valve. When the maximum allowable working pressure exceeds 125 pounds per square inch, the blowoff valve shall be of at least extra heavy construction.

(c) For pressures exceeding 200 pounds per square inch, the valves or cocks shall be of steel construction.

(d) The inlet and outlet of the blowoff valve shall be the full size of the blowoff pipe.

(7) BLOWOFF PIPE PROTECTION. A bottom blowoff pipe, when exposed to direct furnace heat, shall be protected by fire brick or other heat resisting material so arranged that the pipe may be inspected.

(8) BLOWOFF PIPE OPENING. An opening in the boiler setting for a blowoff pipe shall be arranged to provide for free expansion and contraction.

(9) OTHER REQUIREMENTS. Boiler blowoff equipment shall also comply with the provisions of s. ILHR 41.31.

ILHR 41.88 [41.88] FEED PIPE. (1) CHECK VALVE. (a) Each low pressure steam, miniature and power boiler shall have the feed pipe fitted with a check valve near the boiler and a stop valve between the check valve and the boiler. Single low pressure steam boiler installations of the gravity return type which do not have a stop valve in the steam outlet line need not have a stop valve in the return pipe.

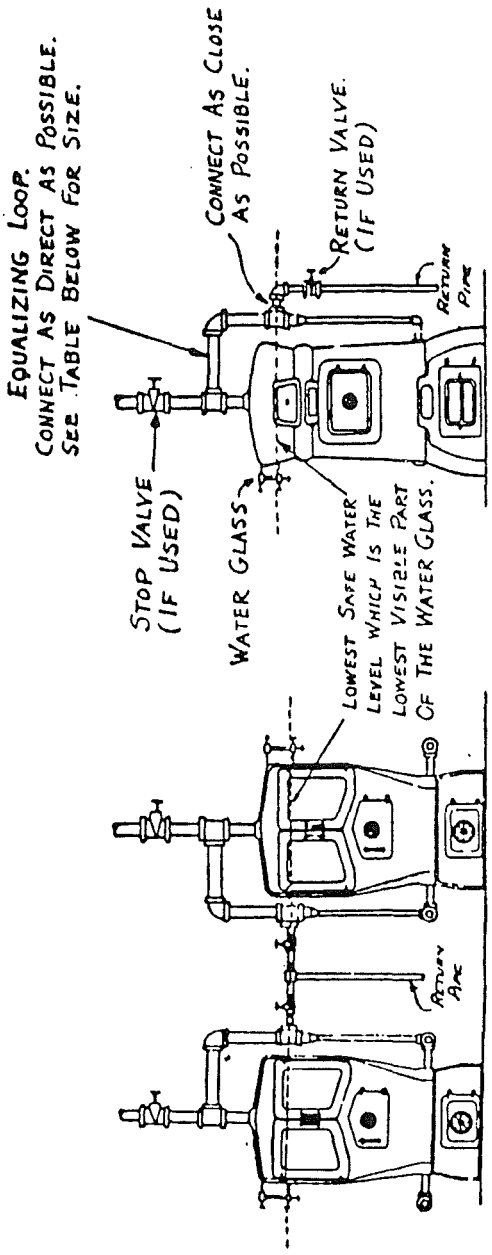
(b) On low pressure steam boilers, the return pipe loop connection shown in Figure 41.88 may be used in place of the check valve.

(2) FEED PIPE LOCATION. (a) The feed water shall be introduced into a boiler in such a manner that the water will not be discharged directly against surfaces exposed to gases of high temperature, or to direct radiation from the fire, or close to riveted joints of shell or furnace sheets.

(b) Where horizontal return tubular boilers are fed through the front, a boiler bushing or its equivalent shall be used and the feed water shall discharge at about three-fifths the length of the boiler from the front head, and above the second row of tubes from the top.

FIGURE 41.88

RETURN PIPE LOOP CONNECTION



GRATE AREA, OR Sq. Ft.	SAFETY VALVE CAP., LBS/HR	EQUALIZING LOOP SIZE, INCHES
4 OR LESS	250 OR LESS	1 ½
OVER 4 TO 15	251 TO 2000 INC.	2 ½
OVER 15	OVER 2000	4

(3) MULTIPLE BOILERS. When 2 or more power boilers are fed from a common source, there shall be a globe or regulating valve on the branch to each boiler, between the check valve and the source of supply. When 2 or more low pressure steam boilers, using a gravity return system, are fed from a common source, one check valve may be placed on the main return pipe with a stop valve on the branch return to each boiler. Wherever globe valves are used on feed piping, the inlet shall be under the disk of the valve.

(4) FEED WATER PRESSURE. (a) Means shall be provided for feeding a boiler against the maximum allowable working pressure or the pressure at which the safety valve is set.

(b) Where a source of feed water is available at a sufficient pressure to feed the boiler against a pressure 6% higher than that at which the safety valve is set, this may be considered one of the means.

(5) WATER SUPPLY LINE. Every boiler and its piping system shall be provided with a water supply line from an outside source of water supply in order to replace the water leaving the system through leakage, process work or other means.

(a) A stop valve and check valve shall be provided in the water supply line with the stop valve closest to the boiler.

(b) On low pressure steam and hot water boilers, the water supply line shall be connected to the boiler return or feed piping system and not directly to the boiler.

(c) On low pressure steam, miniature and hot water boilers, the water supply line pressure shall be high enough to feed the boiler or the system against the maximum allowable working pressure of the boiler.

(6) OIL HEATERS. A heater for oil or other liquid harmful to boiler operation may not be installed directly in the steam or water space within a boiler. Where an external type heater for this service is used, positive means such as double-transfer heaters or indicators such as fuel-oil indicators or sight glasses shall be provided to prevent the introduction into the boiler of oil or other liquid harmful to boiler operation.

ILHR 41.89 [41.89] COMBUSTION REGULATORS FOR BOILERS. (1) TEMPERATURE REGULATOR. A temperature combustion regulator, which will control the rate of combustion to prevent the temperature of the water from rising above 250° F at or near the outlet, or a thermostatic device which will relieve the pressure on the boiler when the temperature exceeds 250° F, shall be used on all hot water boilers.

(2) PRESSURE REGULATOR. When a pressure combustion regulator is used on a steam boiler, it shall operate to prevent the steam pressure from rising above the maximum allowable working pressure for the boiler.

ILHR 41.90 [41.91] WASHOUT AND INSPECTION OPENINGS. (1) GENERAL. All boilers shall be provided with suitable manhole or handhole openings, except special types where they are manifestly not needed or used.

(2) HORIZONTAL FIRE TUBE BOILERS. All horizontal fire tube boilers shall be required to have manhole or handhole openings as follows:

(a) A manhole in the front head below the tubes shall be required for:

1. Horizontal return tubular power boilers over 54 inches in diameter; and

2. Horizontal return tubular low pressure steam or hot water boilers over 60 inches in diameter.

3. For smaller boilers than those specified in subds. 1. and 2., a handhole may be used in place of the manhole.

(b) A manhole in the upper part of the shell or head shall be required for:

1. Horizontal return tubular, fire box and locomotive power boilers over 48 inches;

2. Scotch marine power boilers over 54 inches in diameter; and

3. Low pressure steam boilers over 60 inches in diameter.

4. For smaller boilers than those specified in subds. 1., 2., and 3., a handhole may be used in place of the manhole.

(c) Locomotive and fire box boilers shall also have the following handhole or washout openings:

1. One at each of the 4 corners of the lower portion of the water leg;

2. One in the front head at or about the line of the crown sheet;

3. One near the throat sheet of power boilers where possible; and

4. One in the rear head of power boilers below the tubes.

(3) VERTICAL FIRE TUBE BOILERS. (a) A vertical fire tube boiler, except boilers 24 inches or less in diameter, shall have not less than 4 handholes located as follows:

1. Two in the shell at or about the line of the crown sheet or lower tube sheet; and

2. Two in the shell at the lower part of the water leg.

(b) Vertical fire tube boilers 24 inches or less in diameter shall have 3 one-inch diameter washout plugs, except that boilers not exceeding 12 inches internal diameter having less than 10 square feet of water heating surface need not have more than 2 washout plugs, one of which may be used for the attachment of the bottom blowoff valve. The threads of the washout plugs shall be of nonferrous material.

(4) CAST IRON BOILERS. Every cast iron boiler shall be provided with washout openings to permit the removal of any sediment that may accumulate. Washout openings may be used for the return pipe connection if the washout plug is placed in a tee so that the plug is directly opposite and as close as possible to the opening in the boiler.

(5) HANDHOLE SIZE. Handholes shall be not less than 2-1/2-inches by 3-1/2-inches in size.

(6) WASHOUT PLUG SIZE. Washout plugs, except for vertical fire tube boilers, shall be not less than 1-1/2-inch pipe size and shall have threads of nonferrous materials.

(7) [41.92] MANHOLE SIZE. Manholes shall be not less than 11 inches by 15 inches, or 10 inches by 16 inches in size. A circular manhole opening shall be not less than 15 inches in diameter.

ILHR 41.91 [41.94] THREADED OPENINGS. (1) THREAD STANDARDS. All pipe threads shall conform to the American pipe thread standard and all connections of one inch nominal pipe size or over shall have not less than the number of threads given in Table 41.91. For smaller pipe connections, there shall be at least 4 threads in the opening.

(2) MATERIAL THICKNESS. If the thickness of the shell of the boiler is not sufficient to give the number of threads required in sub. (1), a construction shall be employed which will provide at least the required number of threads.

TABLE 41.91
MINIMUM NUMBER OF PIPE THREADS FOR CONNECTIONS TO BOILERS

Nominal size of pipe connections, inches	1 & 1-1/4	1-1/2 & 2	2-1/2 to 4 incl	4-1/2 to 6 incl	7 & 8	9 & 10	12
Number of threads, per inch	11-1/2	11-1/2	8	8	8	8	8
Minimum number of threads required for opening	4	5	7	8	10	12	13
Minimum thickness of material required to give above number of threads, inches ..	0.348	0.435	0.875	1	1.25	1.5	1.6265

ILHR 41.92 [41.95] BOILER SETTING AND INSTALLATION. (1) LARGE HORIZONTAL RETURN TUBULAR BOILERS. A horizontal return tubular boiler over 72 inches in diameter shall be supported from steel hangers by the outside suspension type of setting, independent of the boiler side walls. The hangers shall be so designed that the load is properly distributed between the rivets attaching them to the shell and so that no more than 2 of these rivets come in the same longitudinal line on each hanger. The distance girthwise of the boiler from the centers of the bottom rivets to the center of the top rivets attaching the hangers shall be not less than 12 inches. The other rivets used shall be spaced evenly between these points. If more than 4 hangers are used, they shall be set in 4 pairs.

(2) MEDIUM AND SMALL HORIZONTAL RETURN TUBULAR BOILERS. (a) A horizontal return tubular boiler over 54 inches and up to and including 72 inches in diameter shall be supported by the outside suspension type of setting, or at 4 points by not less than 8 steel or cast iron brackets, set in pairs.

(b) A horizontal return tubular boiler up to and including 54 inches in diameter shall be supported by the outside suspension type of setting, or by not less than 2 steel or cast iron brackets on each side.

(3) ATTACHMENT OF LUGS OR HANGERS. (a) Lugs or hangers, when used to support a boiler of any type, shall be properly fitted to the surfaces to which they are attached. If riveted, the shearing and crushing stresses on the rivets used for attaching the lugs or hangers may not exceed 8% of the strength given in s. ILHR 41.72.

(b) Where it is impractical to use rivets, studs with not less than 10 threads per inch may be used. In computing the shearing stress, the area at the bottom of the thread shall be used.

(4) WET BOTTOM STATIONARY BOILERS. Wet bottom stationary boilers shall have a space of not less than 12 inches between the bottom of the boiler and the floor line, with access for inspection.

(5) OPEN BOTTOM AND VERTICAL FIRE TUBE BOILERS. The upper surface of the fire grate of an internally fired boiler of the open bottom locomotive, vertical fire tube or similar type, may not be below the water space in the water leg, except where the rivets at the bottom of the water leg are protected from the action of the fire and products of combustion.

ILHR 41.93 [41.96 and 41.97] BOILER DOORS. (1) ACCESS DOOR SIZE. The minimum size of an access door to be placed in a boiler setting shall be 12 inches by 16 inches or equivalent area, with 11 inches to be the least dimension in any case.

(2) WATER TUBE BOILER DOORS. A water tube boiler shall have firing doors, furnace inspection doors and clinker doors of the inward opening type, unless the doors are provided with latching or fastening devices or otherwise so constructed as to prevent them, when closed, from being blown open by pressure on the furnace side.

ILHR 41.94 [41.99] PRESSURE RELIEF DEVICES REQUIRED FOR UNFIRED PRESSURE VESSELS. (1) GENERAL. Every unfired pressure vessel shall be provided with or protected by a pressure relief device set to relieve at or below the maximum allowable working pressure of the vessel.

(2) RELIEVING CAPACITY. The relieving capacity of the pressure relief device shall be equal to or greater than the input to the vessel or shall be great enough to prevent the pressure in the vessel from rising more than 10% above the maximum allowable working pressure of the vessel.

(3) VALVE CONSTRUCTION. Safety valves and safety relief valves shall be ASME code-stamped.

(4) RUPTURE DISKS. Rupture disks may be used in lieu of safety valves on vessels containing substances that may render a safety valve inoperative, or where a loss of valuable material by leakage should be avoided, or contamination of the atmosphere by leakage of noxious gases must be avoided. The rupture disks shall be tested, marked, and installed in accordance with the code in effect at the time of construction.

(5) INDIRECT WATER HEATING. When hot water supply is heated indirectly by steam in a coil or pipe, a safety relief valve of at least one inch in diameter, set to relieve at or below the maximum allowable working pressure of the tank, shall be used.

(6) VALVE INSTALLATION. (a) Each safety valve or relief valve shall have a full size direct connection to the pressure vessel. When an escape pipe is used it shall be full sized and fitted with an open drain, to prevent water lodging in the upper part of the safety valve or relief valve or escape pipe.

(b) When a pressure vessel is fitted with 2 safety valves or relief valves on one connection, this connection to the pressure vessel shall have a cross-sectional area equal to or greater than the combined area of the 2 valves.

(c) No valve of any description may be placed between the safety valve or relief valve and the pressure vessel, nor on the escape pipe between the safety valve or relief valve and the atmosphere.

(7) ESCAPE PIPE SUPPORT. When an elbow is placed on a safety valve or relief valve escape pipe, it shall be located close to the valve outlet, or the escape pipe shall be securely anchored and supported.

(8) FREE AIR CAPACITY. When the capacity of the safety valve on an existing tank for containing gases is not known, the relieving capacity of the safety valve shall be determined from Table 41.94. The safety valves may not exceed 4 inches in diameter.

TABLE 41.94
MAXIMUM FREE AIR SUPPLIED IN CUBIC FEET PER MINUTE FOR DIFFERENT SIZES OF SAFETY VALVES AT STATED PRESSURES

Diameter of Valve (inches)	Gage pressure, pounds per square inch							
	50	100	150	200	250	300	350	400
1/4	-----	-----	-----	-----	-----	-----	-----	53
1/2	20	32	42	51	59	67	74	111
3/4	37	59	78	96	112	127	141	176
1	58	94	124	152	178	202	224	248
1-1/4	84	135	180	221	259	293	325	-----
1-1/2	114	186	248	302	354	400	444	-----
2	189	306	410	501	592	668	741	-----
2-1/2	282	457	613	750	880	998	1114	-----
3	393	638	856	1050	1230	1398	1557	-----

Diameter of Valve (inches)	Gage pressure, pounds per square inch							
	500	600	800	1000	1200	1600	2000	2400
1/4	61	70	84	97	109	128	147	167
1/2	129	147	177	205	230	270	304	330
3/4	224	232	242	346	386	423	474	518
1	286	324	390	450	500	586	-----	-----
1-1/4	374	-----	509	-----	-----	-----	-----	-----
1-1/2	472	-----	634	-----	-----	-----	-----	-----
2	-----	-----	-----	-----	-----	-----	-----	-----
2-1/2	-----	-----	-----	-----	-----	-----	-----	-----
3	-----	-----	-----	-----	-----	-----	-----	-----

CHAPTER ILHR 42
REPAIRS, ALTERATIONS AND MISCELLANEOUS REQUIREMENTS

Subchapter I
Welded Repairs and Alterations

ILHR 42.01 [42.01 (1)] 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 an authorized 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 authorized inspection agency 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 inspection agency responsible for inservice inspection of the boiler or pressure vessel.

ILHR 42.02 GENERAL RULES FOR REPAIRS. (1) AUTHORIZATION. 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 or a valid weld repair program which has been reviewed and verified by the department or an authorized inspection agency. 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 authorized inspector.

Note 1: See s. ILHR 41.06 for penalties for violations of these rules.

Note 2: The department will assist an organization in preparing a quality control program for welded repairs that will comply with the intent of ss. ILHR 42.01 and 42.02. Organizations who hold ASME certificates or National Board "R" certificates are already in possession of approved quality control programs.

[Note: Subsection (1) will not take effect until 9 months after publication in the Wisconsin Administrative Register.]

(2) [42.01 (3)] 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 vesel;

(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.

ILHR 42.03 [42.01 (2)+(4)] 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.

(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 authorized 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 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.

(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.

ILHR 42.04 [42.01 (5)] 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 authorized inspector who inspected or approved the repair or alteration. The owner of the equipment shall retain a copy of the report for review by an authorized 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 authorized 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.

ILHR 42.05 [42.02] HYDROSTATIC AND NONDESTRUCTIVE TESTS. If, in the opinion of the authorized 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 authorized 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 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.

ILHR 42.06 [42.05] WELDING PROCEDURE SPECIFICATIONS. Anyone undertaking repairs or alterations shall have available at the job site a written welding procedure specification acceptable to the authorized 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.

ILHR 42.07 [42.06] 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 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 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.

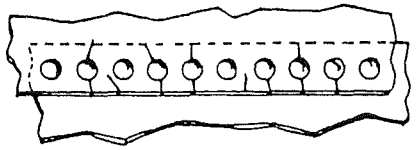
ILHR 42.08 [42.07] WELDED REPAIRS OF CRACKS. (1) REMOVAL OF DEFECTS. A repair of a defect, such as a crack in a welded joint or base material, may not be made until the defect has been removed. A suitable nondestructive examination method shall be used to assure complete removal of the defect. If the 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.

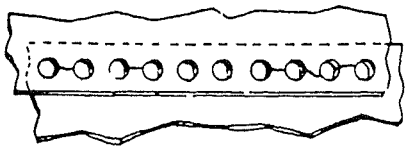
(2) CRACKS IN UNSTAYED AREAS. Cracks in unstayed shells, drums or headers of boilers or pressure vessels may be repaired by welding, providing the cracks do not extend between rivet holes in a longitudinal seam or parallel to a rivet seam within 8 inches, measured from the nearest caulking edge. The 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.

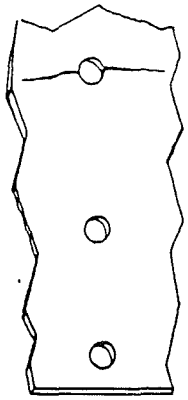
(4) CRACKS IN UNSTAYED FURNACES. Cracks of any length in unstayed boiler furnaces may be welded, provided the welds are thermally stress relieved in accordance with s. ILHR 42.16. Welds applied from one side only shall be subject to the approval of the authorized inspector. Field repair of cracks at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



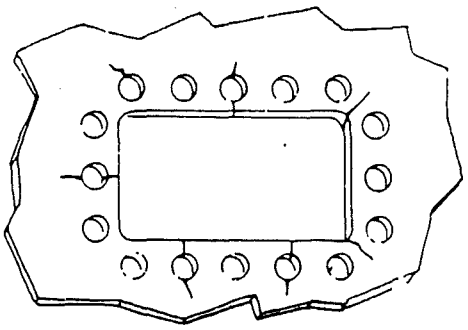
Fire Cracks at Girth Seams



Circumferential Cracks at Girth Seams



Cracks in Stayed Plates



Fire Cracks at Door Openings

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:

a. Prior to welding, the rivets or staybolts from which the cracks extend and the adjacent rivets or staybolts shall be removed.

b. In riveted joints, tack bolts shall be replaced in alternate holes to hold the plate laps firmly.

c. The cracks shall then be prepared for welding by chipping, grinding or gouging.

d. In riveted joints, cracks which extend past the inner edge of the plate lap shall be welded from both sides.

e. Rivet holes shall be reamed before new rivets are driven.

f. Threaded staybolt holes shall be retapped and new staybolts properly driven and headed.

Figure 42.08-1
RIVET AND STAYBOLT HOLE CRACKS

ILHR 42.09 [42.08] 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 judgement 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. 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 judgement of the authorized 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.

(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.

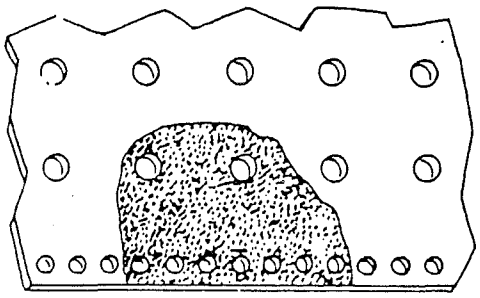
(b) Wasted flange faces may also be remachined in place without building up with weld metal provided the metal removed in the process does not reduce the thickness of the flange to a measurement below that calculated in par. (a).

(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 authorized 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.

ILHR 42.10 [42.08 (4) and (6)] 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 authorized 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.

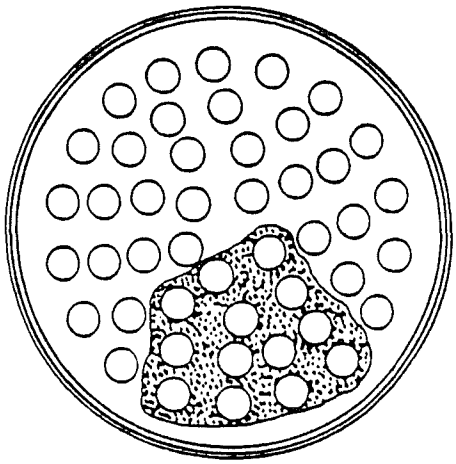


RIVETS AND STAYBOLTS

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

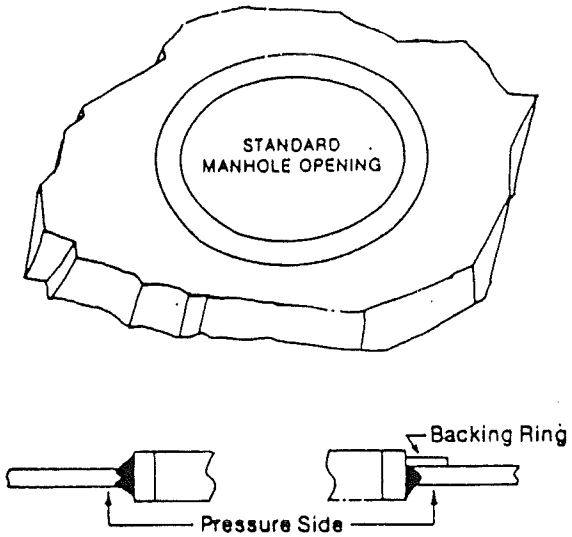
TUBESHEET

a. Prior to welding, the tubes in the wasted area shall be removed.
b. After welding, the tube holes may be reamed before new tubes are installed.

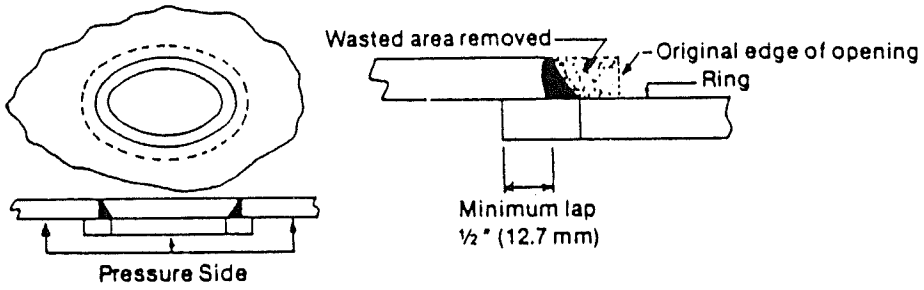


Wasted areas in stayed and unstayed surfaces may be built up by welding provided that in the judgment of the authorized inspector the strength of the structure will not be impaired. Where extensive weld build-up is employed, the authorized inspector may require an appropriate method of nondestructive examination for the complete surface of the repair.

Figure 42.09-1
WELD BUILD-UP OF WASTED AREAS

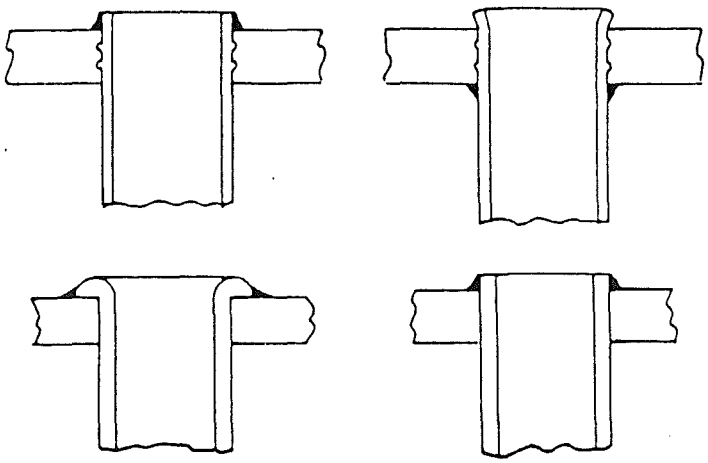


A badly wasted manhole flange may be removed and replaced with a ring-type frame as shown above. The requirements of s. ILHR 42.17 (1) for flush patches shall be met. A full penetration weld shall be required. The weld may either be double welded or welded from one side with or without a backing ring.



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

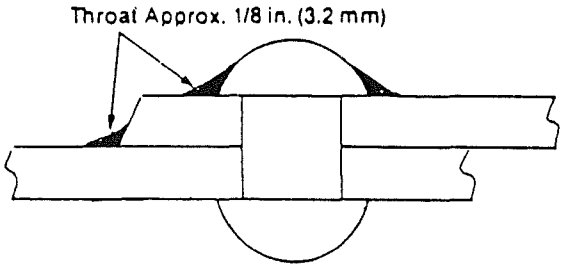
Figure 42.09-2
REPAIRS FOR ACCESS OPENINGS



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 tubesheet.

Figure 42.10-1
SEAL WELDING OF TUBES



TYPICAL RIVET JOINT SHOWING SEAL WELD

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.

Figure 42.10-2
SEAL WELDING OF RIVETED JOINTS

ILHR 42.11 [42.09] 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.

ILHR 42.12 [42.10] 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.

ILHR 42.13 [42.11] 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 an authorized 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.

ILHR 42.14 [42.12] 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.

ILHR 42.15 [42.13] 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.

ILHR 42.16 [42.14] 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 authorized 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 authorized 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 repairs 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 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 authorized 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 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 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.

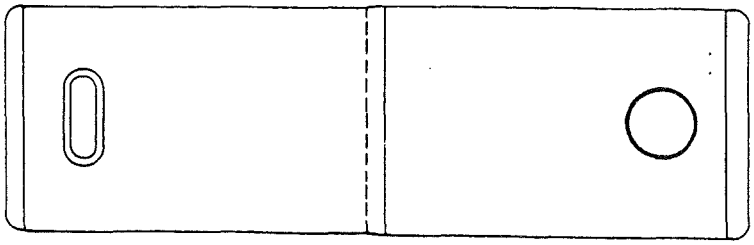
Note: See ASME code, section VIII, division 1, paragraph UHA-105.

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

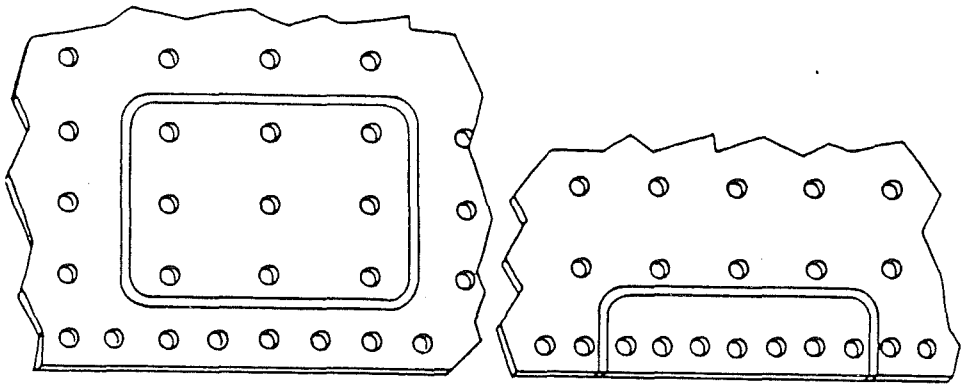
ILHR 42.17 [42.15] WELDED PATCHES. (1) FLUSH PATCHES. The weld around a flush patch shall be a full penetration weld and the accessible surfaces shall be ground flush where required by the applicable section of the ASME code. The welds shall be subjected to the nondestructive examination method used 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.

(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 opening 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 be be covered by welding.



FLUSH PATCHES IN UNSTAYED AREAS



FLUSH PATCHES IN STAYED AREAS

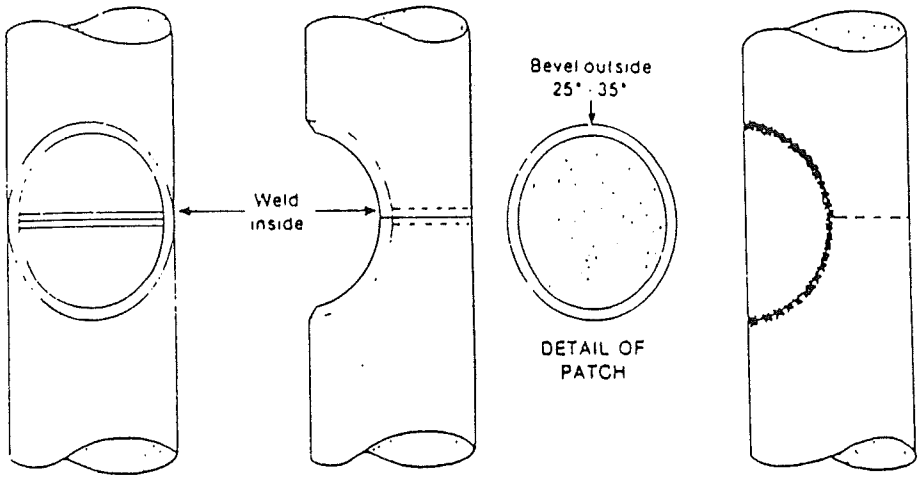
Before installing a flush patch, the defective metal shall be removed until sound metal is reached. The patch shall be rolled or pressed to the proper shape or curvature. The edges shall align without overlap.

In stayed areas, the weld seams shall come between staybolt rows 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 42.17-1
FLUSH PATCHES



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.

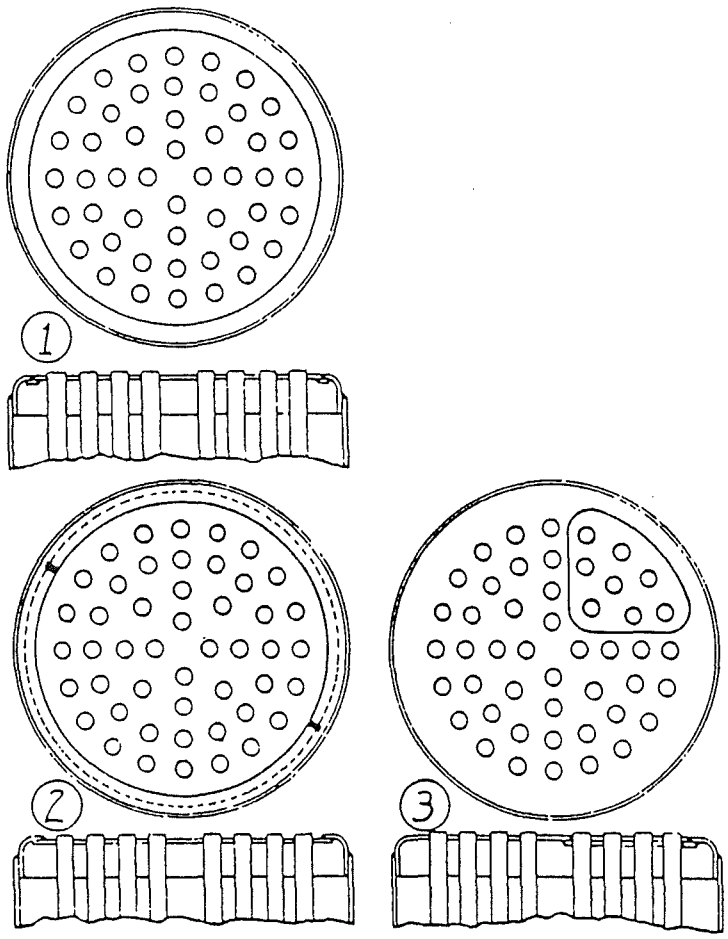
d. The balance of the weld may be completed by any appropriate welding process.

Figure 42.17-2
TUBE WINDOW PATCHING METHOD

ILHR 42.18 [42.16] STAYS. Threaded stays may be replaced by welded-in stays provided that, in the judgment of the authorized 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.

ILHR 42.19 [42.17] ADDITIONAL ACCEPTABLE REPAIR METHODS. Repairs and repair methods not covered in this chapter may be used if acceptable to the authorized inspector. Additional methods illustrated in Figures 42.19-1 and 42.19-2 are acceptable if performed as specified in the figures.

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.



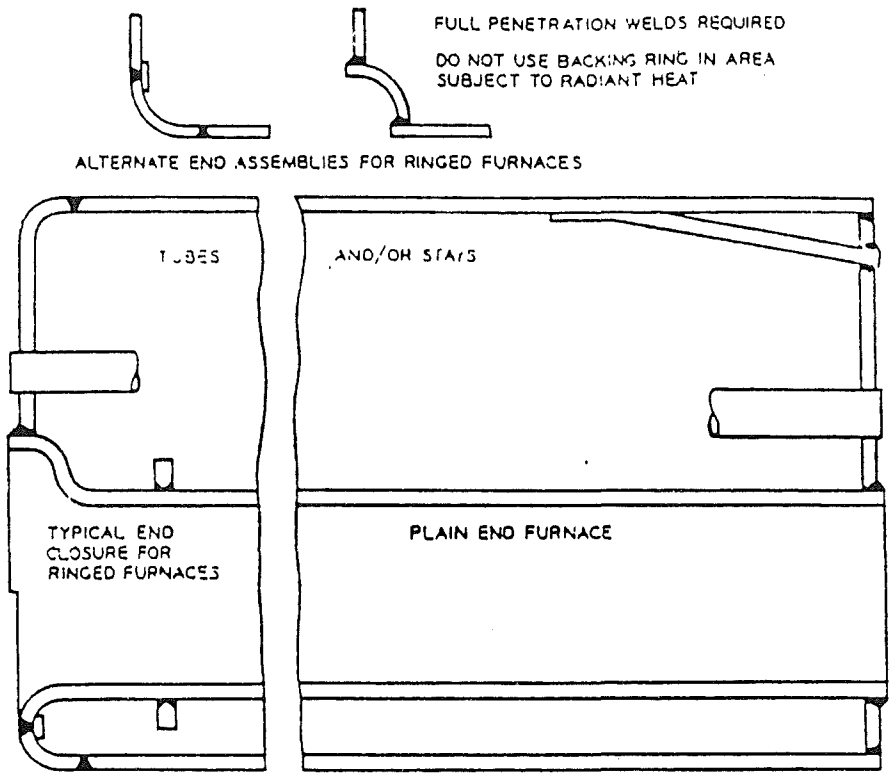
1. Flush Butt Welded Head

   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

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



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.

Figure 42.19-2
ACCEPTABLE FURNACE RENEWAL

Subchapter II
Riveted Repairs

ILHR 42.25 [42.18 to 42.21] 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 authorized inspector may require a pressure test, as specified in s. ILHR 42.05, after completion of a riveted repair.

Subchapter III
Rerating and Derating

ILHR 42.30 [42.22] 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 authorized inspection agency. 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 authorized inspection agency.

(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 authorized inspection agency 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.

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 authorized 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 _____ °
(MAWP) (Temp)

(Wisconsin Registration Number)

_____
(Date Derated)

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

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

Subchapter IV
Safety and Safety Relief Valve Repairs

ILHR 42.35 [41.07] 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;

(b) National Board VR stamp covering the work to be performed; or

(c) An owner's program of repair limited to adjustments of set pressure and blowdown performed by trained and qualified people and authorized by the department.

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

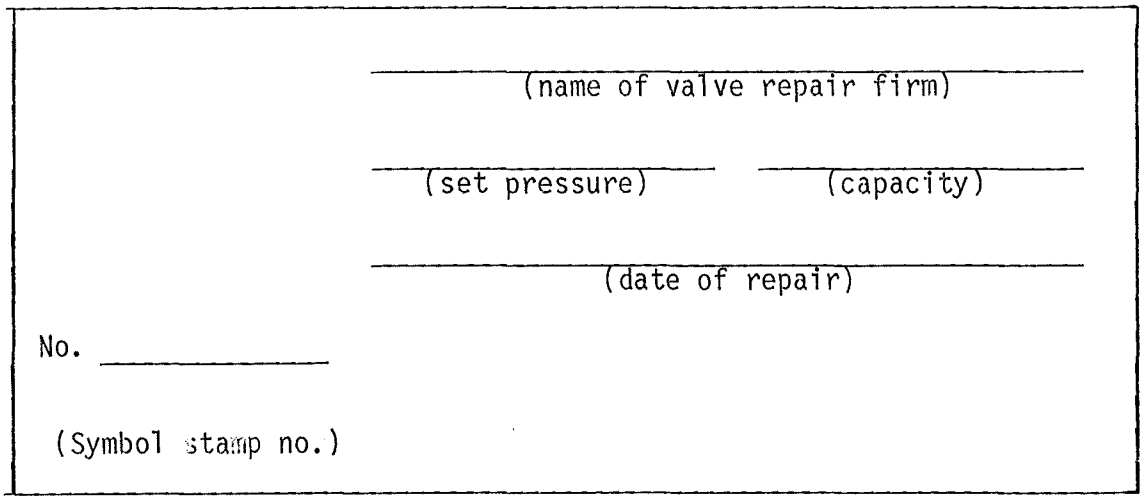
(3) AUTHORIZED ADJUSTMENTS. The department may authorize properly trained and qualified employes of boiler or pressure vessel users to make external adjustments to set pressure and blowdown to safety valves and safety relief valves owned by them provided the adjusted settings and capacities and the date 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.



Note #1: The nameplate should be stamped with the valve repair symbol stamp.

Note #2: Capacity should be indicated only when set pressure has been changed.

Figure 42.35
VALVE REPAIR NAMEPLATE

Subchapter V
Secondhand Vessels

ILHR 42.40 [42.25] APPLICATION. Sections ILHR 42.40 to 42.46 shall apply to secondhand boilers and secondhand pressure vessels.

ILHR 42.41 [42.27] 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.

ILHR 42.42 [42.28] 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.

ILHR 42.43 [42.29] 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.

ILHR 42.44 [42.30] 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.

ILHR 42.45 [42.31] 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 an authorized inspector.

(2) ALTERNATE TESTS. When the authorized 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.

ILHR 42.46 [42.32] 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.

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.

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 510-1985.

(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.

APPENDIX A

The material contained in this appendix is for information purposes only. Forms SBD-7678 and SBD-7679 are referred to in ss. ILHR 41.16 and 41.23. Forms SBD-6314 and SB-5204 are referred to in s. ILHR 41.41. Copies of these forms are available from the Division of Safety and Buildings, P.O. Box 7969, Madison, Wisconsin 53707.

Forms SB-190, R-1 and NR-1 are referred to in ss. ILHR 41.56 and 42.04. Copies of form SB-190 are available from the Division of Safety and Buildings. Copies of forms R-1 and NR-1 are available from the National Board, 1055 Crupper Avenue, Columbus, Ohio 43229.

PRESSURE VESSEL INSPECTION REPORT

Department of Industry, Labor and Human Relations
Safety and Buildings Division
P.O. Box 7969, Madison, WI 53707
(608) 266-1580

(Statutory Reference: Chap. 101, Wis. Stats.)
See Reverse Side For Code References

FOR DILHR USE ONLY	
FILE NUMBER	BATCH NUMBER
INS. CODE	SUM CODE
INSP FEE	DIST NO.

1

DATE INSPECTED: MO. DAY YEAR	CERTIFICATE EXP. DATE MONTH/YEAR	OWNER NO.:	REGISTRATION NO.:	KIND OF INSPECTION: ☐ CERTIFICATE ☐ SPECIAL
				IS INSPECTION ☐ INTERNAL ☐ EXTERNAL

2

OWNER:	NATURE OF BUSINESS:	☐ NAT'L BD. NO. ☐ OTHER NO.
OWNER'S STREET ADDRESS:	OWNER'S CITY:	STATE / ZIP CODE

3

USER'S NAME - WHERE OBJECT LOCATED:	SPECIFIC LOCATION OF OBJECT:	OBJECT LOCATION-COUNTY:
USER'S STREET ADDRESS:	USER'S CITY:	STATE / ZIP CODE

4

TYPE: ☐ AIR TANK ☐ OTHER _____	YEAR BUILT	MANUFACTURER:

5

USE: ☐ STORAGE ☐ PROCESS ☐ HEAT EXCHANGE ☐ OTHER _____	SIZE:	CUBIC CAPACITY:

6

PRESSURE ALLOWED: THIS INSPECTION _____ PREVIOUS INSPECTION _____	SAFETY VALVES SET AT _____	EXPLAIN IF PRESSURE CHANGED:

7

CAN A CERTIFICATE BE ISSUED FOR THIS OBJECT? ☐ YES (If modifications, list below) ☐ NO (Explain fully below)	NEXT CERTIFICATE INSPECTION DATE: MONTH/YEAR	HYDRO TEST: ☐ YES ☐ NO IF YES: _____ PSI DATE _____

8 COMMENTS:

9 ITEM	ORDER NO.	REQUIREMENTS (List code violations)

10 COMPLIANCE DATE:	PERSON'S NAME TO WHOM REQUIREMENTS WERE EXPLAINED:	PERSON'S TITLE:

I CERTIFY THIS IS A TRUE REPORT OF MY INSPECTION:

INSPECTOR SIGNATURE:	CERT. NO.:	EMPLOYED BY:

SBD-7678 (N. 03/87)

FIRST INSPECTION ☐

INSPECTION PERIOD
☐ 1 YR. ☐ 3 YR.

(266) 266-1580

Department of Industry, Labor and Human Relations

BOILER-FIRED PRESSURE VESSEL

INSPECTION REPORT

Safety and Buildings Division, P.O. Box 7969, Madison, WI 53707

(Statutory Reference: Chap. 101, Wis. Stats. See Back for Code References)

FOR DILHR USE ONLY	
FILE NUMBER	BATCH NUMBER
INS CODE	SUM CODE
INSP FEE	DIST NO

1	DATE INSPECTED: MO. DAY YEAR	CERT. EXP. DATE: MONTH/YEAR	OWNER NO.	REGISTRATION NO.	KIND OF INSPECTION: ☐ CERTIFICATE ☐ SPECIAL IS INSPECTION ☐ INTERNAL ☐ EXTERNAL	
2	OWNER:				NATURE OF BUSINESS	☐ NAT'L BD. NO. ☐ OTHER NO.
	OWNER'S STREET ADDRESS:				OWNER'S CITY	STATE: ZIP CODE
3	USER'S NAME - WHERE OBJECT LOCATED:				SPECIFIC LOCATION OF OBJECT:	OBJECT LOCATION-COUNTY:
	USER'S STREET ADDRESS				USER'S CITY:	STATE: ZIP CODE
4	TYPE: ☐ FT ☐ WT ☐ CI ☐ Other _____		YEAR BUILT		MANUFACTURER:	
5	USE: ☐ POWER ☐ PROCESS ☐ STEAM HTG. ☐ HWH ☐ OTHER _____				FUEL:	FIRING METHOD: HEATING SURFACE:
6	PRESSURE ALLOWED: THIS INSPECTION _____ PREV. INSPECTION _____				SAFETY VALVES: SET AT _____ TOTAL CAPACITY _____	EXPLAIN IF PRESSURE CHANGED:
7	CAN A CERTIFICATE BE ISSUED FOR THIS OBJECT? ☐ Yes (If modifications, list below) ☐ NO (Explain fully below)				NEXT CERTIFICATE INSPECTION DATE: MONTH/YEAR	HYDRO TEST:
8	COMMENTS:					

ITEM	ORDER NO.	REQUIREMENTS (List code violations)

0 COMPLIANCE DATE	PERSON'S NAME TO WHOM REQUIREMENTS WERE EXPLAINED:	PERSON'S TITLE:

CERTIFY THIS IS A TRUE REPORT OF MY INSPECTION:

SIGNATURE OF INSPECTOR	CERT. NO.	EMPLOYED BY:

SBD-7679 (N. 03/87)

Copy Distribution: White - DILHR; Green - Inspector; Yellow - Owner

BOILER AND PRESSURE VESSEL INSTALLATION REGISTRATION

Installing Contractors shall prepare this form in triplicate for each boiler or pressure vessel installed.

Distribute as follows:

WHITE:

Department of
Industry, Labor & Human Relations.

Send to: Safety & Buildings Division
Box 7969, Madison, WI 53707.

YELLOW: Send to owner. PINK: Installer's copy.

STATE OF WISCONSIN
DEPARTMENT OF INDUSTRY, LABOR & HUMAN RELATIONS
SAFETY AND BUILDINGS DIVISION

(Complete appropriate portion)

BOILER: ☐ POWER ☐ HEATING ☐ MINIATURE
☐ PRESSURE VESSEL
☐ NEW ☐ USED

NAME OF USER OR OWNER:			LOCATION OF INSTALLATION:		
STREET ADDRESS:			WIS. REGISTRATION NO.:	NATIONAL BOARD NO.:	
CITY:	STATE:	ZIP CODE:	MFR. SERIAL NO.:	OTHER NO.:	
NAME OF INSTALLING CONTRACTOR:			SIGNATURE OF INSTALLER:		DATE:
STREET ADDRESS:			CITY:	STATE:	ZIP CODE:

DILHR-SBD-6314 (N. 02/81)

POWER PIPING
INSTALLATION REGISTRATION
SBD-5204 (R. 1/82)

FORM SBD-5204

STATE OF WISCONSIN
DEPARTMENT OF INDUSTRY, LABOR AND HUMAN RELATIONS
SAFETY AND BUILDINGS DIVISION

Complete appropriate portion.

Installing contractor shall prepare this form in triplicate and distribute as follows:

White — Send to Dept. of Industry, Labor & Human Relations, Safety & Buildings Division, P.O. Box 7969, Madison, Wisconsin 53707, or City of Milwaukee, if applicable.

Yellow — Send to owner.

Pink — Retain for file.

Description of system

Name of user or owner

Street Address

City State Zip

Location of installation

Safety valve settings—power source Capacity

1. _____ _____

2. _____ _____

3. _____ _____

P S I G

Maximum allowable pressure _____

Test pressure _____

Date tested _____

Name of installing contractor Street address City State Zip

I certify this system was installed and tested in accordance with Ind. 41.56 of the Wisconsin Administrative Code.

Date installation completed	Signature of installer	Title	Date registered

State of Wisconsin
Department of Industry,
Labor and Human Relations

WELDED REPAIR RECORD

Safety & Buildings Division
P.O. Box 7969
Madison, Wiscosnin 53707
Telephone: (608) 266-1904

Repair completed on:

☐ Power Boiler ☐ Heating Boiler

☐ Pressure Vessel ☐ Miniature Boiler

Manufacturer: _____

Wisconsin Reg. No: _____

National Board No: _____

Serial No: . . . . _____

Other No: . . . . _____

WORK COMPLETED BY:	IN THE PLANT OF:
Name:	Owner's Name:
Street Address	Location of Repair:
City/Town/Village: Zip Code:	
Repair Program No:	

Description of Repair - attach additional page if needed:
(use reverse side of this page for sketch) _____

Hydrostatic Test PSI _____ NDE _____

Repair made in accordance with the requirements of the Wisconsin Department of Industry, Labor and Human Relations, Wisconsin Administrative Code Chapters 41-42.

The welding was completed by _____, who has met the test requirements of Chapters 41-42.

Welding procedure specification: _____

Contractor rep. signature: _____ Dated: _____

I, the undersigned, have inspected the work described in this report and state that this work, to the best of my knowledge and belief, has been done in accordance with the requirements of Wis. Adm. Code Chapters ILHR 41-42. By signing this certificate, neither the inspector nor his employer makes any warranty, expressed or implied, concerning the work described in this report. Furthermore, neither the inspector nor his/her employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection. The only exception is for such liability that may be provided in an insurance policy which the inspector's insurance company may issue for the object, and then only in accordance with terms of that policy.

Authorized Inspector Signature: Cert. No:	Employed By:	Dated:

FORM R-1, REPORT OF WELDED ☐ REPAIR OR ☐ ALTERATION
as required by the provisions of the National Board Inspection Code

1. Work performed by _____ _____
(name of repair or alteration organization) (P.O. no., job no., etc.)

_____
(address)

2. Owner _____
(name)

_____
(address)

3. Location of Installation _____
(name)

_____
(address)

4. Unit Identification: _____ Name of original manufacturer _____
(boiler, pressure vessel)

5. Identifying nos.: _____ _____ _____ _____ _____
(mfr's serial no.) (original National Board no.) (jurisdiction no.) (other) (year built)

6. Description of work: _____
(use back, separate sheet, or sketch if necessary)

_____ Pressure test, if applied _____ psi

7. Remarks: Attached are Manufacturers' Partial Data Reports properly identified and signed by Authorized Inspectors for the following items of this report: _____

_____
(name of part, item number, mfr's name, and identifying stamp)

CERTIFICATE OF COMPLIANCE

The undersigned certifies that the statements made in this report are correct and that all design, material, construction, and workmanship on this _____ conform to the National Board Inspection Code.
(repair or alteration)

Certificate of Authorization no. _____ to use the _____ symbol expires _____, 19____.

Date _____ 19____ _____ Signed _____
(repair or alteration organization) (authorized representative)

CERTIFICATE OF INSPECTION

The undersigned, holding a valid Commission issued by The National Board of Boiler and Pressure Vessel Inspectors and certificate of competency issued by the state or province of _____ and employed by _____ of _____ has inspected the work described in this data report on _____, 19____ and state that to the best of my knowledge and belief this work has been done in accordance with the National Board Inspection Code.

By signing this certificate, neither the undersigned nor my employer makes any warranty, expressed or implied, concerning the work described in this report. Furthermore, neither the undersigned nor my employer shall be liable in any manner for any personal injury, property damage or loss of any kind arising from or connected with this inspection, except such liability as may be provided in a policy of insurance which the undersigned's insurance company may issue upon said object and then only in accordance with the terms of said policy.

Date _____, 19____ Signed _____ Commissions _____
(Authorized Inspector) (National Board (incl. endorsements), state, prov., and no.)

This form may be obtained from The National Board of Boiler and Pressure Vessel Inspectors, 1055 [illegible]

FORM NR-1 REPORT OF REPAIR ☐ MODIFICATION ☐ OR INSTALLATION OF REPLACEMENT(S) ☐ TO NUCLEAR COMPONENTS AND SYSTEMS IN NUCLEAR POWER PLANTS

1. Work performed by _____ (name) _____ (repair organization's P.O. no., job no., etc.)

_____ (address)

2. Owner _____ (name)

_____ (address)

3. Name, address and identification of nuclear power plant _____

_____

4. Identification of system _____

5. a: Identification of component repaired, modified or replaced _____

b: Name of manufacturer _____

c: Identifying nos. _____ (mfr.'s serial no.) _____ (Nat'l. Bd. no.) _____ (jurisdictional no.) _____ (other) _____ (year built)

6. Applicable section(s) _____ of ASME Code, 19____ edition _____ addenda _____ Code Case _____

7. Design responsibilities _____

8. Tests conducted: hydrostatic ☐ pneumatic ☐ design pressure ☐ pressure _____ psi.

9. Description of work _____ (use of additional sheet(s) or sketch(es) is acceptable if properly identified)

_____

_____

10. Remarks: _____

CERTIFICATE OF COMPLIANCE

We certify that the statements made in this report are correct and that all design, material and workmanship on this _____ (repair, modification or replacement) conforms to the applicable section of the ASME Code.

Certificate of Authorization no. _____ to use the "NR" stamp expires _____ 19_____.

Signed _____ (repair organization) _____ (authorized representative) _____ (title) _____, 19____ (date)

CERTIFICATE OF INSPECTION

I, the undersigned, holding a valid commission issued by The National Board of Boiler and Pressure Vessel Inspectors, and certificate of competency issued by the state or province of _____ and employed by _____ of _____ have inspected the repair, modification or replacement described in this report on _____, 19____ and state that to the best of my knowledge and belief, this repair, modification or replacement has been made or constructed in accordance with Section XI and Section III of the ASME Code and the National Board rules as defined in the publications NB-65 and NB-102, current editions. By signing this certificate, neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the repair, modification or replacement described in this report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date _____, 19____ Signed _____ (Authorized Inspector) Commissions _____ (Nat'l. Bd. no. (including endorsements) state or province and number)

This form may be obtained from The National Board of Boiler and Pressure Vessel Inspectors, 1055 Crupper Ave., Columbus, OH 43229

APPENDIX B

(EXCERPTS FROM BOILER, PRESSURE VESSEL AND PIPING CODES AND STANDARDS)

Excerpts from the following boiler, pressure vessel and piping codes and standards are reproduced here strictly for reference: ASME Sections I, IV and VIII and ANSI/ASME B31.1. This information has been included to provide a general idea as to the requirements of these codes and standards. Users of this information must be cautioned that these excerpts do not provide complete guidelines for inspection, installation, operation and manufacturing.

Only portions of each code and standard thought to be frequently used by persons not having direct access to the complete documents have been included. It must be noted that these codes and standards change on a periodic basis as indicated in s. ILHR 41.10. Those who are bound by the rules of ch. ILHR 41 must avail themselves of the applicable code section or standards listed in s. ILHR 41.10. Refer to ch. ILHR 42 for rules applying to repairs, alterations, and miscellaneous requirements.

[Note to Revisor: Please reprint pages 91 to 148 from the existing chapters ILHR 41-42, to complete this Appendix B. A revised index will be forwarded to you for printing.]

* *

EFFECTIVE DATE

Pursuant to s. 227.22 (2) (b), Stats., s. ILHR 42.02 (1) of chapter ILHR 42 shall take effect on the first day of the 10th month following publication in the Wisconsin Administrative Register.

Pursuant to s. 227.22 (2) (intro.), Stats., the remainder of these rules shall take effect on the first day of the month following publication in the Wisconsin Administrative Register.

* *

State of Wisconsin \ Department of Industry, Labor and Human Relations

Office of the Secretary
201 E. Washington Avenue
P.O. Box 7946
Madison, Wisconsin 53707
Telephone 608/266-7552

November 25, 1987

Gary Poulson
Assistant Revisor of Statutes
Suite 904
30 West Mifflin Street
Madison, Wisconsin 53703

Douglas LaFollette
Secretary of State
Room 271, GEF-1
201 East Washington Avenue
Madison, Wisconsin 53702

Dear Messrs. Poulson and LaFollette:

TRANSMITTAL OF RULE ADOPTION

CLEARINGHOUSE RULE NO. 86-135

RULE NO. Chapters ILHR 41-42

RELATING TO Boilers and Pressure Vessels

Pursuant to section 227.20, Stats., agencies are required to file a certified copy of every rule adopted by the agency with the offices of the Secretary of State and the Revisor of Statutes.

At this time, the following material is being submitted to you:

1. Order of Adoption.
2. Rules Certificate Form.
3. Rules in Final Draft Form.

Pursuant to section 227.114, Stats., a summary of the final regulatory flexibility analysis is also included.

Respectfully submitted,

John T. Coughlin

John T. Coughlin
Secretary