

MARK-UP. Striken language is deleted. Underlined language is added.

~~RULES AND REGULATIONS~~

~~Governing the Inspection, Installation
and Operation of
Steam Boilers, Hot Water Heating
and Supply Boilers, Pressure Piping, and
Unfired Pressure Vessels
Including Anhydrous Ammonia
Containers and Equipment~~

~~State of Arkansas~~

~~April 1, 2002~~

~~Issued by~~

~~Boiler Inspection Division
Arkansas Department of Labor
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**ADMINISTRATIVE REGULATIONS REGARDING THE MANUFACTURE, USE, AND INSPECTION
OF
STEAM BOILERS, HOT WATER HEATING BOILERS,
HOT WATER SUPPLY
AND
UNFIRED PRESSURE VESSELS
BOILER INSPECTION DEPARTMENT
Department of Labor
Little Rock, Arkansas**

~~WHEREAS, the Rules and Regulations of the BOILER INSPECTION DIVISION of the DEPARTMENT OF LABOR regulating the manufacture, use, and inspection of boilers have in part been rendered obsolete; and~~

~~WHEREAS, evidence has been amassed with respect to the requirements necessary for the safe operation of boilers and unfired pressure vessels have in part been rendered obsolete; and~~

~~WHEREAS, the Boiler Advisory Board of the State of Arkansas the Director of the Department of Labor of the State of Arkansas, and Chief Boiler Inspector of the Boiler Inspection Division find from all evidence that the safety of life and property require that rules and regulations be promulgated and passed with respect to the manufacture and maintenance of boilers and unfired pressure vessels in the State of Arkansas, and~~

~~WHEREAS, Ark. Code Ann. §§ 20-23-101 through 20-23-405, provides for the promulgation and formulation of rules, regulations, and orders for the purpose of keeping abreast the standard usage to enforce the provisions of said Law.~~

~~NOW, THEREFORE, it is ordered by the Boiler Advisory Board of the State of Arkansas and by the Boiler Inspection Division of the Department of Labor, that the following Rules and Regulations shall be effective after October 1, 1999, and so far as applicable shall be complied with by all persons, firms, or corporations who are dealing in the sale or repair of boilers or unfired pressure vessels and the installation thereof, and all persons who are using boilers or unfired pressure vessels within the State of Arkansas, and all who are engaged in inspecting boilers or unfired pressure vessels in the State of Arkansas, such orders being as follows:~~

~~APPLICATION: To the extent permitted by statute where the application of a rule would cause expense materially out of proportion to the increase of safety obtained thereby, or would be unreasonable under the facts of the particular case, and safety can be obtained in other ways, the Chief Boiler Inspector may, upon adequate showing by person affected, grant an exemption or variance of the rule complained of, under such requirements as will secure a reasonable condition of safety provided such exemption or variance be not in conflict with the Ark. Code Ann. §§ 20-23-101 et seq.~~

CHAPTER 1 GENERAL PROVISIONS

Subchapter 1. ASME CODE ADOPTION AND CONSTRUCTION

(A) — All new and used boilers, unfired pressure vessels and steam generating apparatuses installed in the state shall be built to conform with the several specifications and provisions of The Boiler and Pressure Vessel Construction Codes of the American Society of Mechanical Engineers, (ASME), together with such revisions as may be made in said code from time to time by the Boiler Code Committee and adopted by the Boiler Inspection Division of the Arkansas Department of Labor. All said boilers and pressure vessels shall be stamped "National Board" unless exceptions are made by these regulations.

(B) — The following sections of the A.S.M.E. Codes (1995 and Addenda 1998) are adopted hereby and incorporated herein:

- Sec. I — Power Boilers
- Sec. II — Material Specifications
- Sec. III — Subsection NCA, General requirements for Divisions 1 & 2
- Sec. IV — Heating Boilers
- Sec. V — Nondestructive Examination
- Sec. VI — Recommended Rules for care and operation of heating boilers
- Sec. VII — Recommended guidelines for the care of power boilers
- Sec. VIII — Pressure Vessels Divisions 1 and 2
- Sec. IX — Welding and Brazing Qualifications
- Sec. X — Fiberglass Reinforced plastic pressure vessels
- Sec. XI — Rules for in service inspections of nuclear power plants
- B31.1 — Power Piping

Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME, CSD 1. (1998 Edition and 1999 Addenda). In the event there is a conflict between an ASME Code and a statute or other regulation adopted by the Boiler Inspection Division, such statute or other regulation shall apply and control.

(C) — Exemptions to the Arkansas Boiler and Pressure Codes are listed under Ark. Code Ann. §20-23-102 and referenced ASME codes listed above.

(D) — State Boiler and Pressure Codes may differ from ASME Codes concerning construction or exemptions. In such cases, the jurisdictional codes override the ASME. In the event there is a conflict between an ASME Code and a statute or other regulation adopted by the Boiler Inspection Division, such statute or other regulation shall apply and control.

(E) — Fired storage water heaters rated 200,000 B.T.U. and below are exempt from ASME construction and National Board registration. These objects are not exempt from state inspection. All such objects located in schools, hospitals, nursing homes, and day care centers shall be inspected annually.

(F) — The hydrostatic test pressure of both new and used boilers or pressure vessels shall be obtained from the vessel's **data report, or vessel nameplate**. For boilers, the test pressure shall at no time exceed 90% of its yield strength. For unfired pressure vessels, the test pressure shall at no time exceed 1.3 times the MAWP at any point within the vessel. **Pneumatic testing** of a pressure vessel shall not exceed 1.1 times the MAWP stamped on the vessel.

(G) — Boilers below 50 horsepower are not subject to the additional hydrostatic test requirements outlined in the ASME Code for boilers that have been hydrostatically tested at the manufacturer, and for which the boiler external piping has not been shipped with the boiler. Boiler external piping for these boilers, which must be separately manufactured, shall be tested in accordance with B31.1 and Code stamped if required.

Subchapter 2. GENERAL CONSTRUCTION OF WORDS, PHRASES AND TERMS USED HEREIN

The following words, phrases, and terms as used in these Boiler Rules and Regulations shall be construed as follows:

(A) — "Boiler" The word boiler, boilers, or steam boilers as defined by Ark. Code Ann. §§ 20-23-101 *et. seq.*, shall mean any boiler or like vessel or container in which water is heated and/or steam is generated by the application of heat, and also shall mean any unfired pressure vessel or vessels constructed for the accumulation, or storage, or transportation of air, liquids, or gases that are under induced pressure.

For the purpose of these regulations, the terms boiler or boilers shall mean a vessel in which water is heated and/or steam is generated, and shall be classified as defined by the several sections of the ASME Boiler Construction Code as follows; Power Boilers, Section No. 1; Low Pressure heating boiler, (Boiler used exclusively for low pressure steam heating, hot water heating,

and hot water supply), Section No. 4; Miniature boilers, as defined in Section I; and

(B) ~~—"Unfired pressure vessel or pressure vessels" shall mean any unfired pressure vessel constructed for the accumulation, storage, or transportation of air, liquids, or gases that are under induced pressure, and as defined by Section VIII, Division 1, of the A.S.M.E. Boiler Construction Code, except containers used for liquified petroleum gases.~~

(C) ~~—"Boiler" a closed vessel in which water is heated, steam is generated, steam is superheated, or any combination thereof, under pressure or vacuum by the direct application of heat. The term boiler shall include fired units for heating or vaporizing liquids other than water where these systems are complete within themselves.~~

(D) ~~—"Boiler, automatically fired" a boiler which cycles automatically in response to a control system.~~

(E) ~~—"Boiler, high pressure, steam or vapor" a boiler in which steam or vapor is generated at a pressure exceeding 15 PSIG.~~

(F) ~~—"Boiler, hot water heating" a boiler in which no steam is generated and from which hot water is circulated for heating purposes, then returned to the boiler.~~

(G) ~~—"Boiler, hot water supply" a boiler that furnishes hot water to be used externally to itself at pressure not exceeding 160 PSIG or a temperature not exceeding 250 degrees F (120 degrees C) at or near the boiler outlet.~~

(H) ~~—"Boiler, low pressure, steam or vapor" a boiler in which steam or vapor is generated at a pressure not exceeding 15 PSIG.~~

(I) ~~—"Boiler, miniature" a boiler that does not exceed any of the following limits:~~

~~16 in. inside diameter of shell~~

~~20 sq ft heating surface~~

~~5 cu ft gross volume*, exclusive of casing and insulation~~

~~100 PSIG maximum allowable working pressure~~

~~*This gross volume is intended to include such gas passages as are integral with the assembled pressure parts. A definition is: The volume of a rectangular or cylindrical enclosure into which all the pressure parts of the boiler in their final assembled positions could be fitted. Projecting nozzles or fittings need not be considered in the volume.~~

~~Externally fired objects such as jacketed cookers, steam kettles, steam chests, etc., rated above 15 PSI, exclusive of size, are deemed to fall under the code.~~

~~Coil type hot water boilers where the water can flash into steam when released directly to the atmosphere through a manually operated nozzle may be exempted from the rules of this Section provided the following conditions are met.~~

~~(1) There is no drum, header, or other steam space.~~

~~(2) No steam is generated within the coil.~~

~~(3) Tubing outside diameter does not exceed 1 in.~~

~~(4) Pipe size does not exceed NPS 3/4.~~

~~(5) Nominal water capacity does not exceed 6 gal.~~

~~(6) Water temperature does not exceed 350 degrees F.~~

~~(7) Adequate safety relief valves and controls are provided.~~

(J) ~~"A.S.M.E., "BOILER AND PRESSURE VESSEL CONSTRUCTION CODE" is the title of the accepted reference for construction, operation, and inspection of boilers and pressure vessels, compiled and written by the American Society of Mechanical Engineers. This code is the basis of rules and regulations presented herein.~~

(K) ~~The term "National Board" as used herein shall mean the National Board of Boiler and Pressure Vessel Inspectors.~~

~~Where a boiler or pressure vessel bears an A.S.M.E. symbol stamp and is stamped "National Board" or "N.B." it shall mean that the boiler or vessel is constructed to comply with the recognized standard of construction and has been inspected by an inspector holding a National Board Commission.~~

(L) ~~"INSPECTOR" as used herein shall mean the inspector of boilers appointed under the provisions of Act 494 of the 1961 Acts of Arkansas, or some person lawfully authorized to inspect boilers.~~

(M) ~~An "AUTHORIZED INSPECTOR" is a deputy inspector duly appointed by the Chief Inspector; or an insurance inspector holding a National Board and an Arkansas Commission.~~

(N) ~~"DEPARTMENT" as used herein shall mean the Boiler Inspection Division of the Department of Labor of the State of Arkansas.~~

(O) ~~The term "SECOND HAND BOILER" or second hand pressure vessel applies to any boiler or pressure vessel which has undergone both a change of ownership and location.~~

(P) ~~The terms "FITTINGS and "APPLIANCES" as used herein shall be taken to mean such necessary safety devices as are attached to a boiler and/or an unfired pressure vessel for safety purposes.~~

(Q) — The term "FACTOR OF SAFETY" as used herein means the ratio of the ultimate strength of materials to the allowable stress.

(R) — "OWNER or USER" as used herein shall mean any person, firm, partnership, or corporation owning or operating, in charge or in control of any boiler and/or any unfired pressure vessel.

(S) — The term "EXISTING INSTALLATION" as used herein shall be taken to mean and to apply to any power or miniature boiler which was in service on or before January 1, 1938, and any low pressure heating boiler or unfired pressure vessel which was in service on or before June 10, 1959, and which was at that time recognized by the Department as an existing installation.

(T) — "State Special" shall mean a boiler or fired/unfired pressure vessel of any type or size, which carries neither the ASME symbol nor National Board stamping, which may be acceptable for use provided the manufacturer, installer, or owner can present sufficient evidence to the Chief Boiler Inspector that the vessel is built to standards which are at least equivalent to the applicable ASME Code.

Subchapter 3. DEFINITIONS

A

absolute pressure. The sum of gauge pressure and atmospheric pressure.

accessory. Piece of equipment not directly attached to the boiler but necessary for its operation.

accumulation test. Test used to establish the relieving capacity of boiler safety valves.

air cock. See boiler vent

air ejector. Steam-driven device that removes air and other noncondensable gases from the condenser, thus maintaining a higher vacuum.

air flow switch. Proves that primary air is supplied to the burner.

air to fuel ratio. Amount of air and fuel supplied to the burner over high and low fire.

air heater. Supplies heated air for combustion. Located in the breeching between the boiler and chimney.

ambient temperature. Temperature of the surrounding air.

alkalinity. Determined by boiler water analysis. Boiler water with a PH over 7 is considered alkaline.

anthracite coal. Hard coal that has a high fixed carbon content.

ash hopper. Large receptacle used to store ashes until they can be disposed of.

ASME code. Code written by the American Society of Mechanical Engineers that controls the construction, repairs and operation of boilers, unfired pressure vessels, and their related equipment.

atmospheric pressure. Pressure at sea level (14.7 psi).

atomize. To break up liquid into a fine mist.

automatic nonreturn valve. Valve located on the steam line closest to the shell of the boiler that cuts the boiler in on the line and off line automatically. This valve also protects the system in the event of a large steam leak on any boiler.

auxiliaries. Equipment necessary for the operation of a boiler.

B

baffles. Direct the path of the gases of combustion so that the maximum heat will be absorbed by the water before the gases of combustion enter the breeching and chimney.

balanced draft. When the intake damper is automatically controlled by the pressure in the furnace. Furnace pressure is maintained slightly below atmospheric pressure.

bent tube boiler. A water tube boiler with more than one drum in which the tubes connect the drums.

bituminous coal. Soft coal that has a high volatile content.

blowdown tank. Coded tank vented to the atmosphere that protects sewer lines from boiler pressure and high temperature when blowing down.

blowdown valves. Found on the boiler blowdown line at the lowest part of the water side of the boiler.

boiler capacity. Pounds of steam per hour that a steam boiler is capable of producing.

boiler explosion. Caused by a sudden drop in pressure (failure on the steam side) without a corresponding drop in temperature.

boiler horsepower. The evaporation of 34.5 pounds of water per hour from and at a feedwater temperature of 212°F.

boiler lay up. Removing a boiler from service for an extended period of time. A boiler can be laid up wet or dry.

boiler operator. A person who has successfully completed the boiler operator's examination and been issued a boiler operator license from the Boiler Inspection Division.

boiler room. Any building, enclosed room, or space within a building other than residential dwelling, intended by design or by

usage to contain a boiler which is connected and available for use.

boiler room log. A data sheet used to record pressures, temperatures and other operating conditions of a boiler on a continuous basis.

boiler shutdown. A sequence of operations completed when taking a boiler off line.

boiler start-up. A sequence of operations completed when preparing a steam boiler for service.**boiler tubes.** Used to carry water or heat and gases of combustion. May be straight or bent tubes.

boiler vent. Line coming off the highest part of steam side of the boiler that is used to vent air from the boiler when filling with water and when warming the boiler. Also used to prevent a vacuum from forming when taking the boiler off line. Also known as air cock.

boiler external piping. Includes all piping from the boiler proper up to and including the second stop valve and the free blow drain valve.

boilers in battery. Two or more boilers connected to a common steam header.

Bourdon tube. Connected by linkage to a pointer that registers pressure inside pressure gauges.

box header. Requires staybolts to prevent the headers from bulging. Found on older water tube boilers.

breeching. Duct connecting boiler to chimney.

British thermal unit (BTU). A measurement of the quantity of heat. The quantity of heat necessary to heat one pound of water to 1°F.

burning in suspension. Combustion of a fuel when burned in air without support.

butterfly valve. A balanced valve used to control gas flow to gas fired boilers.

bypass damper. Controls the air temperature in air heaters to prevent corrosion.

bypass line. A pipeline that passes around a control, heater or steam trap. Used so that a plant can operate while equipment is serviced or repaired.

C

calibrate. Adjusting a pressure gauge to conform to a test gauge.

carryover. Particles of water that flow with the steam into the main steam line.

caustic embrittlement. The collection of high alkaline material that leads to breakdown and weakening of boiler metal.

centrifugal force. Force caused by a rotating impeller that builds up in a centrifugal pump.

centrifugal pump. Works on the principle of centrifugal force that is converted into pressure.

chain (traveling) grate stoker. A cross-feed stoker that is used with larger capacity boilers because of its ability to feed coal at a faster rate than other stokers.

check valve. Automatic valve that controls the flow of a liquid in one direction.

chemical compound. Formed when two or more chemical elements combine into a new substance.

chemical concentration. The amount of a specific chemical in the boiler water.

chemical energy. Energy in the fuel that converts to heat energy during the combustion process.

chimney. Used to create draft. Also an outlet to the atmosphere for the gases of combustion.

coal bunker. An overhead bin where large quantities of coal are stored.

coal conveyor. Mechanism on a stoker that moves coal to the coal scale.

coal feeder. Controls the flow of coal entering the pulverizer.

coal gate. Used to control the depth of coal entering the boiler furnace on chain grate stokers.

coal ram. Distributes coal evenly into the center retort on underfeed stokers and forces the coal up to the top where it is burned.

coal scale. Measures and records the amount of coal fed to stoker-fired or pulverized coal-fired boilers.

combustible material. Any material that burns when it is exposed to oxygen and heat.

combustion. The rapid union of oxygen with an element or compound that results in the release of heat.

combustion control. Regulates the air to fuel ratio supplied to the burner.

complete combustion. The burning of all supplied fuel using the minimum amount of excess air.

compressive stress. Occurs when two forces of equal intensity act from opposite directions, pushing toward the center of an object. Fire tubes in a fire tube boiler are subjected to compressive stress.

condensate. Steam that has lost its heat and has returned to water.

condensate pump. Used to return condensed steam to the open feedwater heater.

condensate tank. Where condensed steam (water) is stored before it is delivered back to the open feedwater heater by the condensate pump.

condense. Process whereby steam turns back to water after the removal of heat.

conduction. A method of heat transfer in which heat moves from molecule to molecule.
conductivity. A measure of the ability of electrons to flow through a solution.
constant attendance. Boiler operator must be stationed at the boiler with no other significant job duties.
continuous blowdown. Used to control chemical concentrations and total dissolved solids in the boiler water.
convection. A method of heat transfer that occurs as heat moves through a fluid.
convection superheater. Located in a boiler and receives heat from convection currents.
counterflow. Principle used in heat exchangers where the medium being heated flows in one direction and the medium supplying the heat flows in the opposite direction.
cracking open. Slowing opening a steam valve to allow pressure to equalize.
cross "T". Used on connections on a water column for inspection of steam and water lines to ensure they are clean and clear.
eyelone separator. Separates water droplets from steam using centrifugal force and by changing direction.

D

damper. Used to control the flow of air or gases.
data plate. A plate that must be attached to a safety valve containing data required by the ASME code.
deadweight tester. Used to test a pressure gauge so that it can be recalibrated.
deaerating feedwater heater. Type of open feedwater heater equipped with a vent condenser.
desuperheating. Removing heat from superheated steam to make it suitable for process.
discharge piping. Piping attached to the outlet side of a safety valve that conveys steam to the atmosphere.
draft. The difference in pressure between two points that causes air or gases to flow.
dry pipe separator. A closed pipe perforated at the top with drain holes on the bottom that remove moisture from the steam.
duplex strainers. Remove solid particles from the fuel oil in fuel oil systems.

E

economizer. Uses the gases of combustion to heat the feedwater.
element. A basic substance consisting of atoms.
enthalpy. Total heat in the steam.
erosion. Wearing away of metal caused by wet steam.
equalizing line. Line used to warm up the main steam line and equalize the pressure around the main steam stop valve.
evaporation test. Test that checks the operation of the low water fuel cutoff.
excess air. Air more than the theoretical amount of air needed for combustion.
exhauster. Discharges a mixture of coal and warm air to the burner.
expansion bends. Installed on boiler main steam lines to allow for expansion and contraction of the lines.
external treatment. Boiler water treated before it enters the boiler to remove scale-forming salts, oxygen and noncondensable gases.
extraction steam. Steam that is extracted from a steam turbine at a controlled pressure for process.

F

factor of evaporation. A correction factor used to determine boiler horsepower.
feathering. That point when a safety valve is about to lift.
feedwater. Water that is supplied to the steam boiler.
feedwater heater. Used to heat feedwater before it enters the steam and water drum.
feedwater lines. Lines leaving the open feedwater pump and going to the boiler.
feedwater pump. Takes water from the open feedwater heater and delivers it to the boiler at the proper pressure.
feedwater regulator. Control used to maintain a NOWL that cuts down the danger of high or low water.
feedwater treatment. Can be internal, using chemicals, or external, using water softeners. Protects boiler from scale and corrosion.
field-erected boiler. Boiler that must be erected in the field because of its size and complexity.
fire point. The temperature at which fuel oil burns continuously when exposed to an open flame.
firebox. The part of the boiler where combustion of fuel takes place.
fire tube boiler. Has heat and gases of combustion passing through tubes surrounded by water.
firing rate. Amount of fuel the burner is capable of burning in a given unit of time.
fittings. Trim found on the boiler that is used for safety, and/or efficiency.
flame failure. When the flame in the furnace goes out.
flame scanner. Device found on a boiler that proves pilot and main flame.

flareback. Flames discharging from the boiler through access doors or ports caused by delayed ignition or furnace pressure buildup.

flash economizer. A heat recovery system used to reclaim the heat from the boiler blowdown water and used in conjunction with the continuous blowdown system.

flash point. Temperature at which fuel oil, when heated, produces a vapor that flashes when exposed to an open flame.

flash steam. Created when water at a high temperature has a sudden drop in pressure.

flash tank. Used with a continuous blowdown system to recover the flash steam from the water being removed from the steam and water drum.

flat gauge glass. Type of gauge glass used for pressure over 250 psi.

flexible joint. Used to allow for expansion and contraction of steam or water lines.

flow meter. Meter used to measure the flow of steam or water in the system.

fly ash. Small particles of noncombustible material found in gases of combustion.

fly ash precipitator. An electric device that traps and holds fly ash until it is properly disposed of.

foaming. Rapid fluctuations of the boiler water level that can lead to priming or carryover. Caused by impurities on the surface of the boiler water.

forced draft. Mechanical draft produced by a fan supplying air to the furnace.

free-blowing drain. Used to remove condensate from the main steam line.

front header. Connected to the steam and water drum by downcomer nipples.

fuel oil heater. Used to heat fuel oil so it can be pumped and is at the correct temperature for burning. Can be electric or steam.

fuel oil pump. Pump that takes fuel oil from the fuel oil tank and delivers it to the burner at the proper pressure.

furnace explosion. Occurs when fuel or combustible gas build up in the fire side of the boiler.

furnace volume. Amount of space available in a furnace to complete combustion.

Fyrite analyzer®. Instrument used to measure the percentage of carbon dioxide in the gases of combustion.

G

galvanometer. Used to measure small electric currents.

gas analyzer. Used to analyze the gases of combustion to determine combustion efficiency.

gas calorimeter. Used to determine the BTU content of natural gas.

gas cock. A manual quick closing shutoff valve.

gas leak detector. Device used to locate gas leaks in a boiler room.

gas mixing chamber. Where air and gas mix before they enter the furnace in low pressure gas burners.

gas pressure regulator. Used to supply gas to the burner at the required pressure needed for combustion of the gas.

gases of combustion. Gases produced by the combustion process.

gate valve. Valve used on boilers as the main steam stop valve that when open offers no restriction to flow. Must be wide open or fully closed.

gauge glass blowdown valve. Valve used to remove any sludge and sediment from gauge glass lines.

gauge pressure. Pressure above atmospheric pressure that is read on a pressure gauge and is recorded as psi or psig.

globe valve. Used to take a piece of equipment out of service for maintenance. Used in conjunction with a bypass line and bypass valve.

grade. Refers to the size, heating value and ash content of coal.

grates. Where the combustion process starts in a coal fired furnace.

H

handhole. A part found on both fire tube and water tube boilers that is removed when cleaning the water side of the boiler.

heat energy. Kinetic energy caused by molecular motion within a substance.

heat exchanger. Any piece of equipment where heat is transferred from one substance to another.

heat recovery system. Equipment that is installed to reclaim heat that is normally lost during the blowdown process.

heat transfer. Movement of heat from one substance to another that can be accomplished by radiant conduction or convection.

heating boilers. Boilers used exclusively for low pressure steam heating, hot water heating, and hot water supply.

heating surface. That part of the boiler that has heat and gases of combustion on one side and water on the other.

heating value. Expressed in BTU's per gallon or per pound. Heating value varies with the type of fuel used.

high and low water alarm. Warns the operator of high or low water. Found inside the water column.

high fire. Point of firing cycle when burner is burning the maximum amount of fuel per unit of time.

high pressure steam boiler. Boiler that operates at a steam pressure over 15 psi and over 6 boiler horsepower.

horizontal return tubular boiler. Type of fire tube boiler that consists of a drum suspended over the firebox.

hot well. A reservoir located at the bottom of a condenser where condensate collects.

huddling chamber. Part on a safety valve that increases the area of the safety valve disc, thus increasing the total upward force, causing the valve to pop open.

hydraulic coupling. Coupling between the drive element and fan or pump.

hydrogen. A basic element present in gas, coal and fuel oil.

hydrostatic pressure. Water pressure per vertical foot (.433) exerted at the base of a column of water.

hydrostatic test. Water test made on a PRI after repair work on the steam or water side or overheating of boiler metal.

I

ignition. The lightoff point of a combustible material.

ignition arch. Made of refractory material that absorbs the heat from the fire and radiates it back to the green coal.

impeller. The rotating element found in a centrifugal pump that converts centrifugal force into pressure.

impingement (fuel oil). Fuel oil striking brickwork or the boiler heating surface that results in formation of carbon deposits and smoke.

impingement (steam). Steam that strikes the boiler heating surface, causing erosion of boiler metal.

incomplete combustion. Occurs when all the fuel is not burned, resulting in the formation of smoke and soot.

induced draft. Draft that is produced mechanically using a fan located between the boiler and the chimney.

infrared. Invisible light rays produced by the combustion process and detected by a flame scanner.

installer. A person, firm or corporation which sets up or adjusts for service any mechanical device, apparatus or pressure vessel.

insulation. Material used to cover steam, water, and fuel oil lines to cut down on radiant heat losses.

integrator. A calculating device used on differential pressure flow meters to determine hourly or daily flow rates.

interlock. Used with burner controls to ensure proper operating sequence.

internal feedwater line. Perforated line located at the NOWL in the boiler that distributes the relatively cool feedwater over a large area to prevent thermal shock to the boiler metal.

internal furnace. Furnace that is located within the boiler and is surrounded by water in the scotch marine boiler.

internal overflow. A pipeline located in an open feedwater heater that prevents the water level from exceeding a fixed level and flooding the system.

internal treatment. The addition of chemicals directly into the boiler water to control pitting, scale and caustic embrittlement.

instrument (boiler). Device that measures, indicates, records and controls boiler room systems.

ion (zeolite) exchanger. Water softener that uses zeolite to soften water for use in the boiler.

J

jobber. One who deals as a wholesaler or one who does work by the job.

K

(There are no definitions under this category.)

L

lighting off. The ignition of the fuel.

lignite. Coal with a low heating value (BTU content) and a high moisture content.

lime-soda process. A process that uses lime and soda ash to soften water.

live steam. Steam that leaves the boiler directly without having its pressure reduced in process operations.

low fire. Point of firing cycle where burner is burning the minimum amount of fuel per unit of time.

low pressure steam boiler. Boilers that operate at a steam pressure of no more than 15 psi.

low water. Whenever the water level in the gauge glass is below the NOWL.

low water fuel cutoff. A device located a little below the NOWL that shuts off the boiler burner in the event of low water, preventing burning out of tubes and possible boiler explosion.

M

main header. That part of the system which connects boilers in battery and then distributes the steam to wherever it is needed.

main steam stop valve. Valve or valves found on the main steam line leaving the boiler.

makeup water. Water that must be added to the boiler to make up for leaks in the system, water that is lost through boiler blowdowns, or condensate that is dumped because of contamination.

malleable iron. Used for construction of water columns in boilers carrying a pressure between 250 psi and 350 psi.

manhole. Opening found on the steam and water side of a boiler that is used for cleaning and inspection of the boiler.

manometer. Instrument used to measure boiler draft.

manual reset valve. Used to secure the gas in the event of a low water condition or a pilot flame failure on a low pressure gas system.

master control. Unit that receives the primary signal and relays signals to individual control units.

MAWP (maximum allowable working pressure). Determined by the design and construction of the boiler in conformance with the code of construction.

mercurey switch. Switch in which the movement of mercury in a capsule controls the flow of electricity in a circuit.

mica. Used to protect the flat gauge glass from the etching action of steam and water.

microprocessor. A computer acting as a flame monitoring device that programs the burner, blower motor, ignition and fuel valves to provide for safe burner operation.

modulating motor. Receives signals from the modulating pressure control and repositions the air to fuel ratio linkage.

modulating pressure control. Located at the highest part of the steam side of the boiler and sends a signal to the modulating motor that controls firing rate.

mud drum. Lowest part of the water side of a water tube boiler.

multiple-pass boiler. Boilers that are equipped with baffles to direct the flow of the gases of combustion so that the gases make more than one pass over the heating surfaces.

N

natural draft. Caused by the difference in weight between a column of hot gases of combustion inside the chimney and a column of cold air of the same height outside the chimney.

natural gas. A combustible gas found in pockets trapped underground that consists mainly of methane.

nonadhering sludge. Residue formed in a boiler when scale-forming salts are created by adding feedwater chemicals.

noncondensable gases. Gases found in boiler makeup water (oxygen) and in condensate returns.

nonvolatile. Any substance not easily vaporized under average temperature.

NOWL (normal operating water level). Water level carried in the boiler gauge glass during normal operation (approximately one third to one half glass).

O

oil separator. A device that removes oil from the exhaust steam before it enters the open feedwater heater.

operating range. Range that must be set when using an ON/OFF combustion control in order to prevent extremes in firing rate.

operator. (see **boiler operator**)

orifice plate. Plate with a fixed opening that is installed in a pipeline to give a certain pressure drop across the opening where liquid or steam is flowing.

Orsat analyzer. A flue gas analyzer that measures the percentage of carbon dioxide, oxygen and carbon monoxide in the gases of combustion.

outside stem and yoke valve (os&y). Shows by the position of the stem whether it is open or closed. Used as boiler main steam stop valves.

overfeed stoker. Air introduced over the fire to aid in complete combustion. Used mostly when burning soft coal that has a high volatile content.

P

package boiler. Comes completely assembled with its own feedwater pumps, fuel system and draft fans.

packing gland. Holds packing or seals in place on valves and pumps to minimize leakage.

perfect combustion. Burning of all the fuel with the theoretical amount of air. Can only be achieved in a laboratory.

periodic attendance. Boiler operator must inspect the boiler for proper operation every four hours to take and record any required readings. Boiler is equipped with the usual local operating and safety devices which include alarm lights and buzzers. In addition, there must be remotely actuated alarm devices to detect: (1), low water condition; (2), over pressure condition (set to operate before the safety valve operates); and (3), loss of operating boiler.

pilot. Used to ignite fuel at the proper time in a firing cycle.

pipeline heater. Electric heater attached to the fuel oil line in order to maintain proper fuel oil temperature (viscosity) for moving fuel oil.

pneumatic system. A system of control that uses air as the operating medium.

pneumercator. A fuel oil level indicating device that gives a direct reading in gallons.

popping pressure. Predetermined pressure at which a safety valve opens and remains open until the pressure drops.

pop-type safety valve. Valve with a predetermined popping pressure. Commonly found on steam boilers.

positioning controller. A control that regulates air and fuel going to a boiler furnace.

postpurge. The passing of air through a furnace after normal burner shutdown.

pour point. Lowest temperature at which fuel oil flows as a liquid.

prepurge. The passing of air through a furnace prior to lightoff.

pressure control. Attached to the highest part of the steam side of a boiler to control its operating range.

pressure gauge. Calibrated in pounds per square inch. Used to indicate various pressures in the system.

pressure reducing governor. Used on low pressure gas burner systems to reduce the gas pressure to 0 psi.

pressure reducing station. Where higher pressure steam is reduced in pressure for plant process.

PRI. Pressure retaining item.

primary air. Air supplied to the burner that regulates the rate of combustion.

process steam. Steam used in the plant for manufacturing purposes.

products of combustion. Gases that are formed as a fuel is burned in the furnace.

programmer. Control that puts the burner through a firing cycle.

proportioning chemical feed pump. Pump that can be adjusted to feed chemicals to a boiler over a 24 hour period.

proving pilot. Sighting the pilot through the scanner to verify that the pilot is lit.

proximate analysis. Provides information regarding moisture content, volatile matter, fixed carbon and ash content of coal.

psi (pounds per square inch). Unit of measurement used to express the amount of pressure present in a given structure or system.

pulverizing mill. Grinds coal to the consistency of talcum powder before it is delivered to the furnace, where it burns in suspension.

pump controller. Starts and stops a feedwater pump, depending on the water level in the boiler.

purge period. Before ignition and after burner shutdown when explosive combustibles are removed.

pyrometer. High pressure thermocouple used to measure furnace temperatures.

Q

quality of steam. Term used to express the moisture content present in saturated steam. Quality of steam effects the BTU content of the steam.

quick closing valve. Valve that requires a one-quarter turn to be fully open or closed.

R

radiant superheater. A nest of tubes that the saturated steam passes through to acquire heat.

rank. Refers to how hard the coal is.

rate of combustion. The amount of fuel that is being burned in the furnace per unit of time.

raw water. Untreated water from wells or city water lines.

rear header. Found on straight tube water tube boilers. Connected to front header by water tubes.

reciprocating pump. Positive displacement pump used to pump liquids.

recorder. An instrument that records data such as pressures and temperatures over a period of time.

refractory. Brickwork used in boiler furnaces and for boiler baffles.

regular attendance. Boiler operator must inspect the boiler for proper operation and take any required readings once each hour. Boiler must be equipped with local operating and safety devices and should have local alarm lights and buzzers.

relief valve. Used to protect liquid systems from excessive pressure.

reset. Switch that must be reset manually after tripping.

retort. Space below the grates of an underfeed stoker.

Ringelmann. Chart used as a means of determining smoke density.

rivets. Fasteners used to connect steel plates.

rotometer. Variable area flow meter that measures the flow of a fluid.

S

safety valve blowdown. Drop in pressure between popping pressure and reseating pressure (usually 2 to 8 psi below popping pressure).

safety valve capacity. Measured in pounds of steam per hour safety valves can discharge.

saturated steam. Steam at a temperature that corresponds with its pressure.

scale. Deposits caused by improper boiler water treatment.

scale forming salts. Salts such as calcium carbonate and magnesium carbonate that when in solution tend to form a hard, brittle scale on hot surfaces.

scanner. Device that monitors the pilot and main flame of the furnace. The scanner is used to prove the pilot flame and the

main flame.

school. Includes all public and private school systems, as well as public and private colleges, universities, and technical schools.

scotch marine boiler. A fire tube boiler with an internal furnace.

secondary air. Air needed to complete the combustion process.

sediment. Particles of foreign matter present in boiler water.

shear stress. Occurs when two forces of equal intensity act parallel to each other but in opposite directions.

sinuous header. Found on water tube boilers. Tubes are expanded, rolled and beaded into front and rear headers.

siphon. Protective device used between the steam and Bourdon tube in a steam pressure gauge.

slow-opening valve. Valve that requires five full turns of its handwheel to be fully open or closed.

sludge. Accumulation residue produced from impurities in water.

smoke density. Varies from clear to dark. Determined by the amount of light that passes through the smoke as it leaves the boiler.

smoke indicator. An indicating or recording device that shows the density of the smoke leaving the chimney.

solenoid valve. An electromagnetic valve positioned open or closed.

solid state. An electronic system using transistors in place of electronic tubes.

soot. Carbon deposits resulting from incomplete combustion.

soot blowers. Used to remove soot from around tubes to increase boiler efficiency. Mostly found on water tube boilers.

spalling. Hairline cracks in boiler brickwork (refractory) due to changes in furnace temperature.

spontaneous combustion. Occurs when combustible materials self ignite.

“State Special”. A boiler or fired/unfired pressure vessel of any type or size, which carries neither the ASME symbol nor the National Board stamping, and which has been accepted by the Boiler Division and assigned an Arkansas state number.

staybolts. Bolts used in boilers to reinforce flat surfaces to prevent bulging.

steam and water drum. The pressure vessel in a steam boiler that contains both steam and water.

steam boiler. A closed pressure vessel in which water is converted to steam by the application of heat.

steambound. Condition that occurs when the temperature in the open feedwater heater gets too high and the feedwater pump cannot deliver water to the boiler.

steam separator. Device used to increase the quality of steam. Found in the steam and water drum.

steam space. The space above the water line in the steam and water drum.

steam strainer. Used before steam traps and turbine throttle valves to remove solid impurities.

steam trap. An automatic device that removes gases and condensate from steam lines and heat exchangers without the loss of steam.

steam turbine. Used to drive boiler auxiliaries or generators in large plants.

stopcock. A quick opening or closing valve usually found on gas lines.

strip chart. Recording chart that records temperatures and pressures in the system.

suction pressure. Pressure on the liquid at the suction side of a pump.

sulfur. A combustible element found in coal and fuel oil.

superheated steam. Steam at a temperature above its corresponding pressure.

superheater. Used to increase the amount of heat in the steam.

superheater drain. Valve found on the superheater header outlet. Used to maintain flow throughout the superheater during start up and shutdown.

super-jet safety valve. Valve set to open at a predetermined pressure.

surface blowdown valve. Used to remove impurities from the surface of the water in a steam and water drum.

surface condenser. A shell and tube vessel used to reduce the exhaust pressure on the outlet end of turbines or engines.

surface tension. Caused by impurities on the top of the water in the steam and water drum.

suspension sling. Used to support the drum of the HRT boiler.

synchronize. To balance out combustion controls before switching to automatic.

T

tensile stress. Occurs when two forces of equal intensity act on an object, pulling in opposite directions. Affects boiler plates and staybolts.

therm. Unit used to measure BTU content of natural gas. A therm has 100,000 BTU.

thermal efficiency. The ratio of the heat absorbed by the boiler to the heat available in the fuel per unit of time.

thermocouple. Used to measure temperatures in the system and send them back to a recording chart.

thermometer. Instrument used to measure temperature (degree of heat). Calibrated in degrees Celsius or degrees Fahrenheit.
through stays. Found on fire tube boilers (HRT and scotch marine) to keep front and rear tube sheets from bulging.
total force. Total pressure that is acting on an area, determined by diameter and pressure.
totalizer. dial that determines hourly or daily flow rates.
try cocks. Secondary way of determining the water level.
tube brushes. Used in fire tube boilers to remove soot from inside of tubes.
tube sheet. Tubes are rolled, expanded and beaded into front and rear tube sheets of HRT and scotch marine boilers and upper and lower tube sheets of vertical fire tube boilers.
tubular gauge glass. Round gauge glass used for pressures up to and including 250 psi.
turbine stages. That part of the turbine where steam gives up its energy to the turbine blades. As the steam pressure drops, the stages (blades) become larger.
turbulence. Movement of water in the steam and water drum.

U

ultimate analysis. Used to determine the elements present in a coal sample.
ultraviolet. A form of light that is produced during combustion.
underfeed stoker. A coal firing system that introduces the coal under the fire.
U-tube manometer. When filled with mercury, used to measure vacuum. U-tube manometers are calibrated in inches.

V

vacuum. A pressure below atmospheric pressure.
vacuum gauge. Pressure gauge used to measure pressure below the atmosphere that is calibrated in inches of mercury.
valve flow meter. Measures flow of a substance by the movement of a piston in a valve caused by resistance to flow of the substance.
vaporstat. Control with a large diaphragm that makes it highly sensitive to low pressure.
variable area flow meter. Measures the flow of a substance by how much resistance is created by a float or piston which changes the area (size) of the flow path.
variance. ~~A petition presented in writing to the Chief Inspector of the Boiler Inspection Division for consideration of a non-code boiler or pressure vessel to be installed and used within the State of Arkansas.~~
vent condenser. Removes oxygen and other noncondensable gases in a deaerating feedwater heater.
venturi. A constricting device used in pipelines to measure flow.
vertical fire tube boiler. One pass boiler that has fire tubes in a vertical position. Vertical fire tube boilers are classified as wet top or dry top.

W

warping. Bending or distortion of boiler or superheater tubes, usually caused by overheating.
water column. Reduces fluctuations of boiler water to obtain a better reading of the water level in the boiler gauge glass. Located at the NOWL.
Water column blowdown valve. Valve on the bottom of the water column used to remove sludge and sediment that might collect at the bottom of the water column.
water hammer. A banging condition that is caused by steam and water mixing in a steam line.
water softening. The removal of scale forming salts from water.
water tube boiler. Boiler that has water in the tubes with heat and gases of combustion around the tubes.
waterwall. Vertical or horizontal tubes found in the furnace area of water tube boilers that lengthen the life of the refractory.
waterwall blowdown valve. Approved valve used to remove sludge and sediment from waterwalls and waterwall headers.
weight type alarm whistle. Alarm whistle which signals high or low water by the gain or loss of buoyancy of weights in water within the water column.
windbox (plenum chamber). Pressurized air chamber that supplies air to a furnace.

X

~~(There are no definitions for this category.)~~

Y

~~(There are no definitions for this category.)~~

Z

zeolite. A resin material that is used in the process of softening water.

Subchapter 4. SUMMARY

(A) CONSTRUCTION REQUIREMENTS

~~———— All boilers and pressure vessels must be constructed in accordance with the A.S.M.E. Code, and registered with the National Board.~~

(B) INSTALLATION REQUIREMENTS

~~Installers and sellers of boilers and pressure vessels must be licensed by the State. Installers must obtain installation permits from the State.~~

(C) INSPECTION REQUIREMENTS

~~(1) Boilers must be inspected both internally and externally at least once each year. The inspection should be made during the same calendar month of each year if possible.~~

~~(2) Pressure vessels shall be inspected biennially externally and internally where conditions permit. NOTE: The regulations of the Boiler Inspection Division require that unfired pressure vessels inspected by insurance companies be inspected both internally and externally each year. This regulation may be enforced by the Chief Inspector.~~

~~(3) Insurance companies shall file annual reports of all boilers and pressure vessels inspected with the Boiler Division by January 30 of each year. Insurance company inspectors must report all boilers and pressure vessels found during their inspections that are in use, but not insured by their insurance company.~~

~~(4) Authorized inspectors can shut down equipment they consider unsafe. Any inspector reporting an unsafe boiler as safe to operate shall be subject to statute 20-23-403.~~

~~(5) Inspectors shall attach state numbers to vessels as follows:~~

~~(a) High-Pressure Boiler State Number shall be preceded by the letters "AR".~~

~~(b) Low-Pressure Boilers used for Heating or Hot-Water Supply and Unfired Pressure Vessels State Numbers shall be preceded by the letter "AR".~~

~~(c) All Fired and Unfired Hot Water Heaters which come under the law shall have a State Number assigned which shall be preceded by the letters "AR".~~

~~(6) When insurance companies cancel insurance coverage, they must notify the Boiler Division on approved forms. When insurance is canceled due to an existing dangerous defect, the Boiler Division shall be notified immediately. If insurance companies do not file their inspection reports with the Boiler Division within sixty (60) days from the date they are due inspection, the Boiler Division shall make the required inspection, and charge the insurance company for a special inspection fee, mileage, meals and motel expenses incurred.~~

(D) BOILERS AND PRESSURE VESSELS EXEMPT FROM INSTALLATION PERMITS AND CERTIFICATE INSPECTIONS

~~(1) Hot-water heating boilers below 200,000 BTU/HR input. Such objects located in schools, day-care centers, hospitals, and nursing homes shall be inspected.~~

~~(2) Air tanks in garages and service stations.~~

~~(3) Air tanks of (12) gallons, or less, containing 150 PSIG or less.~~

~~(4) Boilers and Pressure Vessels subject to inspection by the Interstate Commerce Commission presently recognized as U.S. Department of Transportation.~~

~~(5) Boilers and Pressure Vessels used in private residences and apartment complexes with (8) apartments or less.~~

~~(6) Pressure Vessels with (6) inches I.D. or less, with no limit on length of vessel or pressure.~~

~~(7) Pressure Vessels, other than air tanks, with a maximum allowable working pressure of (15) PSI or less, or a volume of (5) cubic feet or less.~~

~~(8) Liquefied Petroleum Gas Vessels. (Propane & Butane Tanks).~~

~~(9) Boilers and Pressure Vessels used in the production, transmission or storage of oil, natural gas or casinghead gas. (Refineries)~~

~~(10) Coil Type Steam Generators that do not have accumulator drum.~~

~~(11) Fired and Unfired Water Heaters below 200,000 btu/hr. Such objects located in schools, day-care centers, hospitals, and nursing homes shall be inspected.~~

~~(12) Hot Water Supply Storage Tanks. Tanks which are heated by steam or any other direct or indirect means, when none of the following are exceeded:~~

- (a) — Heat input of less than 200,000 Btu/hr.
- (b) — Water temperature of less than 210 degrees F.
- (c) — Nominal water containing capacity of less than 120 gallons.

(13) — (a) — Pressure vessels which are an integral part of components of rotating or reciprocating mechanical devices and hydraulic or pneumatic cylinders where the primary design considerations and/or stresses are derived from the functional requirements of the device; or

(b) — Pressure vessels which are an integral part of the structure that have a primary function of transporting fluids from one location to another within the system.

(14) — Vessels with a capacity of 120 gallons or less for containing water under pressure, including those containing air, the compression of which serves only as a cushion.

(E) — REPAIR REQUIREMENTS

Major and all welding repairs must have state approval. Repairs must be done in accordance with A.S.M.E. and the National Board Inspection Code. Repairs must be accomplished by licensed organizations. Repair firms must obtain permits to repair from the State. Plants with qualified maintenance personnel may perform their own repairs on their own boilers and pressure vessels, but all such repairs will comply with the National Board Inspection Code.

(F) — MISCELLANEOUS

(1) — The statutes and these regulations have special requirements pertaining to Anhydrous Ammonia equipment and facilities.

(2) — Explosions and accidents must be reported to the Boiler Inspection Division.

(3) — Steam boilers (50) horsepower and over, and boilers used in hospitals, hotels, schools, theatres and office buildings, but not limited to, must be under regular attendance by a licensed operator.

(4) — Manually operated boilers must be under constant attendance when fired.

(5) — Inspection certificates to operate power and heating boilers shall be posted in the boiler room. Inspection certificates for unfired pressure vessels and portable boilers shall be kept on the premises with the vessel.

(6) — Safety valves must meet A.S.M.E. Code Requirements.

(7) — Blow-off piping and tanks must meet A.S.M.E. Code Requirements.

(8) — Water columns must meet A.S.M.E. Code Requirements.

(9) — All boilers, gas, oil or mechanically fired shall be provided with an automatic low water fuel cut out so located as to automatically cut off the fuel supply in case the water level falls to a point no lower than the bottom of the water glass.

(10) — The Chief Inspector may grant an exemption or variance from regulations if he finds that strict compliance would create an undue hardship and that equivalent safety will be provided by other means.

**CHAPTER 2
INSTALLATION**

(A) — INSTALLATIONS

(1) — Every manufacturer, contractor, jobber, owner or user of a boiler or unfired pressure vessel shall obtain permission from the Boiler Inspection Division before any boiler or unfired pressure vessel may be installed or moved and reinstalled in the State of Arkansas. When boilers or unfired pressure vessels are to be installed, the manufacturer's data report for each boiler and unfired pressure vessel must be submitted with the application for installation. No boiler or unfired pressure vessel may be installed without approval from the Boiler Inspection Division. All persons, firms or corporations engaged in the installation of boilers, unfired pressure vessels or hot water storage tanks or fired/unfired storage water heaters 200,000 btu/hr or greater input in any location shall be licensed by the Boiler Inspection Division to perform such work. The annual license fee shall be seventy five dollars (\$75.00), payable in advance on or before January 31 of each calendar year.

(2) — All new and second hand boilers and pressure vessels shall be installed and equipped to conform with the requirements of the A.S.M.E. Boiler Construction Code and CSD-1 and shall be inspected and approved by a State Boiler Inspector or an Authorized Insurance Inspector before they are placed in service. All such work must be performed by persons or firms possessing a license. Permits must be obtained for each boiler and/or pressure vessel before they may be installed.

(B) — METHOD OF SUPPORT

(1) — 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 two 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 centers 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.

(2) — A horizontal return tubular boiler, 14 ft or more in length, or over 54 inches and up to and including 72 inches in diameter, shall be supported by the outside suspension type of setting as specified above or at four points by not less than eight steel or cast iron lugs set in pairs. A horizontal return tubular boiler up to and including 54 inches in diameter, shall be supported by the outside suspension type of setting as specified above, or by not less than two steel or cast iron lugs on each side.

The distance girthwise of the boiler from the centers of the bottom rivets to the centers of the top rivets attaching the hangers shall be not less than the square of the shell diameter divided by 675. If more than four lugs are used they shall be set in four pairs, the lugs of each pair to be spaced not over 2 inches apart and the load to be equalized between them. If the boiler is supported on structural steel work, the steel supporting members must be so located or insulated that heat from the furnace cannot impair their strength.

(3) — Lugs or hangers, when used to support a boiler of any type, shall be properly fitted to the surfaces to which they are attached.

(4) — Where it is impracticable to use rivets, studs with not less than 10 threads per inch may be used. In computing the shearing stresses, the area at the bottom of the thread shall be used. The shearing and crushing stresses on the rivets or studs used for attaching the lugs or brackets shall not exceed 8 percent of the strength given in the A.S.M.E. Code.

(5) — Lugs, hangers or brackets made of materials in accordance with the Code requirements may be attached by fusion welding providing the welding meets the requirements of the A.S.M.E. Code, including stress relieving but omitting radiographic examination, and provided that they are attached by fillet welds along the entire periphery or contact edges, of the size and form shown in the A.S.M.E.

Code. The stresses computed by dividing the total load on the lug, hanger, or bracket by the minimum cross sectional area of the weld shall not exceed, for tension and compression, 40 percent and for shear, 32 percent, of the stress values given multiplied by the welded joint efficiency specified in the A.S.M.E. Code. The furnace setting shall have adequate means for expansion and contraction.

(C) — SETTING

(1) — Steel boilers of the wet bottom type having an external width of over 36 inches shall have not less than 18 inches between the bottom of the boiler and the floor line, with access for inspection. When the width is 36 inches or less, the distance between the bottom of the boiler and the floor line shall not be less than 6 inches, and when any part of the wet bottom is not farther from an outer edge than 12 inches, it shall be not less than 4 inches.

(2) — The minimum size of the access door used in a boiler setting shall be 12 x 16 inches, or equivalent area, the least dimension being 11 inches.

**CHAPTER 3
INSPECTIONS**

— (A) — No person shall operate or cause to be operated any new boiler or unfired pressure vessel which has been installed or erected, or any used boiler or unfired pressure vessel which has been reinstalled or reerected in the State of Arkansas, until it has been inspected by a State Boiler Inspector or an authorized Insurance Inspector and a Certificate of Inspection has been issued and is displayed in the boiler or engine room as required by law. The certificate of inspection for power and heating boilers shall be posted in the boiler or engine room in a location where it may be easily read by the engineer or fireman. Certificates of inspection for unfired pressure vessels or portable boilers shall be kept on the premises where such pressure vessels or boilers are located and shall be accessible at all times.

(B) — The owner or user of a boiler which requires annual internal inspection shall prepare the boiler for inspection by cooling it down, blanking off connections to adjacent boilers if necessary, drawing off the water, removing the handhole and manhole plates, removing the grate bars from internally fired boilers. When considered necessary by the inspector, the brickwork, lagging, jacketing, appliances, other parts or fittings and any boiler covering shall be removed.

(C) — The combustion chamber and passages and the firebox shall be cleaned and soot and ashes removed. Water, scale and mud must be removed from the interior portions of the boiler. Unfired pressure vessels shall be prepared for inspection in a manner that will insure a thorough and proper inspection.

(D) — Where, in the opinion of the inspector, as a result of conditions, disclosed at an inspection, it is deemed advisable

to remove interior or exterior lining, covering or brick work to expose certain parts of the vessel not visible, the inspector shall require the removal of such materials to permit the proper inspection and the drilling of any part of the vessel when necessary to ascertain thickness.

(E) — When the tensile strength is not known, it shall be taken as 55,000 pounds per square inch for temperatures not exceeding 650° F.

(F) — If at any time the owner, user or agent of the owner of any boiler within the State shall desire a special inspection of any boiler or unfired pressure vessel, it shall be made by the Boiler Inspection Division after due request therefor, and the inspector making the inspection shall collect a fee of One hundred dollars (\$100.00) for each boiler, together with his expenses from Little Rock to the place of inspection and return. All inspection fees shall be paid by the owner, user or agent of the owner, and the inspector is authorized to receive such fee and issue his receipt therefor.

(G) — All boilers or unfired pressure vessels that have been inspected and found unsafe by an authorized inspector shall be stamped "XXOOOXX," which will designate an unsafe boiler. No person except an authorized inspector shall deface or remove such stamping.

(H) — If, upon an external inspection, there is evidence of a leak or crack, enough of the covering of the boiler or unfired pressure vessel shall be removed to enable the Inspector to determine safety of the boiler or unfired pressure vessel. If the covering cannot be removed at that time, he may order the operation of the boiler or unfired pressure vessel stopped until the covering can be removed and proper examination made.

(I) — If in the judgement of an authorized inspector the condition of a boiler warrants the certificate being withheld or withdrawn, such reasons shall be stated fully in a report to the Division. When a certificate has been withdrawn or withheld, it shall not be reissued until a "Repair" or inspection report has been filed with the Division, showing that the boiler has been placed in a safe working condition.

(J) — When an authorized inspector finds it necessary to change the pressure allowed on a boiler, either increasing or decreasing it, the reasons therefor shall be stated on the report and the certificate taken up and forwarded with the report to the Division.

(K) — INSPECTORS

(1) — Inspectors of boilers and/or unfired pressure vessels employed by insurance companies are required to hold Certificates of Competency issued by the Boiler Inspection Division.

(2) — Any inspector of steam boilers who shall report a boiler for a certificate of inspection as safe to operate while knowing such report to be false and that said boiler is unsafe to operate, or who shall fail to perform his duties as herein stated, or cause the repair, installation or sale of a boiler that does not comply with the standards as set out in this Act and the regulations hereinafter provided shall be guilty of a felony and upon conviction thereof shall be punished by a fine in any sum not less than one hundred dollars (\$100) nor more than five hundred dollars (\$500), or by imprisonment not to exceed three (3) years, or both fine and imprisonment.

(3) — All boilers and unfired pressure vessels inspected by insurance companies shall be inspected both internally and externally at least once each year unless exceptions are made for the internal inspection by these regulations. Where an annual internal inspection is made the external inspection report need not be filed unless some defect is found at the time of external inspection that would affect safety of the boiler or pressure vessel.

(4) — The annual internal inspection, or general inspection where internal inspection cannot be made, shall be made at least once each twelve (12) months, and should be made during the same calendar month each year if possible.

(5) — If annual inspection reports are not filed with the Boiler Inspection Division by insurance companies who have insurance on boilers in the State of Arkansas within sixty (60) days from the date they are due inspection, the Boiler Inspection Division shall make the required inspection, and a special fee of One hundred dollars (\$100.00) for each boiler or unfired pressure vessel inspected, plus mileage and expenses from Little Rock to the point of inspection and return, not to exceed the current rate authorized by the General Assembly to employees of state agencies who furnish their own transportation, plus meals and hotel bills incurred, shall be charged to the insurance company insuring the boilers or unfired pressure vessels unless extension of time is granted by the Chief Inspector.

(6) — All insurance companies authorized to inspect boilers in the State of Arkansas must have at least one resident inspector located in the central part of the State of Arkansas, in order that persons or firms who have their boilers insured may be in closer contact with their insurance company and this Department.

(7) — When insurance on a boiler or pressure vessel is canceled, the Department shall be notified on approved type forms. The reason for cancellation must be given. When insurance is canceled because of an existing dangerous defect, the Department shall be notified immediately upon cancellation of the insurance.

(8) — All representations and recommendations made by authorized inspectors, Departmental or Insurance, in regard to necessary repairs and pressure to be allowed, are subject to the final approval or disapproval of the Chief Boiler Inspector.

(9) — Insurance companies must report to the Boiler Inspection Division any boiler and/or unfired pressure vessel that is in use and not insured by them in any location of their assured.

(10) — All authorized inspectors as well as the owner or user of a boiler or unfired pressure vessel shall notify the Department of any explosion or accident involving a boiler or unfired pressure vessel. No part or parts of such boiler or unfired pressure vessel shall be disturbed or moved until authority to do so is granted by the Chief Boiler Inspector.

(L) — DATA REPORTS

(1) — A data sheet shall be filled out and signed by the manufacturer and the inspector. When signing each data report, the manufacturer shall show under his signature the expiration date of his certificate of authorization to use the A.S.M.E. Symbol. This data sheet, together with the stamping on the vessel, shall be a guarantee by the manufacturer that he has complied with all requirements of the A.S.M.E. Code.

(2) — Manufacturers and jobbers shall forward to the department "Notice of Shipment" and manufacturer's data sheet on the same day that shipment of vessels is made into the State.

(3) — A complete data report shall be furnished with the first internal inspection report on all new boilers and unfired pressure vessels. At the time of the first inspection, the boiler shall be stamped with a State Serial Number preceded by the letters AR, said letters and figures to be not less than 5/16" in height. The stamping shall not be concealed by lagging, covering, or paint. On high pressure boilers the State Number shall be attached as close to the code stamping as possible. On Cast Iron Boilers and boilers (encased) the State Number shall be stamped on a metal tag attached to the boiler.

**CHAPTER 4
OPERATORS**

(A) — All power boilers subject to the provisions of this Act shall be under attendance by a licensed operator whenever they are in use for any purpose. Boilers that are fired up are considered in use whether steam is being withdrawn or not.

(B) — Steam boilers 50 horsepower and over, as rated by the manufacturer, and steam boilers used in hospitals, hotels, schools, theaters and office buildings, but not limited to, must be under regular attendance by a licensed operator who holds a certificate of competency issued by the Boiler Inspection Division.

(C) — The Boiler Inspection Division shall conduct examinations for each applicant seeking a boiler operator's license. This examination may be either written or oral.

(D) — Each applicant shall pay a fee of sixteen dollars (\$16.00) for the examination and first license. Each license must be renewed annually. The annual fee shall be twelve dollars (\$12.00).

(E) — If licenses are not renewed within two (2) to five (5) years after the expiration date, the renewal fee shall be sixteen dollars (\$16.00). Any operator who shall allow his license to lapse for a period of over five years will be required to participate in a written examination before license may be reissued. An average of 70 percent shall be required for a passing grade, and the license may be issued with a restriction to an individual location.

(F) — Any operator found operating a boiler without a certificate issued by the Boiler Inspection Division, or operating a boiler knowing it to be defective, shall have his license revoked at once. Any person found operating a boiler without an operator's license shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine of not less than twenty-five dollars (\$25.00) and not more than one hundred dollars (\$100), and in addition may be imprisoned for not more than two (2) years or both.

(G) — All power boilers and high pressure/high temperature water boilers without fully automatic controls shall have a full-time Operator while the boiler is in service.

(H) — Operator is defined as a competent attendant who is familiar with the particular boilers to be operated, and who has received proper instruction in their safe operation; he or she must also be licensed by the Boiler Inspection Division.

(I) — OPERATOR ATTENDANCE

It should be noted that nothing will replace the need for one or more boiler operators being in attendance when the boilers are in operation.

(1) — High Pressure Steam Boilers

(a) — Manual boilers shall be maintained by **constant attendance** by a boiler operator. (See definition of constant attendance.)

(b) — High pressure steam boilers, which meet CSD-1 recommendations for local alarms and safety devices, shall be maintained by **regular attendance** by a boiler operator. (See definition of regular attendance.)

(c) — High pressure steam boilers, which meet CSD-1 as in paragraph (b) above, plus have installed remotely actuated alarms to detect low water condition, high pressure, high water condition, loss of operating boiler, etc., shall be maintained by **periodic attendance** by a boiler operator. (See definition of periodic attendance.)

(d) — High temperature, high pressure water boilers fall under the same guidelines as those for high pressure boilers in (a), (b), and (c), above.

(e) — Remote monitoring for high pressure boilers (SV set at greater than 15 psi) shall only be approved with a formal request, in writing, to the Chief Inspector; it must describe the system, the equipment, what is presently installed, and what the plans are for remote monitoring.

(2) — **Low Pressure Steam, Hot Water Heating, and Hot Water Supply Boilers:**

(a) — Low pressure steam boilers shall meet the requirements of CSD-1 for controls, local alarms and safety devices. Boiler operator attendance shall be as described for Regular Attendance, except the time frame shall be expanded to every two hours for inspections and readings. This can be extended to four hours by meeting the requirements for Periodic Attendance of a boiler.

(b) — Hot water heating boilers shall meet the requirements of CSD-1 for controls, local alarms, and safety devices. Boiler operator attendance shall be a maximum of every twelve hours for inspection and any required readings with the boilers in operation, and more often should there be other extenuating circumstances.

(c) — Hot water supply boilers shall meet the requirements of CSD-1 for controls, local alarms, and safety devices. Boiler operator attendance shall be a maximum of every twelve hours for inspection and any required readings with the boilers in operation, and more often should there be other extenuating circumstances.

CHAPTER 5 FITTINGS & APPLIANCES

(A) — Fittings and appliances on new boilers or new unfired pressure vessels shall comply with the provisions relative thereto in the A.S.M.E. Boiler Construction Code, or of these regulations.

(B) — Where pressure reducing valves are used, one or more relief or safety valves shall be provided on the low pressure side of the reducing valve in case the piping or equipment on the low pressure side does not meet the requirements of the full initial pressure. The relief or safety valves shall be located adjoining to or as close as possible to the reducing valve. Proper protection shall be provided to prevent injury or damage caused by the escaping steam from the discharge of relief or safety valves if vented to the atmosphere. The combined discharge capacity of the relief valves shall be such that the safe working pressure of the lower pressure piping or equipment shall not be exceeded in case the reducing valve sticks in the open position.

(C) — The use of hand controlled by passes around reducing valves is permissible. The by pass if used around a reducing valve shall not be greater in capacity than the reducing valve unless the piping or equipment is adequately protected by relief valves or meets the requirements of the high pressure system.

(D) — The flange dimensions, wall thicknesses, and material of reducing and relief valves shall conform to the requirements specified for valves and fittings for the pressures and temperatures to which they may be subjected.

(E) — It is mandatory that a pressure gauge be installed on the low pressure side of the reducing valve.

(F) — WATER GLASSES

(1) — Each boiler shall have at least one water gauge glass except that boilers operated at pressures over 400 psi shall be provided with two water gauge glasses which may be connected to a single water column or connected directly to the drum. The gauge glass connections and pipe connection shall be not less than 1/2 in pipe size. Each water gauge glass shall be equipped with a valved drain.

(2) — The lowest visible part of the water gauge glass shall be at least 2 inches above the lowest permissible water level which level shall be that at which there will be no danger of overheating any part of the boiler when in operation at that level.

(3) — Boilers of the horizontal fire-tube type shall be so set that when the water is at the lowest reading in the water gauge glass there shall be at least 3 inches of water over the highest point of the tubes, flues or crown sheet.

(4) — Each water gauge glass shall be equipped with a top and a bottom shutoff valve of such through flow construction as to prevent stoppage by deposits of sediment and to indicate by the position of the operating mechanism whether they are in operation or closed position. If stopcocks are used, they shall be of a type with the plug held in place by a guard or gland. The pressure-temperature rating shall be at least equal to that of the lowest set pressure of any safety valve on the boiler

drum and the corresponding saturated steam temperature.

~~(5) — Straight run globe valves of the ordinary type shall not be used on such connection. Where water columns are seven feet or more above the floor level, adequate means for operating gauge cocks or blowing out the water glass must be provided.~~

~~(6) — When automatic shutoff valves are used, they shall conform to the requirements of the A.S.M.E. Code.~~

~~(7) — When shutoffs are used on the connections to a water column, they shall be either outside screw and yoke or leverlifting type gate valves or stop cocks with levers permanently fastened thereto and marked in line with their passage, or of such other through flow constructions to prevent stoppage by deposits of sediment and to indicate by the position of the operating mechanism whether they are in open or closed position; and such valves or cocks shall be locked or sealed open. Where stopcocks are used, they shall be of a type with the plug held in place by a guard or gland.~~

(G) — GAUGE COCKS

~~(1) — Gauge Cocks under the 1995 ASME Code are not required on new installations.~~

~~(2) — Boilers that have two water glasses located on the same horizontal lines are not required to have gauge cocks.~~

~~(3) — No outlet connections, except for control devices, drains, steam gauges or apparatus of such form which does not permit the escape of an appreciable amount of steam or water therefrom shall be placed on the pipes connecting a water column or gauge glass to a boiler.~~

(H) — STEAM GAUGES

~~(1) — Each boiler shall have a steam gauge connected to the steam space or to the water column or its steam connection. The steam gauge shall be connected to a syphon or equivalent device of sufficient capacity to keep the gauge tube filled with water and so arranged that the gauge cannot be shut off from the boiler except by a cock placed near the gauge and provided with a tee or level handle arranged to be parallel to the pipe in which it is located when the cock is open. For boilers carrying 500 lbs. pressure or over, valves may be used in place of cocks. Gauge connections which are filled with water at a temperature never greater than that of saturated steam at a pressure of 250 PSI or 460° F shall be of brass, copper, bronze or other non-corrosive composition suitable for the pressure and temperature conditions. Connections that are filled with steam or water of a temperature greater than that of saturated steam at a pressure of 250 PSI or 460° F shall be of steel pipe or of other material capable of safely withstanding the temperatures corresponding to the maximum allowable working pressure. Where steel or wrought iron pipe connections are used they shall be not less than 1 inch pipe size.~~

~~(2) — The wall thickness of all pipe connections shall comply at least with the requirements of the A.S.M.E. Code.~~

~~(3) — Where the use of a pipe longer than 10 ft becomes necessary, an exception may be made to the rule that the gauge must be arranged so that it cannot be shut off except by a cock placed near the gauge, and a shutoff valve or cock arranged so that it can be locked or sealed open may be used near the boiler. Such a pipe shall be of ample size and arrangement so that it may be cleared by blowing out.~~

~~(4) — The dial of the steam gauge shall be graduated to approximately double the pressure at which the safety valve is set but in no case to less than 1 1/2 times this pressure.~~

~~(5) — Each boiler shall be provided with a 1/4 inch pipe size valved connection for the exclusive purpose of attaching a test gauge when the boiler is in service, so that the accuracy of the boiler steam gauge can be ascertained.~~

(I) — VALVES

~~(1) — Each steam discharge outlet, except safety valve and super heater connections, shall be fitted with a stop valve located at an accessible point in the steam delivery line and as near the boiler nozzle as convenient and practicable. When such outlets are over 2 inch pipe size, the valve or valves used on the connection shall be of the outside screw and yoke rising spindle type so as to indicate at a distance by the position of its spindle whether it is closed or open and the wheel may be carried either on the yoke or attached to the spindle. A plug-cock type valve may be used provided the plug is held in place by a guard or gland, and it is equipped to indicate at a distance whether it is closed or open and it is equipped with a slow opening mechanism.~~

~~(2) — If a shutoff valve is used between the boiler and its superheater connections, the safety valve capacity on the boiler must comply with the requirements of the A.S.M.E. Pressure Vessel Code Section I PG-68, no credit being taken for the safety valve on the superheater, and the superheater must be equipped with a safety valve capacity as required by the A.S.M.E. Pressure Vessel Code. In a separately fired superheater installation, a stop valve is not required at the inlet or the outlet of the superheater.~~

~~(3) — All stop valves and the fittings between them and the boiler shall be equal at least to the requirements of~~

the American Standards given in the A.S.M.E. Code for the maximum allowable working pressure and the temperature in service and material used, subject to the provisions of the A.S.M.E. Code and except where heavier construction is specifically required. In all cases the valves and fittings shall be equal to the American Standard for 100 psi.

(4) — Valves and fittings made of any material permitted by the Code for pressure ratings of 100 lbs. or more, and marked as required by the Code, may be used for saturated steam service up to the rated pressure, except that in no case shall they be used for temperatures exceeding that permitted by the A.S.M.E. Code.

(5) — The nearest steam stop valve or valves to the superheater outlet shall have a pressure rating at least equal to the minimum set pressure of any safety valve on the boiler drum at the corresponding saturated steam temperature.

(6) — The nearest stop valve or valves to the superheater outlet shall have a pressure rating at least equal to the minimum set pressure of any safety valve on the superheater and at the expected superheated steam temperature; or at least equal to 85 percent of the lowest set pressure of any safety valve on the boiler drum at the expected steam temperature of the superheater outlet, whichever is greater.

(7) — When high or low pressure boilers are connected to a common steam main, the steam connection from each boiler having a manhole opening shall be fitted with two stop valves having an ample freeblow drain between them. The discharge of this drain shall be visible to the operator while manipulating the valve. The stop valves shall consist preferably of one automatic non return valve (set next to the boiler) and a second valve of the outside screw and yoke type; or two valves of the outside screw and yoke type shall be used.

(8) — When a second steam stop valve or valves is required, it shall have a pressure rating at least equal to that required for the expected steam temperature and pressure at the valve, or the pressure rating shall be not less than 85 percent of the lowest set pressure of any safety valve on the boiler drum and for the expected temperature of the steam at the valve, whichever is greater.

(9) — When a stop valve is so located that the water can accumulate, ample drains shall be provided. All drain lines, including pipes, fittings and valves, shall comply with the requirements for steam piping or water piping according to the service.

(J) — STEAM MAINS

(1) — Provisions 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.

(2) — Each superheater shall be equipped with at least one drain so located as to most effectively provide for the proper operation of the apparatus.

(K) — BLOWOFF PIPING

(1) — A blowoff as required herein is defined as a pipe connection provided with valves through which the water in the boiler may be blown out under pressure, excepting drains such as are used on water columns, gauge glasses or piping to feed water regulators, etc. used for the purpose of determining the operating condition of such equipment. Piping connections used primarily for continuous operation, such as deaerators on continuous blowdown systems, are not classed as blowoffs but the pipe connections and all fittings up to and including the first shutoff valve shall be equal at least to the pressure requirements for the lowest set pressure of any safety valve on the boiler drum and with the corresponding saturated steam temperature.

(2) — A surface blowoff shall 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 property designed steel busing, similar to or equivalent to those shown in the A.S.M.E. Code, or flanged connection shall be used.

(3) — Each boiler shall have a bottom blowoff pipe fitted with a valve or cock in direct connection with the lowest water space practicable.

(4) — The minimum size pipe and fittings shall be 1 inch and the maximum size shall be 2 1/2 inches. The minimum size of pipe and fittings may be 1/4 inch for boilers with 100 sq. ft of heating surface or less.

(5) — Straight run globe valves or valves that dams or pockets can exist for the collection of sediment, shall not be used on such connections.

(6) — Straightway "Y" type globe valves as shown in the A.S.M.E. Code or angle valves may be used in vertical pipes or horizontal runs of piping provided they are so constructed or installed that the lowest edge of the opening through the seat shall be at least 25 percent of the inside diameter below the center line of the valve.

(7) — Return connections of the same size or larger than the size herein specified may be used, and the blowoff

may be connected to them. In such case, the blowoff must be so located that the connection may be completely drained.

(8) — All integral economizers, waterwalls, or water screens forming parts of a steam boiler shall be equipped with drain or blowoff valves conforming to the requirements herein described.

(9) — 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.

(10) — The blowoff valve or valves and the pipe between them and the boiler shall be of the same size except where a larger pipe for the return of condensation is used, as described above.

(11) — All fittings between the boiler and valves shall be of steel for pressures not less than 125 psi.

(12) — In all cases the valves and fittings from the boiler to and including the required stop valves shall be equal at least to the requirements of the A.S.M.E. Code for pressure 1.25 times the maximum allowable working pressure of the boiler or 1.25 times the lowest set pressure of any safety valve on the boiler drum, except that for pressures not exceeding 100 psi, the valves and fittings shall be equal at least to the requirements of the American Standards given in the A.S.M.E. Code for 125 psi.

(13) — For pressure exceeding 100 psi, the valves shall, if of cast iron, be equal at least to the requirements of the American Standards for 250 lbs. as given in the A.S.M.E. Code; and if of steel construction shall be equal to the requirements of the American Standards as given in the A.S.M.E. Code.

(14) — For pressures over 200 psi, the valves or cocks shall be of steel construction equal at least to the requirements of the American Standard for 300 psi as given in the A.S.M.E. Code.

(15) — On all boilers, except those used for traction and/or portable purposes, when the allowable working pressure exceeds 100 psi, each bottom blowoff pipe shall have two slow opening valves or one slow opening valve and a quick opening valve or cock complying with the above requirements.

(16) — By "slow opening" valve is meant one which requires at least five 360 degree turns of the operating mechanism to change from full closed to full opening and vice versa.

(17) — 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. In this case either the master valve or the individual valves or cocks must be of the slow opening type.

(18) — Two independent slow opening valves, or a slow opening valve and a quick opening valve, or a cock may be combined in one body provided the combined fittings is the equivalent of two independent slow opening valves, or a slow opening valve and a quick opening valve, or a cock so that the failure of one to operate could not affect the operation of the other.

(19) — The drain or blowoff valves for waterwalls or water screens forming parts of a boiler shall conform to the requirements herein.

(20) — The bottom blowoff pipes of every traction and/or portable boiler shall have at least one slow opening or one quick opening blowoff valve or cock conforming to the above requirements.

(21) — A bottom blowoff pipe when exposed to direct furnace heat shall be protected by firebrick or other heat resisting material so arranged that the pipe may be inspected.

(22) — An opening in the boiler setting for a blowoff pipe shall be arranged to provide free expansion and contraction.

(L) — BLOWOFF TANKS

(1) — Blowoff piping as referred to herein, is defined as the piping connection fitted with valves through which water in a boiler may be blown out under pressure excepting blowoff used for the purpose of determining the operating conditions of water columns, gauge glasses, or piping to feed water regulators, etc.

(2) — These regulations do not contain details for all possible arrangements of boiler blowoff equipment. If a design of boiler blowoff equipment is not covered by these rules, a complete set of drawings of the arrangement of the blowoff equipment shall be submitted for approval to the Boiler Inspection Division before the blowoff equipment is installed.

(3) — These regulations do not contain rules for continuous blowdown systems but the general requirements under Sections I, II, and III of the National Board of Boiler and Pressure Vessel Inspectors must be met, no matter what arrangement of equipment is used.

(M) — BLOWDOWN PROCEDURE

The National Board regulations which follow are in three sections: General Rules, Rules for Single Unit for Reducing Temperature and Pressure, and Rules for Multiple Unit for Reducing Temperature and Pressure.

(1) — General Rules

(a) — The blowdown from a boiler or boilers that enter a sanitary 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 required hereinafter:

(b) — The temperature of the water leaving the blowoff equipment shall not exceed 150° F.

(c) — The pressure of the blowdown leaving any type of blowoff equipment shall not exceed 5 psi.

(d) — The blowoff piping shall comply with the A.S.M.E. Boiler Code.

(e) — All materials used in the fabrication of boiler blowoff equipment shall comply with the material section of the A.S.M.E. Boiler Code.

(f) — The blowoff equipment shall be fitted with openings to facilitate cleaning and inspection.

(2) — Single Unit

(a) — The rules of this section are not intended to apply to boiler blowoff tanks which are connected to boilers that operate at 400 psi and over.

(b) — When a single unit is used to lower the pressure and the temperature of the blowdown from a boiler, it shall be designed and operated in accordance with the rules of this section. The design of a single unit blowoff tank is shown in Figure 1 and Figure 2. In addition, openings shall be defined by ASME Code.

(c) — The tank or receiver used in a single unit shall be designed in the following manner:

(d) — The tank shall be of a volume equal to twice the volume of water removed from the boiler when the normal level is reduced not less than 4 inches.

(e) — The tank shall be fitted with a blowoff line inlet, water outlet, and a vent connection. The water outlet connection shall be connected to the tank so that the tank will remain half full of water after each blowdown. The blowoff line inlet shall be located between the water level in the tank and the top of the tank. It is recommended that blowdown enter tangential and that a wearing plate or baffles be placed in the tank to extend the life of the shell. The outlet connection shall have a water seal incorporated in its design. The vertical leg of the water seal shall extend to within 6 inches of the bottom of the tank. The top of this water seal shall have a 3/4 inch opening to act as a syphon breaker. The vent connection shall be located in the uppermost part of the tank and shall be open to the atmosphere without intervening valves and shall discharge at a point that is away from walkways and other adjacent property.

(f) — The size of the opening for the blowoff line inlet, water outlet, and vent shall have an area ratio of 1:1:5 (to the nearest pipe size). This ratio of openings is listed in Table 1 Page 98. When the limits of Table 1 are exceeded, Appendix 1 of the National Board Rules governing the construction and installation of blowoff tanks shall be used. (Copy of Appendix 1 may be obtained from National Board Headquarters, 1055 Crupper Ave, Columbus, Ohio). It is recommended that the openings in the shell of the tank for water outlet connection be made at least two pipe sizes larger than the blowoff inlet. This opening then shall be bushed to the size as shown in Table 1, (figure one). The tank shall be designed in accordance with Section VIII of the A.S.M.E. Boiler Construction Code. The tank shall be designed for a working pressure at least equal to the maximum working pressure of the boiler to which it is connected. In no case, however, shall the plate thickness be less than 1/4 inch.

(g) — The connections to the tank shall be designed so that freezing will not close the inlet, the outlet, or the vent. Piping between valve and tank should drain in the direction of the tank, and piping between outlet and sewer should drain toward the sewer. Where the above mentioned gravity drain cannot be obtained, a drain valve must be installed at the lowest point in the piping. It is recommended that these valves remain slightly cracked open when blowdown is not in operation.

(h) — The tank shall be fitted with the openings and appliances that are outlined below. The inspection openings shall be provided as required in the A.S.M.E. Unfired Pressure Vessel Code.

(i) — The tank shall be fitted with a pressure gauge graduated to read from 0 to 25 pounds pressure.

(j) — The tank shall be fitted with an opening for a thermometer well, located close to the water outlet connection and in contact with the retained water in the tank.

(k) — The tank shall be fitted with a gauge glass at least 1/2 inch diameter. The lower connection to the glass shall be made at a point about 6 inches below the water and the upper connection about 6 inches above the water line.

(l) — The tank shall be fitted with a drain connection which is at least 2 inch standard pipe size. It is recommended that the drain line contain fittings that will permit cleaning the line.

(m) — The tank shall be fitted with a cold water supply line which is at least 3/4 inch pipe size.

(n) — No boiler may be blown down into a blowoff tank which contains water at a temperature exceeding the room temperature unless it is fitted with a water cooling device as outlined hereinafter. When the temperature of the water in the tank exceeds room temperature, the temperature shall be reduced to room temperature before blowing down the

boiler.

(o) — If a blowoff tank is used in connection with a battery of boilers and it is desired to blowdown the boilers consecutively and not replace or cool the water in the tank after each blowdown, an automatic limit control water cooling or mixing device shall be attached to the tank or to the water discharge line so that cold water will be mixed with the blowdown water to reduce the temperature at or below 160° F. For proper cooling of the water leaving the blowoff tank, the rate of cooling water should be at least equal to three times the rate of water leaving the tank.

(p) — If during the operation of the blowoff tank the pressure is more than 5 pounds, additional vent area to the tank shall be provided.

(q) — If the tank is less than one-half full after the boiler is blown down, it shall be brought to the proper level before the next blowdown by adding water.

(r) — If during a blowdown the water seal level cannot be maintained, the water outlet line shall be reduced one pipe size. Operators are cautioned that a reduction of water outlet pipe size may cause an increase in pressure in the tank. If the tank pressure exceeds 5 psi, the vent pipe size shall be increased.

(s) — All scale and sediment that is blown from the boiler that does not remain in solution with the water will deposit in the bottom of the tank. Therefore, the tank shall be blown down periodically to prevent sediment accumulation to a point that would close off the outlet.

(3) — Multiple Units

(a) — Multiple units as used in this section of the boiler blowoff equipment regulations means that more than one tank or receiver is used in a boiler blowoff line for the purpose of reducing temperature and pressure of the blowdown.

(b) — Multiple unit systems usually consist of a receiver or separator which discharges into one or more additional receivers, heat exchanger, sump or cooling pond and then flows to sewer, river or pond.

(c) — The size of the tank or receiver must be at least equal to the volume of water removed from the boiler when the normal water level is reduced 4 inches.

(d) — The tank receiving the blowdown direct from the boiler shall be designed with blowoff inlet, water outlet, and vents. The size of these openings shall be such that the pressure in the tank or receiver will not exceed 5 psi. The tank shall be designed for a working pressure at least equal to the allowable pressure stamped on the boiler. In no case shall the plate thickness be less than 1/4 inch. Inspection openings shall be provided as required in the A.S.M.E. Unfired Pressure Vessel Code.

(e) — When multiple tanks are used, the gauge glass, thermometer well, and cooling water supply lines are not required.

(f) — The discharge from the first tank to the second unit shall be arranged so that it will not be a hazard to life and property. The final discharge of the water when entering a sanitary sewer shall not exceed 150° F.

(g) — When a steam separator is used it shall be designed to withstand at least twice the operating pressure of the separator and shall be equipped with a vent, inlet and outlet, and pressure gauge.

**TABLE 1
OPENING OF BLOWOFF TANKS
PIPE SIZE**

BOILER BLOWOFFLINE	WATER OUTLET	VENT
*3/4	3/4	2
1	1	2-1/2
1-1/4	1-1/4	3
1-1/2	1-1/2	4
2	2	5
2-1/2	2-1/2	6

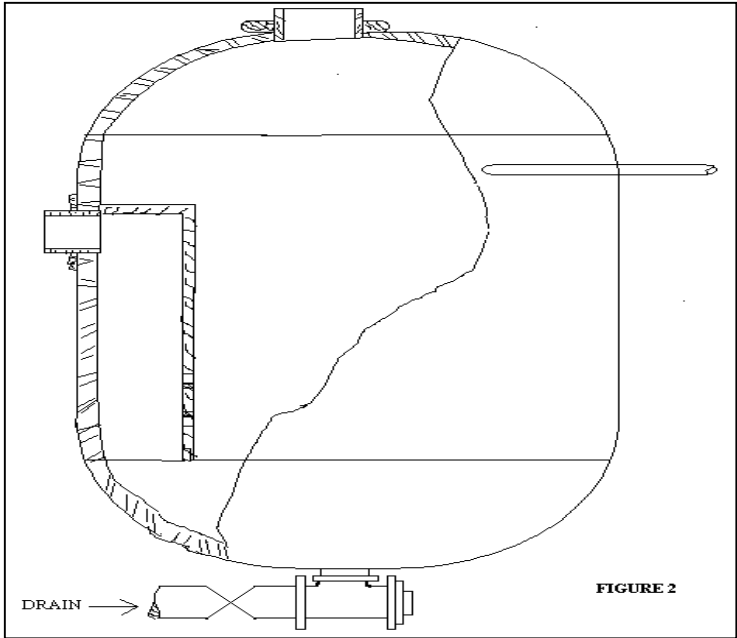
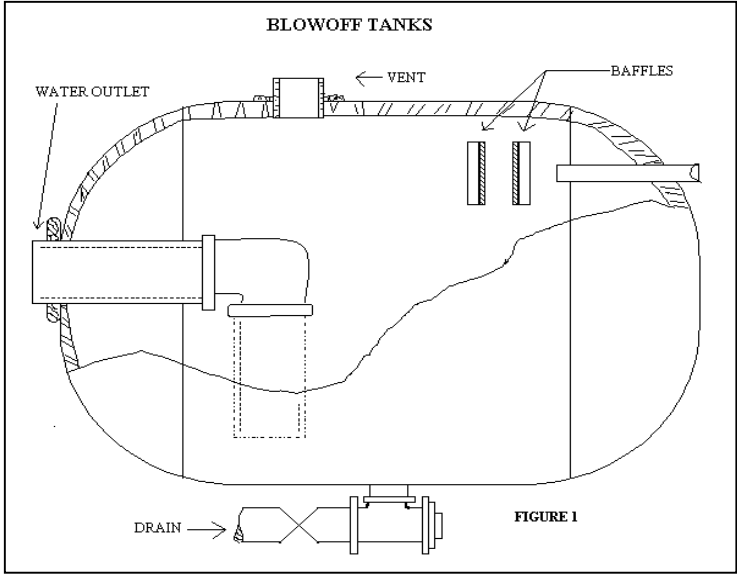
See Figures

TABLE EXPLANATION

From the blowoff column, pick the size of pipe which is the smallest size of pipe in the blowoff line from the boiler to the blowoff tank. The size of the water outlet and vent will be that as indicated on the same line of the table. Example: A boiler installation that has a 1 1/2 inch blowoff line from the drum to a 2 1/2 inch header which leads to the blowoff tank, the size of the water outlet and vent will be determined by the 1 1/2 inch size.

* To be used only with boilers of 100 sq. ft of heating surface or less.

Note: Vent size in the above table is based on the area of extra heavy pipe and is approximately 5 times the area of the blowoff line.



(N) FEED PIPING

(1) — The feedwater 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 any riveted joints of the furnace sheets or of the shell. For pressures of 400 lbs., or over, the feed water inlet through the drum shall be fitted with shields, sleeves or other suitable means to reduce the effects of temperature differentials in the shell or head. If necessary, the discharge end of a feed pipe shall be fitted with a baffle to divert the flow from the riveted joint. Feedwater, other than condensate returned as provided for in Blowoff Piping, shall not be introduced through the blowoff.

(2) — When the horizontal return tubular boiler exceeds 40 inches in diameter, the feedwater shall discharge at about three-fifths the length from that end of the boiler which is subjected to the hottest gases of the furnace (except a horizontal return tubular boiler equipped with an auxiliary feedwater heating and circulating device), above the central rows of tubes. The feed pipe shall be carried through the head or shall farthest from the point of discharge of the feedwater in the manner specified for a surface blowoff in the A.S.M.E. Code, and be securely fastened inside the shell above the tubes.

(3) — In vertical tubular boilers having tubes 4 ft or less in length, the feedwater shall be introduced at a point not less than one-fourth the length of the tube above the lower tube sheet. For tubes more than 4 ft in length, the feedwater shall be introduced at a point not less than 12 inches above the crown sheet. When the boiler is under pressure, feedwater shall not be introduced through the openings or connections used for the water column, the water gauge glass, the blowoff, or the gauge cocks. In closed systems the water may be introduced through any opening when the boiler is not under pressure.

(4) — In these and other types of boilers where both internal and external pipes making a continuous passage are employed, the boiler bushing or its equivalent shall be used.

(O) FEED PIPING CHECK VALVE REQUIREMENTS

(1) — The feed pipe shall be provided with a check valve near the boiler and a valve or cock between the check valve and the boiler, and when two or more boilers are fed from a common source, there shall also be a globe or regulating valve on the branch to each boiler between the check valve and the source of supply. A typical arrangement is shown in the A.S.M.E. Code. Wherever globe valves are used on feed piping, the inlet shall be under the disk of the valve.

(2) — When the supply line to a boiler is divided so as to feed a drum in more than one place or to feed more than one drum, it is recommended that each such branch line be equipped with a stop and check valve even though the common source is equipped as required above.

(3) — If a boiler is equipped with duplicate feed arrangements, each such arrangement shall be equipped as required by the rules.

(4) — A combination stop and check valve in which there is only one seat and disk, and a valve stem is provided to close the valve when the stem is screwed down, shall be considered only as a stop valve, and a check valve shall be installed as otherwise provided.

(5) — Where an economizer or other feedwater heating device is connected directly to a boiler without intervening valves, the feed valves and check valves required shall be placed on the inlet of the economizer or feedwater heating device.

(6) — Boilers having a water heating surface of not more than 100 sq. ft, the feed connection to the boiler shall not be smaller than 1/2 inch pipe size. For a water heating surface of more than 100 sq. ft, the feed connection to the boiler shall not be less than 3/4 inch pipe size.

High temperature water boilers shall be provided with a means of adding water to the boiler or to the system under pressure.

A forced flow steam generator with no fixed steam and waterline shall be provided with a source of feeding capable of supplying water to the boiler at a pressure not less than the expected maximum sustained pressure at the boiler inlet.

(P) SELECTION OF FEED PUMPS

(1) — In selecting boiler feed pumps, the fact that boilers are often operated two or three hundred percent of their rating should be taken into consideration. The figures as outlined in Table 2 are of the actual boiler horsepower developed, based on 34.5 pounds of evaporated per hour from and at 212° F.

**TABLE 2
REQUIREMENTS IN U.S.G.P.M. BOILER FEEDING**

BOILER HP	GPM	BOILER-HP	GPM
5	.345	350	24
10	.690	400	28
15	1.03	500	34
20	1.38	750	53
25	1.72	1000	69
30	2.07	1500	104
35	2.41	2000	138
40	3	2500	172
50	4	3000	207
75	5	3500	242
100	7	4000	276
150	10	4500	310
175	12	5000	345
200	14	10000	689
225	16	15000	1034
250	17	20000	1387
275	19	25000	1723
300	21	35000	2413

Boiler feed pumps should have pressure in excess of the boiler rated pressure in order to compensate for frictional losses, entrance losses, regulating valve losses, and normal static head, etc. However, for estimating purposes, the following are fair values for feed pumps differential:

_____ Boiler _____	_____ Boiler Feed Pump _____
_____ Pressure _____	_____ Discharge Pressure _____
_____ 200 _____	_____ 250 _____
_____ 400 _____	_____ 475 _____
_____ 800 _____	_____ 925 _____
_____ 1200 _____	_____ 1350 _____

(Q) FEEDWATER SUPPLY

(1) — A boiler having more than 500 sq. ft. of water heating surface shall have at least two means of feeding water. Each source of feeding shall be capable of supplying water to the boiler at a pressure of 3% higher than the highest setting of any safety valve on the boiler. For boilers that are fired with solid fuel not in suspension, and for boilers whose setting or heat source can continue to supply sufficient heat to cause damage to the boiler if the feed supply is interrupted, one such means of feeding shall not be susceptible to the same interruption as the other, and each shall provide sufficient water to prevent damage to the boiler.

A boiler fired by gaseous, liquid, or solid fuel in suspension may be equipped with a single means of feeding water, provided means are furnished for shutting off its heat input prior to the water level reaching the lowest permissible level.

(R) WATER FRONTS

Each boiler fitted with a water jacketed boiler furnace mouth protector, or similar appliance, having valves on the

pipes connecting them to the boiler, shall have these valves locked or sealed open. Such valves, when used, shall be of the straightway type.

(S) — WATER COLUMN PIPES

(1) — The minimum size of pipes connecting the water column to a boiler shall be 1 inch. For pressures of 400 lbs., or over, lower water column connections to drums shall be provided with shields, sleeves or other suitable means to reduce the effect of temperature differentials in the shells of heads. Waterglass fittings or gauge cocks may be connected direct to the boiler.

(2) — The design and materials of a water column shall comply with the requirements of the A.S.M.E. Code. Water columns made of cast iron in accordance with Specifications SA 48 may be used for maximum boiler pressures not exceeding 250 psi. Water columns made of malleable iron in accordance with Specification SA 47 may be used for maximum boiler pressures not exceeding 350 psi. For higher pressures, steel construction shall be used.

(3) — The steam and water connections to a water column or a water gauge glass, including all pipes, fittings, valves and drains, shall comply with requirements of the A.S.M.E. Code. These connections shall be such that they are readily accessible for internal inspection and cleaning. Some acceptable methods of meeting this requirement would be by providing a cross or fitting with a back outlet at each right angle turn to permit inspection and cleaning in both directions, or by using pipe bends or fittings of a type which does not leave an internal shoulder or pocket in the pipe connection and with a radius of curvature which will permit the passage of a rotary cleaner. 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 water column drain, an additional drain shall be placed on this connection in order that it may be blown off to clear any sediment from the pipe. The water column blowoff pipe shall be at least 3/4 inch pipe size.

(4) — When the gauge glasses and gauge cocks required above are not connected substantially directly to the shell or drum of a boiler, a water column shall be used into which the gauge glass and gauge cocks shall be connected, except as modified by the A.S.M.E. Code.

(5) — The lower edge of the steam connections to a water column and the boiler shall not be below the highest visible water level in the water gauge glass.

(6) — There shall be no sag or offset in the piping which will permit the accumulation of water.

(7) — The upper edge of the water connection to a water column and the boiler shall not be above the lowest visible water level in the gauge glass.

(8) — No part of this pipe connection shall be above the point of connection at the water column.

(9) — An acceptable arrangement is shown in the A.S.M.E. Code.

(T) — FUSIBLE PLUGS

(1) — A fusible plug, if used, shall be placed at the lowest safe water line and in contact with the products of combustion.

(2) — Any or all of the fittings and appliances required by these rules may be installed inside the boiler jackets provided the water gauge and try cocks on a steam boiler are accessible without the use of tools and provided the water gauge and pressure gauge on a steam boiler or the thermometer and pressure gauge on a water boiler are visible through an opening or openings at all times.

(U) — WASHOUT OPENINGS

All steam and hot water boilers shall be provided with suitable washout openings to permit the removal of any sediment that may accumulate therein. Washout openings may be used for return pipe connections and the washout plug placed in a tee so that the plug is directly opposite and as close as possible to the opening in the boiler.

**CHAPTER 6
SAFETY VALVES**

(A) — No person shall in any manner load the safety valve or relief valve to a greater pressure than that allowed in the Certificate of Inspection. Dead weight or weighted lever safety valves shall not be used. Each boiler shall have at least one safety valve and if it has more than 500 square feet of water heating surface it shall have two or more safety valves. The method of computing the steam generating capacity of the boiler shall be in compliance with the A.S.M.E. Code.

(B) — The safety valve capacity for each boiler shall be such that the safety valve or valves will discharge all the steam that can be generated by the boiler without allowing the pressure to rise more than 6 percent above the highest pressure at which any valve is set and in no case to more than 6 percent above the maximum allowable working pressure. The maximum steaming capacity of a boiler shall be determined by the manufacturer and shall be based on the capacity of the fuel burning equipment,

on the air supply, draft, etc.

(C) — One or more safety valves on the boiler proper shall be set at or below the maximum allowable working pressure. If additional valves are used the highest pressure setting shall not exceed the maximum allowable working pressure by more than 3 percent. The complete range of pressure settings of all the saturated steam safety valves on a boiler shall not exceed 10 percent of the highest pressure to which any valve is set.

(D) — All safety valves shall be so constructed that the failure of any part cannot obstruct the free and full discharge of steam from the valve. Safety valves shall be of the direct springloaded pop type, with seat inclined at any angle between 45 and 90 degrees, inclusive, to the center line of the spindle. The maximum rated capacity of a safety valve shall be determined by actual steam flow at a pressure of 3 percent in excess of that at which the valve is set to blow, and shall operate without chattering and shall be set and adjusted as follows: To close after blowing down not more than 4 percent of the set pressure but not less than 2 lbs. in any case.

For spring loaded pop safety valves for pressures between 100 and 300 psi, both inclusive, the blowdown shall be not less than 2 percent of the set pressure. To insure the guaranteed capacity of satisfactory operation, the blowdown as marked upon the valve shall not be reduced.

(E) — Safety valves used on forced circulation boilers of the once through type may be set and adjusted to close after blowing down not more than 10 percent of the set pressure. The valve for this special use must be so adjusted and marked by the manufacturer.

(F) — The blowdown adjustment shall be made and sealed by the manufacturer.

(G) — The popping point tolerance plus or minus shall not exceed the following: 2 lbs. for pressures up to and including 70 lbs.; 3 percent for pressures from 71 to 300 lbs.; and 10 lbs. for pressures over 300 lbs.

(H) — Each safety valve shall be plainly marked by the manufacturer in such a way that the markings will not be obliterated in service. The markings may be stamped on the casing or stamped or cast on a plate or plates securely fastened to the casing, and shall contain the following markings:

(1) — The name or identifying trademark of the manufacturer.

(2) — Manufacturer's design or type number.

(3) — Size _____ in. Seat Diameter _____ in. (The pipe size of the valve inlet)

(4) — SET Pressure _____ lb. (The steam pressure at which it is to blow)

(5) — Capacity _____ lb. per hr. (As stated above and with the valve adjusted to the blowdown given in the preceding item)

(6) — Capacity Lift _____ in. (Capacity lift: The distance the valve disc rises under the action of the steam when the valve is blowing under a pressure of 3 percent above set pressure)

(7) — Year Built _____

(8) — A.S.M.E. Symbol as shown in the A.S.M.E. Code

(I) — If the safety valve capacity cannot be computed or if it is desirable to prove the computations, it may be checked in any one of the three following ways, and if found insufficient, additional capacity shall be provided:

(1) — By making an accumulation test, that is, by shutting off all other steam discharge outlets from the boiler and forcing the fires to the maximum. The safety valve equipment shall be sufficient to prevent an excess pressure beyond that specified previously.

(2) — By measuring the maximum amount of fuel that can be burned and computing the corresponding evaporative capacity upon the basis of the heating value of the fuel as outlined in the A.S.M.E. Code for Power Boilers.

(3) — By determining the maximum evaporative capacity by measuring the feedwater. The sum of the safety valve capacities marked on the valves shall be equal to or greater than the maximum evaporative capacity of the boiler.

(J) — All firms that are in the business of repairing safety or temp/relief valves shall be qualified and hold a VR certificate of authorization from the National Board. Each firm engaged in the repair of safety valves shall be registered and licensed by the state.

(K) — Any firm or corporation operating within the state, that has their own qualified personnel and quality control program may repair and reset their own valves. Each firm or corporation shall submit a copy of their Q.C. Program to the Boiler Inspection Division.

(L) — When two 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 valves having two valves in the same body casing. Twin valves made by placing individual valves on Y bases, or duplex valves having two valves in the same body, shall be of equal size.

(M) — When not more than two valves of different sizes are mounted singly, the relieving capacity of the smaller valve

shall be not less than 50 percent of that of the larger one.

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

(O) — The opening or connection between the boiler and the safety valve shall have at least the area of the valve inlet. In the case of fire tube boilers, the openings in the boilers for safety valves shall not be less than in the A.S.M.E. Code (except fire tube boiler used for waste heat purposes only, and which are not equipped for direct firing. This type boiler need not meet the requirements of the Code provided the rated steam capacity is stamped on the boiler and safety valves of the required relieving capacity are supplied so that the provisions of page 82 paragraph 2 are satisfied). No valve of any description shall be placed between the required safety valve or 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 valve outlet or of the total of the areas of the valve outlets discharging therein and shall be as short and straight as possible and so arranged as to avoid undue stresses on the valve or valves.

(P) — All safety valve discharges shall be so located or piped as to be carried clear from the running boards or platforms. Ample provisions for gravity drain shall be made in the discharge pipe at or near each safety valve, and where water or condensation may collect. Each valve shall have an open gravity drain through the casing below the level of the valve seat. For iron and steel bodied valves exceeding 2 in size, the drain hole shall be tapped not less than 3/8 in pipe size.

(Q) — If a muffler is used on a safety valve it shall have sufficient outlet area to prevent back pressure from interfering with the proper operation and discharge capacity of the valve. The muffler plates or other devices shall be so constructed as to avoid any possibility of restriction of the steam passages due to deposit.

(R) — When a boiler is fitted with two or more safety valves on one connection, this connection to the boiler shall have a cross sectional area not less than the combined areas of inlet connections of all the safety valves with which it connects and shall also meet the requirements as stated on page 86 paragraph 3.

(S) — SUPERHEATER SAFETY VALVES

(1) — Every attached superheater shall have one or more safety valves near the outlet. If the superheater outlet header has a full, free steam passage from end to end and is so constructed that steam is supplied to it at practically equal intervals throughout its length so that there is a uniform flow of steam through the superheater tubes and the header, the safety valve or valves may be located anywhere in the length of the header.

(2) — The discharge capacity of the safety valve or 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 valve or valves on the boiler, as distinct from the superheater, is at least 75 percent of the aggregate valve capacity required.

(3) — Every independently fired superheater which may be shut off from the boiler and permit the superheater to become a fired pressure vessel shall have one or more safety valves having a discharge capacity equal to 6 lbs. of steam per square foot of superheater surface measured on the side exposed to the hot gasses. The number of safety valves installed shall be such that the total capacity is at least equal to that required.

(4) — A soot blower connection may be attached to the same outlet from the superheater that is used for the safety valve connection.

(5) — Every safety valve used on a superheater discharging superheated steam at a temperature over 450° F. shall have a casing, including the base, body, bonnet, and spindle of steel, steel alloy or equivalent heat resistant material. The valve shall have a flanged inlet connection and shall have the seat and disk of suitable heat erosive and corrosive-resisting material, and the spring fully exposed outside of the valve casing so that it shall be protected from contact with the escaping steam.

(6) — Every superheater shall have adequate means of supplying sufficient steam circulation when equipment using superheated steam is out of operation or main steam valve is closed.

(7) — Every boiler shall have proper outlet connections for the required safety valve or valves independent of any other outside steam connection, the area of opening to be at least equal to the aggregate areas of inlet connections of all of the safety valves to be attached thereto. 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 connection of the attached safety valves. The holes in such collecting 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.

(8) — Such dimensional limitations to operations for steam need not apply to steam scrubbers or driers provided

the net free steam inlet area of the scrubber or dryer is at least 10 times the total area of the boiler outlets for the safety valves.

(9) — If safety valves are attached to separate steam drum or dome, the opening between the boiler proper and the steam drum or dome shall be not less than required above.

CHAPTER 7 REPAIRS

(A) — MAJOR REPAIRS — NOTICE TO DEPARTMENT

(1) — All persons, firms or corporations engaged in the repair of boilers and/or pressure vessels shall be licensed by the Boiler Inspection Division.

(2) — Each person, firm or corporation shall submit documentation to the Boiler Inspection Division concerning their qualifications to repair boilers according to State and National Board Rules and Regulations.

(3) — Each firm or corporation shall have a written Quality Control Program. The Q.C. Program shall be comprised of all planned and systematic actions necessary to provide adequate assurance that the boiler or pressure vessel will be installed or repaired in accordance with the applicable section of the A.S.M.E., State Boiler Inspection Code and National Board Inspection Code, latest edition, covering repairs and/or alterations.

(4) — All welders and welding operators shall be qualified in accordance to A.S.M.E. Section IX, "Welding and Brazing Qualifications."

(5) — Each firm or corporation that intends to make weld repairs on boilers or pressure vessels shall submit written documentation to verify that they have a Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR). Performance qualification documentation as per ASME Section IX.

(6) — The department, either directly or through an authorized inspector, shall be notified of any contemplated major repairs to a boiler or pressure vessel. The repair firm or corporation as well as the owner or user of the vessel may give the aforementioned notice to the division before repair work is started and after it is completed.

(7) — All repairs shall be made to comply with the recommendations and standards specified by the Boiler Inspection Division.

(a) — Companies, firms, and/or businesses that wish to perform repairs or alterations on ASME constructed pressure vessels, or within the vessels code boundaries, must have in place a written Quality Control system acceptable to the department, and/or have authorization from the ASME or National Board to perform such repairs or alterations. In all cases, the department must be notified prior to starting repairs or alterations.

(b) — The original construction code of the vessel shall be used for any repairs or alterations. When this is not possible, it is permissible to use other codes, standards, or specifications, including the ASME code provided the repair firm has the concurrence of the inspector and the department.

(c) — The inspector's authorization to do repairs or alterations must be obtained prior to starting, and this inspector shall do the final acceptance inspection of the repair or alteration. In all cases, the inspector shall be an employee of the original organization or an inspector authorized by the department.

(B) — REPAIRS — MATERIALS AND WORKMANSHIP

(1) — When repairs of any nature are made on a boiler the materials used in such repairs shall be only materials recommended by the A.S.M.E. Code for new boilers, and the Division shall be furnished satisfactory evidence that this provision has been fully complied with. The workmanship must be of a quality that will pass inspection by an inspector from the Division, or by an authorized insurance inspector whose opinion shall be subject to the approval or disapproval of the Chief Boiler Inspector.

(2) — All welded repairs shall be made to conform to the recommended procedures outlined in the National Board Inspection Code. A Code book covering repairs by welding may be obtained from the National Board of Boiler and Pressure Vessel Inspectors, 1055 Crupper Ave, Columbus, Ohio 43229.

(3) — No welding of any type shall be performed on any boiler or unfired pressure vessel until permission is granted by the Boiler Inspection Division. All welding shall be performed in accordance with the above mentioned pamphlet.

(4) — The shell or drum of a boiler in which a typical "lap seam crack" is discovered along a longitudinal riveted joint, either butt joint or lap joint, shall be permanently discontinued for use under pressure. "Lap seam crack" means the typical crack frequently found in lap seams extending parallel to the longitudinal joint and located either between or adjacent to rivet holes.

(5) — The maximum allowable working pressure on a water tube boiler, the tubes of which are secured to cast iron or malleable iron headers or which have cast iron and mud drums, shall not exceed 160 pounds per square inch.

(C) — REPAIRS — PATCH

(1) — When damage or injury to a boiler is of a nature which apparently necessitates the use of a patch, the Division or an authorized inspector shall be consulted before work is started on the patch so that one of the proper design may be prescribed to avoid a possible reduction in the approved pressure. All patches shall be designed and installed to comply with National Board requirements.

(2) — Any person or persons who shall make or cause the repair, installation, or sale of a boiler that does not comply with the standards and regulations as set out in this Act shall be guilty of a felony and upon conviction thereof shall be punished by fine in any sum of not less than one hundred dollars (\$100) nor more than five hundred dollars (\$500), and in addition, may be imprisoned for not more than three (3) years, or both.

(D) — TUBES

(1) — When the tubes are removed from any firetube boiler for the purpose of retubing the boiler, the Division shall be notified by the owner, user, and/or the workman performing such work, so that inspection can be made of the internal surface of the shell by a State Inspector or an Authorized Insurance Inspector while the tubes are out of the boiler, and the boiler may be approved before new tubes are applied.

(2) — A fire tube boiler shall have the ends of the tubes firmly rolled and beaded, or rolled, beaded, and welded around the edge of the bead. Where the tubes do not exceed 1 ½ inches in diameter, the tube sheet may be beveled or recessed to a depth at least equal to the thickness of the tubes and the tubes rolled into place and welded. In no case shall the tube end extend more than 3/8 inch beyond the tube sheet.

(3) — Tube ends not subjected to direct radiant heat of the furnace may be rolled and seal welded without beading, provided that:

(a) — The tube ends extend not less than ¼ inch nor more than 5/16 inch through the tube sheet.

(b) — The throat of the seal weld is not less than 3/16 inch, nor more than 5/16 inches.

(4) — After welding, the tubes are re-expanded.

(5) — In the case of tubes not exceeding 1 ½ inches in diameter, they may be expanded by the Prosser method instead of rolling. If tubes larger than 1 ½ inches in diameter are expanded by the Prosser method, the work shall be completed as required above.

(6) — The ends of all tubes, suspension tubes, and nipples shall be expanded and flared not less than 1/8 inch over the diameter of the tube hole on all water tube boilers and superheaters, or they may be flared not less than 1/8 inch, rolled and beaded, or flared, rolled and welded (except as provided in the A.S.M.E. Code), or rolled and seal welded without flaring, provided the throat of the seal weld is not less than 3/16 inch, nor more than 3/8 inch, and the tubes are re-expanded after welding.

(7) — Tube ends or welded necks may be fusion welded to the drums of water tube boilers without expanding or flaring, provided the materials and welding comply with requirements of the A.S.M.E. Code, except that the test plate requirements may be omitted, and the connections comply with the requirements of the A.S.M.E. Code.

(8) — Where pipe as provided in the A.S.M.E. Code is used for tubes in water tube boilers, it may be screwed instead of rolled and flared, and the minimum number of threads shall conform to the requirements of the A.S.M.E. Code. The ends of stub tubes may be closed by either forge or fusion welding.

(9) — Tubes may be seal welded into fittings or headers for both boilers and superheaters after they have been expanded and flared, provided the materials in the fittings or headers complies with the A.S.M.E. Code.

(10) — The ends of all tubes, suspension tubes, and nipples of water tube boilers and superheaters shall project through the tube sheets or headers not less than 1/4 inch nor more than 1/2 inch before flaring. Where the tubes enter at an angle, the maximum limit of 1/2 inch shall apply only at the point of least projection.

(11) — Re ending of tubes in fire tube boilers is permissible provided the Division is notified and if after inspection it is found the remaining tube wall is not less than 75 percent of the original thickness, and providing further that the welding is performed in compliance with National Board rules.

(12) — Piecing or replacement of section of tubes or pipes in water tube boilers is permissible, provided the remaining tube or pipe wall is not less than 75 percent of the original thickness, and that the welder is certified.

(13) — Repairing of bulges in tubes in water tube boilers is permissible when the area to be repaired does not exceed 2 inches in maximum dimension and there are not more than three such repairs in any one tube.

**CHAPTER 8
BOILERS**

Subchapter 1. GENERAL PROVISIONS

(A) — Boilers are vessels in which water is heated and/or steam is generated, and shall be classified as defined by the several sections of the A.S.M.E. Boiler Construction Code.

(B) — Horizontal Return Tubular boilers externally fired of lap joint construction exceeding 36 inches in diameter or any horizontal longitudinal joint exceeding 12 feet in length shall not be installed or reinstalled.

(C) — The factor of safety on all second hand boilers moved into Arkansas from another state shall be determined at the time of the inspection and a complete report containing all construction data shall be submitted to the Division for approval. All such boilers must be constructed in compliance with the A.S.M.E. Code and bear National Board Stamping.

(D) — The flat surface of boilers or pressure parts shall be stayed in accordance with the requirements of the A.S.M.E. Boiler Construction Code for power boilers.

(E) — The furnace and setting shall be provided with sufficient openings to permit inspection and repairs. All boilers having an external width of over 36 inches shall have not less than 18 inches clearance between the bottom of the boiler and the floor line, with access for inspection. When the width is 36 inches or less, the distance between the bottom of the boiler and the floor line shall be not less than 6 inches.

(F) — Boilers installed after effective date of this regulation shall be isolated from employees and the general public with a reinforced concrete block wall of not less than 8 inches in thickness, 6 feet in height; the length of such wall shall be governed by the size and positioning of the boiler, but should surround the boiler, leaving adequate openings for entry into the boiler space.

(G) — All boilers shall be located so that adequate space will be provided on all sides for the proper operation of the boiler and its appurtenances, for the inspection of all surfaces, tubes, water walls, economizers, piping, valves and other equipment and for their necessary maintenance and repair.

(H) — All boilers, whether gas, oil or mechanically fired, shall be provided with an automatic low water fuel cutout so located as to automatically cut off the fuel supply in case the water level falls to a point not lower than the bottom of the water glass.

(I) — Where boilers are gas fired, the burner shall in such cases be equipped with a fuel regulating governor which shall be automatically regulated by steam pressure. This governor shall be constructed so that in the event of its failure there can be no possibility of steam from the boiler entering the gas chamber or supply pipe. A manual stop cock or throttle valve shall be located in the inlet pipe ahead of the fuel regulating governor. A safety ignition pilot shall be installed on all automatically fired boilers of this type.

(J) — The gas train and boiler controls shall comply with ANSI/ASME CSD 1.

(K) — "State Specials" can be any boiler or fired/unfired pressure vessel of any type or size, which carries neither the ASME symbol nor National Board stamping, and which has otherwise been proven acceptable to the Chief Boiler Inspector and assigned an Arkansas state number.

(L) — All steam boilers shall have installed an audible alarm system to work in union with their other operating control devices, unless the boiler is operated under constant attendance by a boiler operator.

Subchapter 2. HEATING BOILERS

(A) — EXPANSION TANKS.

(1) — If the system is equipped with an open expansion tank, an internal overflow from the upper portion of the expansion tank must be provided in addition to an open vent, the internal overflow to be carried within the building to a suitable plumbing fixture or to the basement. If the system is of the closed type, an airtight tank or other suitable air cushion must be installed that will be consistent with the volume and capacity of the system.

(2) — If a system is equipped with a check valve or pressure reducing valve in the cold water inlet line, consideration should be given to the installation of an airtight expansion tank or other suitable air cushion. Otherwise, due to the thermal expansion of the water, the safety relief valve may lift periodically. If an expansion tank is provided, it shall be constructed in accordance with Section VIII Division 1, for a maximum allowable working pressure equal to or greater than the water heater. Except for prepressurized tanks, provisions shall be made for draining the tank without emptying the system.

Expansion Tank Capacities for Gravity Hot Water Systems

Based on two pipe system with average operating water temperature 170° F, using cast iron column radiation with heat emission rate 150 Btu/hr sq ft equivalent direct radiation

Installed Equivalent Direct Radiation, sq ft [Note (1)]	Tank Capacity, gal
Up to 350	18
Up to 450	21
Up to 650	24
Up to 900	30
Up to 1100	35
Up to 1400	40
Up to 1600	2-30
Up to 1800	2-30
Up to 2000	2-35
Up to 2400	2-40

NOTE: For systems with more than 2400 sq ft of installed equivalent direct water radiation, the required capacity of the cushion tank shall be increased on the basis of one gallon tank capacity per 33 sq ft of additional equivalent direct radiation.

Expansion Tank Capacities for Forced Hot Water Systems

Based on average operating water temperature 195° F, fill pressure 12 psig, and maximum operating pressure 30 psig

System Volume, gal	Tank Capacities, gal	
	Prepressurized Diaphragm Type	Nonprepressurized Type
100	9	15
200	17	30
300	25	45
400	33	60
500	42	75
1000	83	150
2000	165	300

NOTE: System volume includes volume of water in boiler, radiation, and piping, not including the expansion tank. Expansion tank capacities are based on an acceptance factor of 0.4027 for prepressurized types and 0.222 for nonprepressurized types. A procedure for estimating system volume and determining expansion tank sizes for other design conditions may be found in Chapter 13 of the 1987 Systems and Applications Volume of the ASHRAE Handbook.

(B) — Steel boilers shall be subjected to a regular internal and external inspection, and cast iron boilers to a general inspection.

(C) — The return water connections to all low pressure steam heating boilers supplying a gravity return heating system shall be so arranged as to form a loop substantially as shown in Section 4 of the A.S.M.E. Boiler Construction Code, the bottom of the return pipe close nipple where it enters the equalizing loop being at the same level as the top of the lower water gauge glass nut. Equalizing pipe sizes shall not be less than the following:

GRATE AREA	EQUALIZING PIPE INCHES
Under 4 sq. ft	1-1/2
4 to 15 sq. ft	2-1/2
15 sq. ft and over	4

(D) — Provisions shall be made for cleaning the interior of the return piping at or close to the boiler.

(E) — When a stop valve is used in the supply pipe connection of a single boiler, there shall be one used in the return pipe connection. When stop valves over 2 inches in size are used, they shall be of the outside screw and yoke rising spindle type or of such type as to indicate at a distance by the position of its spindle or other operating mechanism whether it is closed or open, and the wheel may be carried either on the yoke or attached to the spindle. If the valve is of the plug cock type it must be fitted with a slow opening mechanism and an indicating device, and the plug must be held in place by a guard or gland. When stop valves are used, they shall be properly designated substantially as indicated by the following tags of metal or other durable material fastened to them:

Supply Valve Number (—) Do Not Close Without Also Closing Return Valve— Number (—)	Return Valve Number (—) Do Not Close Without Also Closing Return Valve— Number (—)
---------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------

(F) — A stop valve shall be used in each supply and return pipe connection of two or more boilers connected to a common system.

(G) — Any cross connection between two or more boilers shall have a stop valve in the supply line with a stop valve and a check valve in each return line.

(H) — If a boiler may be closed off from the heating system by closing a steam stop valve, there shall be a stop valve and check valve in the condensate return line between the boiler and the system.

(I) — If any part of a heating system may be closed off from the remainder of the system by closing a steam stop valve, there shall be a stop valve and a check valve in the condensate return pipe from that part of the system.

(J) — When a valve is placed in the top connection from a hot water supply boiler to a storage tank, an additional connection without valve shall be made between the boiler and top storage tank.

(K) — When two or more boilers are connected to a common steam header, the connection from each boiler having a manhole opening shall be fitted with two stop valves and having an ample free blow drain between them, the drain shall be installed such that its discharge is visible to the boiler operator standing in front of the boiler.

(L) — Should a situation arise which is not covered by this Code, the ASME Code Section One (I) for Power Boilers and Section Four (IV) for Heating Boilers shall be consulted. Should Section Four (IV) for Heating Boilers not cover the situation, Section One (I) shall be consulted, even though the object may come under Section Four (IV).

(M) — FEEDWATER CONNECTIONS.

(1) — Feedwater connections shall be independent of any water gauge connections and it is recommended that the connection be made to the condensate return pipe or reservoir of the condensate return pump. There should be a stop valve and a check valve in the feedwater line of the boiler.

(2) — Feed or make-up water shall not be discharged directly into any part of the boiler exposed to the direct radiant heat of the fire.

(3) — A by pass shall be provided around any pump or trap.

(4) — Feedwater shall not be introduced through the openings or connections used for the water column, the water gauge, or the gauge cocks.

(5) — The boiler feed line shall be adequate to take care of the maximum demand of the boiler.

(6) — A manual by pass shall be provided around any feedwater pressure reducing regulator on all hot water heating boilers.

(7) — Each boiler equipped with a condensate return pump, where practicable, shall be provided with a water level control arranged to automatically maintain the water level in the boiler within the range of the gauge glass.

(8) — Hot water heating and hot water supply boilers shall have a flow switch installed to detect loss of water

flow through the boiler. It shall be so located in the line that it cannot be isolated from the boiler through valve manipulation.

(N) — BOTTOM BLOWOFF

(1) — Each boiler shall have one or more blowoff pipe connections fitted with straightaway valve or cocks of not less than 3/4 inch pipe size connected directly with the lowest water space and so located that the discharge shall not constitute a hazard.

(2) — All washout plugs and hand hole openings shall be accessible and shall not be obstructed in any way.

(3) — All hot water heating systems shall be so installed that there will be no opportunity for the fluid relief column to freeze or to be accidentally shut off.

(O) — SAFETY VALVES

(1) — Each steam boiler shall have one or more safety valves of the spring pop type adjusted and sealed to discharge at a pressure not to exceed 15 psi. Seals shall be attached in a manner to prevent the valve from being taken apart without breaking the seal. The safety valves shall be arranged so that they cannot be reset to relieve at a higher pressure than the maximum allowable working pressure of the boiler.

(2) — Each safety valve 3/4 inch or over, used on a steam heating boiler, shall have a substantial device which will positively lift the disk from its seat at least 1/16 inch when there is no pressure on the boiler. The seats and disks shall be of suitable material to resist corrosion.

(3) — No safety valve for a steam boiler shall be smaller than 3/4 inch except in case the boiler and radiating surfaces are a self contained unit. No safety valve shall be larger than 4 1/2 inch. The inlet opening shall have an inside diameter approximately equal to, or greater than, the seat diameter.

(P) — RELIEF VALVES

(1) — Each hot water heating or hot water supply boiler shall have one or more 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 and so arranged that they cannot be reset to relieve at a higher pressure than the maximum allowable working pressure of the boiler.

(2) — Each relief valve shall have a substantial device which will positively lift the disk from its seat at least 1/16 inch when there is no pressure on the boiler.

(3) — The seats and disks shall be of material suitable to resist corrosion. No materials liable to fail due to deterioration of vulcanization when subjected to any temperature not exceeding 250° F. shall be used for any part.

(4) — No relief valve shall be smaller than 3/4 inch nor larger than 2 inch standard pipe size. The inlet opening shall have an inside diameter approximately equal to, or greater than, the seat diameter.

(Q) — INSTALLATION OF SAFETY AND RELIEF VALVES

(1) — Safety valves shall be connected to boilers, with the spindle vertical if possible, either directly to a tapped or flanged opening in the boiler, to a fitting connected to the boiler by a close nipple, to a Y base, to a valveless steam pipe between adjacent boilers, or to a valveless header connecting steam outlets on the same boiler.

(2) — Relief valves shall be connected to the top of boilers, with a spindle vertical if possible, either directly to a tapped or flanged opening in the boiler, to a fitting connected to boiler by a close nipple, to a Y base, to a valveless water pipe between adjacent boilers, or to a valveless header connecting water outlets on the same boiler.

(3) — When a Y base is used the inlet area shall be not less than the combined outlet areas.

(4) — When the size of the boiler requires a safety valve larger than 4 1/2 inches in diameter or a relief valve larger than 2 inches in diameter, two or more valves having the required combined capacity shall be used. When two or more valves are used on a boiler, they may be single, directly attached, or mounted on a Y base.

(5) — No shutoff of any description shall be placed between the safety or relief valve and the boiler, nor on discharge pipes between such valves and the atmosphere. Safety and relief valves shall not be connected to an internal pipe in the boiler.

(6) — When a discharge pipe is used, its area shall be not less than the area of the valve or aggregate area based on the nominal diameters of the valves with which it connects, and the discharge pipe shall be fitted with an open drain to prevent water from lodging in the upper part of the valve or in the pipe. When an elbow is placed on a safety or relief valve discharge pipe, it shall be located close to the valve outlet. The pipe shall be supported so that no undue stress is placed on the valve body. The discharge from safety or relief valves shall be so arranged that there will be no danger of scalding attendants.

(R) — STEAM GAUGES

(1) — Each steam boiler shall have a steam gauge connected to its steam space, or to its water column, or to its steam connection by means of a siphon or equivalent device exterior to the boiler and of sufficient capacity to keep the gauge

tube filled with water and so arranged that the gauge cannot be shut off from the boiler except by a cock with tee or lever handle, placed in the pipe near the gauge. The handle of the cock shall be parallel to the pipe in which it is located when the cock is open.

(2) — The scale on the dial of a steam boiler gauge shall be graduated to not less than 30 pounds. The gauge shall be provided with effective stops for the indicating pointer at the zero point and at the maximum pressure point. The travel of the pointer from zero to 30 pounds pressure shall be at least 3 inches.

(3) — Connections to steam gauge siphons shall be of nonferrous metal when smaller than 1-inch pipe size and longer than 5 feet between the siphon and point of connection of pipe to boiler, and also when smaller than 1/2-inch pipe size and shorter than 5 feet between the siphon and point of connection of pipe to boiler.

(4) — On a compound gauge, effective stops shall be set at the limits of the gauge readings on both the pressure and vacuum sides.

(S) — PRESSURE OR ALTITUDE GAUGES

(1) — Each hot water boiler shall have a pressure or altitude gauge connected to it or to its flow connection in such a manner that it cannot be shut off from the boiler except by a cock with tee or lever handle, placed on the pipe near the gauge. The handle of the cock shall be parallel to the pipe in which it is located when the cock is open. It is recommended that this gauge be of the pressure type with its equivalent in altitude feet indicated.

(2) — The scale on the dial of the pressure or altitude gauge shall be graduated to not less than 1 1/2 times the maximum allowable working pressure. The gauge shall be provided with effective stops for the indicating pointer at the zero point and at the maximum pressure point.

(3) — Pressure or altitude gauge connections shall be of nonferrous composition when smaller than 1-inch pipe size and longer than 5 feet between the gauge and point of connection of pipe to boiler, and also when smaller than 1/2-inch pipe size and shorter than 5 feet between the gauge and point of connection of pipe to boiler.

(T) — THERMOMETERS

Each hot water boiler shall have a thermometer so located and connected that it shall be easily readable when observing the water pressure or altitude. The thermometer shall be so located that it shall at all times indicate the temperature in degrees Fahrenheit of the water in the boiler at or near the outlet.

(U) — TEMPERATURE - COMBUSTION REGULATORS

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 heating and hot water supply boilers. All hot water heating and hot water supply boilers automatically fired must be equipped with an automatic device to automatically control the rate of combustion.

(V) — PRESSURE COMBUSTION REGULATORS

When a pressure combustion regulator is used, it shall operate to prevent the steam pressure from rising above 15 pounds. All automatically fired boilers shall be equipped with an automatic pressure control.

(W) — WATER GAUGE GLASSES

Each steam boiler shall have one or more water gauge glasses attached to the water column or boiler by means of valved fittings, with the lower fitting provided with a valve or pet cock to facilitate cleaning. Gauge glass replacement shall be possible under pressure. (Transparent material other than glass may be used for the water gauge provided that material has proved suitable for the pressure, temperature and corrosive condition met with in service.)

(X) — GAUGE COCKS

Each steam boiler shall have two or more gauge cocks located within the range of the visible length of the water glass.

(Y) — WATER COLUMN PIPES

The minimum size of ferrous or nonferrous pipes connecting a water column to a steam boiler shall be 1-inch. No outlet connections, except for damper regulator, feedwater regulator, steam gauges, or apparatus which does not permit the escape of any steam or water except for manually operated blowdowns, shall be attached to a water column or the piping connecting a water column to a boiler. (See HG 705 of Section IV of the A.S.M.E. Code for introduction of feedwater into a boiler.) If the water column, gauge glass, low water fuel cutoff, or other water level control device is connected to the boiler by pipe and fittings, no shutoff valves of any type shall be placed in such pipe, and a cross tee, or equivalent fitting, to which a drain valve and piping may be attached, shall be placed in the water piping connection at every right angle turn to facilitate cleaning. The water column drain pipe and valve shall not be less than 3/4 in. pipe size.

The steam connections to the water column of a horizontal firetube wrought boiler shall be taken from the top of the shell or the upper part of the head, and the water connection shall be taken from a point not above the center line of the shell. For a cast iron boiler, the steam connection to the water column shall be taken from the top of an end section or the top of the steam header, and the water connection shall be made on an end section not less than 6 in. below the bottom connection to the water gauge glass.

(Z) — AUTOMATIC LOW-WATER FUEL CUTOFF AND WATER FEEDING DEVICE

(1) — All automatically fired steam or vapor system boilers must be equipped with an automatic low water fuel cutoff and automatic water feeding device so constructed that the water inlet valve cannot feed water into the boiler through the float chamber, and so located as to automatically cut off the fuel supply and supply requisite feedwater when the surface of the water falls to the lowest safe water line. This point should be not lower than 1 inch above the bottom of the water glass.

(2) — Such a fuel cutoff or water feeding device may be attached directly to a boiler. A fuel cutoff or water feeding device may also be installed in the tapped openings available for attaching a water glass direct to a boiler, provided the connections are made to the boiler with nonferrous tees or Y's not less than ½ inch pipe size between the boiler and the water glass so that the water glass is attached directly and as close as possible to the boiler; the run of the tee or Y shall take the water glass fittings, and the side outlet or branch of the tee or Y shall take the fuel cutoff or water feeding device. The ends of all nipples shall be reamed to full size diameter.

(3) — Designs embodying a float and float bowl shall have a vertical straightway valved drain pipe at the lowest point in the water equalizing pipe connections by which the bowl and the equalizing pipe can be flushed and the device tested.

(4) — All automatically fired steam or vapor system boilers shall be equipped with an ignition safety pilot.

Subchapter 3. MINIATURE BOILERS

(A) — Boilers to which the classification "Miniature" applies embrace fired pressure vessels which do not exceed the following limits:

16 in inside diameter of shell

5 cubic feet gross volume, exclusive of casing and insulation

20 square feet of water heating surface

100 pounds per square inch maximum allowable working pressure

Where any one of the above limits are exceeded, the rules of power boilers shall apply.

(B) — The construction of miniature boilers, except where otherwise specified, shall conform to that required for power boilers. The factor of safety and method of computing the maximum allowable working pressure shall be the same as for power boilers. The flat surfaces of boilers or pressure parts shall be stayed in accordance with the A.S.M.E. Code.

(C) — For forced circulation boilers and boilers with no fixed steam or water line, the materials used shall comply with the A.S.M.E. Boiler Construction Code. All other code requirements shall be met except where they relate to special features of construction made necessary in boilers of this type and to accessories that are manifestly not needed in connection with such boilers such as water gauge columns and gauge cocks.

(D) — CLEARANCE

Each boiler shall be located so that adequate space will provide for an operation of the boiler and appurtenances and for inspection of all surfaces and their necessary maintenance and repair. Each boiler shall have at least 18 inches clearance on all sides. Each boiler shall have at least 36 inches clearance from electric meters and main line switches. They shall have at least 18 inches clearance from all other switches and fuse boxes. Each boiler shall not be located closer than 7 feet horizontally from any gas meter.

(E) — SAFETY VALVES

(1) — Each miniature boiler shall be equipped with a sealed spring loaded pop safety valve not less than 1/2-inch in diameter. Where there is no extraction of steam (closed system), a safety fracturing disk may be used in addition to the spring loaded pop safety valve.

(2) — The minimum relieving capacity of the safety valve shall be determined on the basis of 3 pounds per hour per square foot of boiler heating surface, and shall be sufficient to discharge all the steam that can be generated by the boiler without allowing the pressure to rise more than 6 percent above the maximum allowable working pressure.

(3) — To insure the safety valve being free, each valve shall have a substantial lifting device by which the valve disk may be lifted from its seat when there is at least 75 percent of full working pressure in the boiler. All safety valves shall be mounted with their spindles vertical in an upright position and freely accessible.

(F) — GAUGE GLASS AND COCKS

Each miniature boiler shall be equipped with a water gauge glass and one or more gauge cocks. The lowest

permissible water level shall be at a point one third of the height of the shell except where the boiler is equipped with an internal furnace in which case it shall not be less than one third the tube length above the top of the furnace. In case of small generating units operated on a closed system where there is insufficient room for the usual water gauge, water level indicators of the glass bulls eye type may be used.

(G) — STEAM GAUGE

Each miniature boiler shall be equipped with a steam gauge having its dial graduated to not less than one and one-half times the maximum allowable working pressure. The gauge shall be connected to the steam space or to the steam connection to the water column by a syphon tube or equivalent device that will keep the gauge tube filled with water.

(H) — STOP VALVES

Each steam line from a miniature boiler shall be provided with a standard valve located as close as practicable to the boiler except in those cases where the boiler and steam receiver are operated as a closed system.

(I) — FEED PUMPS

(1) — Each boiler shall be provided with at least one feed pump or other feeding device except where it is connected to a water main carrying sufficient pressure to feed the boiler or where the steam generator is operated with no extraction of steam (closed system). In the latter case, in lieu of a feeding device, a suitable connection or opening shall be provided to fill the generator when cold. Such connection shall not be less than 1/2 inch pipe size.

(2) — Each miniature boiler shall be fitted with feedwater and blowoff connections which shall not be less than 1/2 inch iron pipe size unless operated on a closed system as provided in the A.S.M.E. Code. The feed pipe shall be provided with a check valve and a stop valve. The feedwater may be delivered to the boiler through the blowoff, if desired. The blowoff shall be fitted with a valve or cock in direct connection with the lowest water space practicable. When the boiler is under pressure, feedwater shall not be introduced through the openings or connections used for the water columns, the water gauge glass, or the gauge cocks. In closed systems the water may be introduced through any opening when the boiler is not under pressure.

(J) — BLOW DOWN

Each boiler shall be provided with a blowoff connection which shall not be reduced in size and shall be led to a safe point of discharge. Whenever in the judgment of the boiler inspector such a place cannot be provided, a blow down tank shall be installed and vent leading to a safe point of discharge shall be provided on all such tanks. The blowoff shall be fitted with a valve or cock in direct connection with lowest water space practicable.

(K) — LOW WATER FUEL CUT OUT

All boilers, gas, oil or mechanically fired, shall be provided with an automatic low water fuel cutout so located as to automatically cut off the fuel supply in case the water level falls to a point not lower than the bottom of the water glass.

(L) — GAS BURNERS

Where boilers are gas fired the burners shall in such cases be equipped with a fuel regulating governor which shall be automatic and regulated by steam pressure. This governor shall be so constructed that in the event of its failure there can be no possibility of steam from the boiler entering the gas chamber or supply pipe. The manual stop cock or throttle valve shall be located in the inlet pipe ahead of the fuel regulating governor. A safety ignition pilot shall be installed on all automatically fired boilers of this type.

(M) — FLUE CONNECTIONS

Each gas fired boiler shall be connected to a 4 inch vent pipe or flue extending to an approved location outside of the building or connected to a chimney flue. A draft hood of approved design shall be provided on each boiler. Where the horizontal run is more than 10 the vent shall be increased to 6 inches.

Subchapter 4. ELECTRIC STEAM GENERATORS

All appliances required for electric steam generators shall be attached in accordance with the following rules:

(A) — A cable at least as large as one of the incoming power lines to the generator shall be provided for grounding the generator shell. This cable shall be permanently fastened on some part of the generator and shall be grounded in an approved manner.

(B) — A suitable screen or guard shall be provided around high tension bushings and a sign posted warning of high voltage. This screen or guard shall be so located that it will be impossible for anyone working around the generator to accidentally come in contact with the high tension circuits.

(C) — Each KW of electrical energy consumed by an electric steam generator operating at maximum rating shall be considered the equivalent of 1 sq. ft of heating surface of a fire tube boiler when determining the required amount of safety valve capacity.

Subchapter 5. POTABLE WATER HEATERS \ SUPPLY TANKS

(A) SERVICE RESTRICTIONS AND EXCEPTIONS

— The rules are restricted to potable water heaters and water storage tanks for operation not exceeding 160 psi, and water temperatures not in excess of 210 degrees F., except that water heaters and supply tanks are exempted when none of the following limitations is exceeded:

- (1) — Heat input less than 200,000 btu/hr;
- (2) — Water temperature 210 degrees F;
- (3) — Nominal water-containing capacity of 120 gallons, except that they shall be equipped with appropriate safety valves.

(B) — “Boiler”, as defined by Arkansas Code 20-23-101, shall mean any boiler or like vessel or container in which water is heated and/or steam is generated by the application of heat. “Hot water heater/boiler” as defined above falls under the authority and responsibility of the Boiler Division.

(C) MINIMUM CONTROLS

— All fired storage water heaters and most electric water heaters and supply vessels shall be equipped with the following controls and devices:

- (1) — Operating temperature control;
- (2) — High limit temperature control;
- (3) — Positive flame failure cut off;
- (4) — Approved pressure temperature relief valve, set at or below the safe working pressure of the vessel, with such setting satisfactory for the application.

(D) LOCATION

— All fired/unfired vessels and heaters shall be so located as to provide access to the controls, safety relief valve, and drain. All vessels shall also be raised sufficiently above the floor level to reduce/prevent rust and corrosion of the bottom and reduce possible early gas ignition from combustible fumes.

(E) DISCHARGE LINES

— When a discharge line from a relief valve is installed, it shall not be reduced, but shall be full size and be piped to a safe location, and installed so that all water will drain from the valve without leaving water trapped in the line or on the valve.

(F) RELIEF VALVE TESTING

— The operator/owner shall manually test the relief valve semi-annually (every six months).

(G) ALTERNATE USE

— Storage water heaters and supply vessels, fired or unfired, shall not be used as a heating boiler.

(H) VENT PIPES

— All fired heaters shall be equipped with a vent pipe or flue conforming to the requirements of the National Fire Protection Association or manufacturer. The flue or vent shall terminate at any acceptable location outside the building.

(I) SHUTOFF VALVES

— A shutoff valve shall be provided in the cold water branch line next to each vessel.

(J) OPENINGS

— Water heaters, both potable and domestic type, are provided with drain valves and/or removable handhole covers. The drain should be used to drain the water heater on a regular schedule, to keep it as clean internally as possible. The handhole covers should be removed and the unit cleaned internally on an as needed schedule.

(K) — Certificate inspections are required on hot water heaters located in schools, hospitals, day care centers, and nursing homes.

**CHAPTER 9
UNFIRED PRESSURE VESSELS**

(A) — Unfired pressure vessels are any pressure vessel constructed for the accumulation, storage or transportation of air, liquids or gases that are under induced pressure.

All vessels shall have the following:

- (1) — The Official Code Symbol.
- (2) — Name of the manufacturer of the pressure vessel, preceded by the words "Certified by".
- (3) — Maximum allowable working pressure ___ psi at ___ ° F.
- (4) — Minimum design metal temperature ___ ° F at ___ psi.

(5) ——— Manufacturer's serial number _____.

(6) ——— Year built _____.

The Manufacturer's NamePlate shall not be permanently covered with any insulating or other material but shall be readily accessible at all times.

(B) ——— MANHOLES AND HANDHOLES

(1) ——— All unfired pressure vessels for use with compressed air or subject to internal corrosion shall be provided with suitable manhole, handhole or other inspection openings for examination and cleaning, except that such openings may be omitted from vessels containing compressed air when the actual service conditions or other material stored in them are such that the vessel is not subject to internal corrosion.

(2) ——— An elliptical manhole shall be not less than 11 X 15 inches or 10 X 16 inches in size. A circular manhole shall be not less than 15 inches in diameter.

(3) ——— A handhole opening shall be not less than 2 X 3 inches but it is recommended that it be as large as possible consistent with the size of the vessel and the location of the opening.

(4) ——— All access and inspection openings in a shell or unstayed head shall be designed in accordance with Section VIII Division 1, of the A.S.M.E. Boiler and Pressure Vessel Code.

(5) ——— When a threaded inspection opening is to be used for inspection or cleaning purposes, it shall be not less than 1 1/2 inches pipe size. The closing plug or cap shall be of a material suitable for the pressure and temperature conditions. Bronze shall not be used for temperatures over 450° F. The thread shall be a standard tapered pipe thread except that a straight thread of equal strength may be used if other sealing surfaces to prevent leakage are provided.

(6) ——— All vessels which require access or inspection openings shall be equipped as follows:

(a) ——— All vessels less than 18 inches in diameter shall have two handholes or two plugged threaded inspection openings.

(b) ——— All vessels 18 to 36 inches, inclusive, in diameter shall have a manhole, or at least two handholes, or two plugged threaded inspection openings of not less than 2 inch pipe size.

(c) ——— All vessels over 36 inches in diameter shall have a manhole except those whose shape or use make it impracticable, in which case they shall have at least two 4 X 6 inch handholes, or two handholes of equivalent area.

(d) ——— When handholes or plugged openings are used for inspection openings in place of a manhole, where permitted, one handhole or one plugged opening shall be placed in each head or in the shell near each head.

(e) ——— (i) ——— Removable heads or cover plates may be used in place of the required openings provided they are equal at least to the required size of the required inspection openings.

(ii) ——— A single removable head or cover plate may be used in place of all other inspection openings if it is of such size and location that a general view of the interior may be obtained through the opening at least equal to that obtained through the inspection openings otherwise required.

(f) ——— In special cases where vessels 16 inches, or less, in diameter are located so that inspections cannot be made without dismantling or removing the vessel, special openings need not be provided if the tapping for pipe connections properly located for inspection purposes is not less than 1 1/2 inch pipe size.

(C) ——— CORROSIVE SUBSTANCES

(1) ——— All pressure vessels which are to contain substances having a corrosive action upon the material of which the vessel is constructed, or those subjected to erosion or mechanical abrasion, shall be designed for the pressure they are to carry, and the thickness of all parts subject to corrosion, erosion or abrasion should be increased by a uniform amount to safeguard against early rejection.

(2) ——— Where a vessel goes into corrosive service without previous service experience, it is recommended that service inspections be made at frequent intervals until the nature and rate of corrosion in service can be definitely established. The data thus secured should determine the subsequent intervals between service inspections and the probable safe operating life of the vessel.

(3) ——— The maximum allowable working pressure for shells other than cylindrical or spherical and for heads and other parts, shall be determined in a similar manner using the formulas appropriate for the parts, as otherwise given in the Code.

(D) ——— INSPECTION OF INACCESSIBLE PARTS

(1) ——— Where, in the opinion of the inspector, as the result of conditions disclosed at the time of inspection, it is advisable to removed the interior or exterior lining, covering, or brickwork to expose certain parts of the vessel not normally visible, the owner or user shall remove such material to permit proper inspection and to establish construction details. Metal thickness shall be determined utilizing appropriate equipment including drilling if necessary.

~~(E) — PRESSURE RELIEF DEVICES~~

~~(1) — Pressure relief devices for each pressure vessel installation shall comply with the requirements of ASME Pressure Vessel Code Section VIII Division I.~~

~~(F) — SAFETY APPLIANCES~~

~~(1) — Each pressure vessel shall be protected by such safety devices, including relief valves and rupture disks, as will insure its safe operation. These valves and devices shall be so constructed, located, and installed that they cannot readily be rendered inoperative. The relieving capacity of the safety devices shall be such as to prevent a rise of pressure in the vessel of more than 10 percent above the maximum allowable working pressure, taking into account the effect of static head pressure. Safety device discharges shall be to a safe place. Device outlets shall not be reduced, and device header piping should not rely on the device body for its support.~~

~~(G) — REPAIRS AND RENEWALS OF FITTINGS AND APPLIANCES~~

~~(1) — All repairs and alterations shall be made by a company in possession of a repair license from the Boiler Inspection Division.~~

~~(2) — Inspection openings shall not be used for anything except their designed use.~~

~~(3) — All cases not specifically covered by these requirements shall be treated as new installations, or may be referred to the Chief Inspector for instructions concerning the requirements.~~

~~(4) — The maximum allowable working pressure of an ASME vessel shall be determined by the nameplate information and/or the data report. The maximum allowable working pressure shall not be increased to a pressure greater than that shown on the manufacturer's nameplate stamping and data report.~~

~~(5) — For information concerning noncode pressure vessels, refer to the ASME Code Section VIII Division I.~~

CHAPTER 10

**ADMINISTRATIVE REGULATIONS
REGARDING THE MANUFACTURE, USE, AND INSPECTION
OF ALL VESSELS USED FOR STORAGE,
TRANSPORTATION, DISPENSING AND HANDLING OF
ANHYDROUS AMMONIA**

BOILER INSPECTION DIVISION

Department of Labor

Little Rock, Arkansas

~~WHEREAS, the Rules and Regulations of the Boiler Inspection Division of the Department of Labor regulating the manufacture, use and inspection of vessels used for storing, transporting and dispensing of Anhydrous Ammonia have in part been rendered obsolete; and~~

~~WHEREAS, evidence has been amassed with respect to the requirements necessary for the safe handling of Anhydrous Ammonia; and~~

~~WHEREAS, the Boiler Advisory Board of the State of Arkansas, the Director of Labor of the State of Arkansas, and Chief Boiler Inspector of the Boiler Inspection Division find from all evidence that the safety of life and property required that rules and regulations be promulgated and passed with respect to the manufacture, maintenance and handling of Anhydrous Ammonia; and~~

~~WHEREAS, Ark Ann. §§ 20-23-101 through 20-23-405, provides for the promulgation and formulation of rules, regulations and orders for the purpose of keeping abreast with standard usage to enforce the provisions of said law.~~

NOW, THEREFORE, it is ordered by the Boiler Advisory Board of the State of Arkansas and by the Boiler Inspection Division of the Department of Labor, said order bearing the approval of the Director of Labor, that the following Rules and Regulations shall be effective after October 1, 1999, and so far as applicable shall be complied with by all persons, firms or corporations who are engaged in the manufacture, sale and/or use of Anhydrous Ammonia, vessels, fittings and hoses used in connection with the storage, transportation and dispensing of Anhydrous Ammonia in the State of Arkansas, such orders being as follows:

(A) — APPLICATION

(1) — To the extent permitted by statute where the application of a rule would cause expense materially out of proportion to the increase of safety obtained thereby, or would be unreasonable under the facts of the particular case, and safety can be obtained in other ways, the Chief Boiler Inspector may, upon adequate showing by the person affected, grant an exemption or variance of the rule complained of, under such requirements as will secure a reasonable condition of safety provided such exemption or modification be not in conflict with the law.

(B) — GENERAL PROVISIONS

(1) — The term "Liquid fertilizer" wherever used in these regulations shall mean Anhydrous Ammonia or any ammonia solution generating a vapor pressure of twenty-five (25) psi gauge, and over, at 70 degrees Fahrenheit.

(2) — In the interest of safety, it is important that personnel understand the properties of this gas and that they be thoroughly trained in safe practices for its storage and handling.

(3) — American National Standards Institute, (A.N.S.I.) K61.1 1989 Edition and subsequent amendments to, or earlier editions of the same as adopted shall govern the "Safety Requirements for the Storage and Handling of Anhydrous Ammonia."

(4) — Under moderate pressure the gas liquefies, but upon release of the pressure, the liquid is readily converted into the gaseous phase. Advantage of this characteristic is taken by the industry, and for convenience the gas is shipped and stored under pressure as a liquid.

(5) — Anhydrous Ammonia may cause varying degrees of irritation of the skin or mucous membrane, and may injure severely the respiratory tract and organs.

(6) — At atmospheric temperatures and pressures, ammonia is a pungent and colorless gas and serves as it's own warning agent. Since ammonia gas is lighter than air, adequate ventilation is the best means of preventing any accumulation.

(7) — In the case of the pure product at atmospheric pressure and below 28° F., Anhydrous Ammonia is a liquid. Anhydrous Ammonia freezes to a white crystalline mass at 107.9° F.

(8) — The common metals are not affected by dry ammonia. Moist ammonia will not corrode iron or steel, but will rapidly react with copper, brass, zinc and many alloys, especially those containing copper. It is required that only iron, steel and certain non ferrous alloys which have proved to be satisfactory for ammonia service, be used for ammonia containers, fittings and other equipment.

(9) — The flammable limits of ammonia are presently classified from 16 to 25 percent by volume in air. Experience has shown that ammonia is extremely hard to ignite in spite of these theoretical limits.

(C) — DEFINITIONS

For the purpose of these regulations, the terms listed below shall be construed to have the following meanings:

(1) — "Department" means the Boiler Inspection Division of the Department of Labor.

(2) — "Tank," "container" or "vessel" refers to vessels designed and constructed for the storage, transportation and utilization of Anhydrous Ammonia.

(3) — "Gas" refers to Anhydrous Ammonia in either the gaseous or liquefied state.

(4) — "The Code" refers to the Unfired Pressure Vessel Code of the American Society of Mechanical Engineers (Section VIII Division 1 of the ASME Code) (1995 and Addenda 1998), and subsequent amendments to, or later editions of the same, as adopted by the Boiler Inspection Division.

(5) — "Design Working Pressure" is identical to the term "Maximum Allowable Working Pressure," used in the Code.

(6) — "Appurtenances" refers to all devices such as safety devices, liquid level gauge devices, valves, pressure gauges, fittings, and metering or dispensing devices.

(7) — "Systems" as used in these regulations refers to an assembly of equipment consisting essentially of the container or containers, appurtenances, pumps, compressors and interconnecting hose and piping.

(8) — "Approved" as used in these standards means:

(a) — Tested and listed by a recognized testing laboratory, or

(b) — Inspected and approved by the Boiler Inspection Division

(9) — "Capacity" as used in these standards refers to the total volume of the container measured in standard U.S. gallons, unless otherwise specified.

(10) — "Filling Density" is defined as the percent ratio of the weight of the gas in a container to the weight of water the container will hold at 60° F.

(D) — LICENSE REQUIREMENTS

(1) — Every manufacturer, jobber or dealer selling or offering for sale in the State of Arkansas, containers used for the storage, transportation and dispensing of Anhydrous Ammonia shall be licensed by the Boiler Inspection Division in compliance with Ark. Code Ann. § 20-23-405 which states all persons, firms or corporations engaged in the sale and/or installation of unfired pressure vessels shall be licensed by the Boiler Inspection Division to perform such work. The annual license fee shall be seventy five dollars (\$75.00) per year, payable in advance on or before January 31 of each calendar year.

(2) — The following fees shall be paid before permits may be issued for the installation of any unfired pressure vessel:

500 Gallons or less	\$15.00
Over 500 Gallons to 1,000 Gallons, Incl.	\$20.00
Over 1,000 Gallons to 5,000 Gallons, Incl.	\$40.00
Over 5,000 Gallons	\$50.00

(3) — The Department, upon sufficient proof being presented, may revoke the bond or license of any manufacturer, jobber or dealer for incompetency, untrustworthiness or willful violation of any provision of these regulations after due notice to the manufacturer, jobber or dealer and to the bonding company, provided all such persons shall be entitled to a hearing before the Department to show cause why such bond or license should not be revoked.

(4) — Manufacturers and jobbers of containers and Anhydrous Ammonia may sell to bonded or licensed dealers only. The sale of either containers or Anhydrous Ammonia to persons other than bonded or licensed dealers is prohibited.

(5) — It shall be unlawful to fill any container, requiring annual inspections, with Anhydrous Ammonia when such container is over 30 days past due annual inspection. Any dealer filling such container will be asked to appear before the Director of Labor to show cause why his bond and/or license should not be revoked.

(E) — DESIGN AND CONSTRUCTION

(1) — Vessels used for storage and dispensing of liquid fertilizer shall be constructed to comply with the provisions of Section VIII, ASME Boiler Code. All containers shall be constructed for a safe working pressure of not less than 250 psig with minimum head and shell thickness of not less than three sixteenths (3/16) inch. All trucks and transports used for the transportation of Anhydrous Ammonia shall be constructed for a safe working pressure of not less than 265 psig and in compliance with Section VIII of the ASME Code.

(2) — In addition to the above requirements, all Anhydrous Ammonia containers to be used for storage purposes, 36 inches in diameter or larger, and all vessels mounted on transport trucks, delivery trucks, and trailer units, regardless of size, shall be constructed to comply with either of the following requirements:

(a) — Stress relieve the container after fabrication in accordance with the ASME Code, Par. UW-40, Sub par. (1) or (2).

(b) — Stress relieve cold formed heads in an approved manner.

(c) — Used not formed heads.

(3) — It is strongly recommended that vessels of this type be stress relieved. All such containers shall be stamped "National Board" at the time of construction. Blueprints showing the type or types, of all containers shall be filed with the Boiler Inspection Division for approval before shipment of any container into the state.

(4) — Shop inspections shall be made of all containers during construction by a duly authorized inspector who holds a National Board Commission, and who is employed by an insurance company, state or municipality.

(5) — All containers shall have the manufacturer's name plate, firmly attached to the container, designating manufacturer's serial number, National Board number, year built, diameter, length, shell and head thickness, capacity in water gallons, pounds and surface area of vessel in square feet.

(6) — All containers, except storage tanks, shall be fully equipped with the required fittings by the manufacturer and shall be tested under air pressure of not less than 100 psig before delivery to the user. Air pressure of not less than twenty-five (25) or more than seventy five (75) psig shall be left in the container when shipment is made into the State by the

manufacturer or jobber, and this information shall be included in the report of shipment provided for in the following paragraph:

(7) — ~~Manufacturers and jobbers shall forward to the Boiler Inspection Division notice of shipment and manufacturer's data report on the same day that shipment of containers is made in the State. Manufacturers and jobbers shall not sell containers to individuals. They shall sell containers and equipment to bonded and licensed dealers only.~~

(8) — ~~Each container which is to be used for the transportation or utilization of Anhydrous Ammonia shall be inspected and approved by the Boiler Inspection Division at the dealer's place of business before being placed in service, and thereafter at such times and in such manner as may be determined under the Rules and Regulations of the Department.~~

(9) — ~~The Department shall notify all dealers when annual inspections will be made of their equipment requiring annual inspections, and it will be the dealer's responsibility to have all trailers and/or transports at his place of business in order that all equipment may be inspected. Dealers will notify their customers, who own their own containers, the date the inspector will be at the dealer's place of business.~~

(10) — ~~All containers used for the storage and all trucks, transports and trailer units used for the delivery of Anhydrous Ammonia shall be inspected annually. For each inspection made by the Department there shall be paid a fee in accordance with the following schedule:~~

(11) — ~~All containers used for dispensing purposes which are mounted on field tractors and have a capacity up to and including~~

150 Gallons	\$ 9.00
151 Gallons and over	\$10.00
Containers used on trailer units, regardless of size	\$11.00
Containers used for storage, regardless of size	\$18.00
Containers mounted on trucks or semi-trailers, regardless of size	\$18.00

(12) — ~~Owners of all types of Anhydrous Ammonia vessels shall be responsible for the inspection fees.~~

(13) — ~~Special inspection fees of \$15.00 per container plus mileage, not to exceed the rate authorized by the General Assembly to employees of the state agencies who furnish their own transportation, traveled from dealer's place of business to point of inspection and return shall be charged for any container moved from dealer's place of business before it is inspected and approved.~~

(F) — CONTAINER VALVES AND ACCESSORIES

(1) — ~~Couplings and external flanges used on any container shall be welded both inside and outside. The use of nipples in lieu of couplings or flanges is prohibited. All couplings, piping and valves shall be wrought iron or steel. The use of cast iron, copper, brass or galvanized fittings is prohibited.~~

(2) — ~~All containers shall be equipped with necessary safety relief valves, filler valves, vapor return valves, liquid level gauge, outage gauge and a pressure gauge graduated from 0 to 400. The vapor return valve, filler valve and liquid outlet valve shall be equipped with excess flow check valves. It is not required that dispensing units be equipped with excess flow check valves in the liquid outlet. Safety relief valves shall have direct communication with the vapor space of the container.~~

(3) — ~~All fittings to be attached to an Anhydrous Ammonia container of any type (liquid or vapor) shall be approved for use with Anhydrous Ammonia and designed for not less than the maximum pressure to which they may be subjected. Valves which may be subjected to container pressure shall have a rated working pressure not less than 250 psig.~~

(4) — ~~All connections to containers, except safety relief connections and gauging devices, shall have shutoff valves located as close to the container as possible.~~

(5) — ~~Liquid level gauging devices which are so constructed that outward flow of container content shall not exceed that passed by a No. 54 drill size opening, need not be equipped with excess flow valve.~~

(6) — ~~Openings from the container or through fittings attached directly on container, to which pressure gauge connection is made, need not be equipped with excess flow valve if such openings are protected by not larger than No. 54 drill size openings.~~

(7) — ~~All excess flow valves shall be plainly and permanently marked with the name of trademark of the manufacturer, the catalog number, and rated capacity.~~

(8) — ~~Excess flow valves shall close automatically at the rated flows of vapor or liquid as specified by the manufacturer, and shall be set to close at not more than 80 percent of the maximum capacity of the normal pipe size into which they are discharging at 60 pounds container pressure.~~

(9) — ~~Excess flow and back pressure check valves shall be located inside the container or at a point outside~~

where the line enters the container. In the latter case, installation shall be made in such a manner that any undue strain, beyond the excess flow or back pressure check valve, will not cause breakage between the container and the valve.

(10) — Each filling connection or valve shall be fitted with one of the following:

(a) — Combination back pressure check valve and excess flow valve.

(b) — One double or two single back pressure check valves.

(c) — A positive shutoff valve, in conjunction with either:

(i) — An internal back pressure valve, or

(ii) — An internal excess flow valve.

(11) — Excess flow valves shall be designed with by-pass, not to exceed a No. 60 drill size opening to allow equalization of pressures.

(G) — PIPING, TUBING AND FITTINGS

(1) — All fittings where subjected to container pressure, shall be made of materials specified for use with Anhydrous Ammonia as described herein and designed for a minimum working pressure of not less than 250 psig. No cast iron bushings, plugs or pipe fittings shall be allowed.

(2) — Galvanized pipe shall not be used. Black steel or iron pipe, (Schedule 40), may be used provided pipe joints are welded or joined by means of welding type flanges. Screwed joints are permissible only with extra heavy (Schedule 80) pipe. Pipe joint compounds shall be resistant to ammonia.

(3) — All pipe lines shall be installed as nearly as possible in a straight line with a minimum amount of pipe, and shall not be restricted by an excessive amount of elbows and bends. Where nipples are used, they shall be of extra heavy seamless type.

(4) — Flexible connections with a bursting pressure of not less than 1750 psig shall be used for a permanent installation. Other type flexible connections may be used for temporary installation. Provisions shall be made for expansion, contraction, jarring, vibration and settling.

(5) — Adequate provisions shall be made to protect all exposed piping from physical damage that might result from moving machinery, automobiles or trucks, or any other undue strain that might be placed upon the piping.

(6) — After assembly, all piping and tubing shall be tested and proved to be free from leaks at a pressure not less than the normal operating pressure of the system, or at 150 psig, whichever is greater. All containers shall be purged of air on initial filling.

(H) — HOSE SPECIFICATIONS

(1) — Hose and hose connectors shall be fabricated of materials that are resistant of the action of Anhydrous Ammonia.

(2) — Hose subject to container pressure shall be designed for a minimum bursting pressure of 1750 psig. Hose assemblies, when made up, shall be capable of withstanding a test pressure of not less than 500 psig.

(3) — Hose and hose connections located on the low pressure side of flow control or pressure reducing valves or devices shall be designed for a minimum bursting pressure of 125 psig. All connections shall be designed, constructed and installed so that there will be no leakage when connected.

(4) — Where hose is to be used for transferring liquid, wet hose is recommended. Such hose shall be equipped with an approved shutoff valve at the discharge end. A safety relief valve shall be installed between the hand shutoff valves as near the containers as possible. The start to discharge pressure of such relief valve shall not be less than 240 psig and not in excess of 312 psig.

(5) — On all hose one-half (1/2) inch I.D. and larger, used for the transfer of Anhydrous Ammonia liquid or vapor, there shall be etched, cast or impressed on the hose at 5-foot intervals or on a nameplate permanently attached thereto, the following information:

"Anhydrous Ammonia"

Bursting Pressure

Manufacturer's Name or Trademark

Year of Manufacture

(I) SAFETY DEVICES

(1) — Every container used for Anhydrous Ammonia shall be provided with one or more safety relief valves of spring loaded type. The discharge from safety relief valves shall be directed away from the container upward and unobstructed to the open air. The rate of discharge shall be in accordance with the provisions of the Flow Chart (page 150).

(2) — Container safety relief valves shall be set to start to discharge as follows, with the relation to the design pressure of the container:

<u>Containers</u>	<u>Minimum</u>	<u>Maximum</u>
ASME 1949		
— or earlier Edition	100%	125%
ASME 1959		
— or earlier Edition	80%	100%

(3) — Safety relief valves used on containers or systems as outlined in these regulations shall be constructed to discharge at the rates required in the above paragraph. The design of these valves must insure such discharge before the pressure exceeds 120 percent of the maximum start to discharge pressure setting.

(4) — Safety relief valves shall be so arranged that the possibility of tampering will be minimized. If the pressure setting adjustment is external, the relief valves shall be provided with approved means for sealing the adjustment. Shutoff valves shall not be installed between the safety relief valves and the container.

(5) — Each safety relief valve shall be plainly and permanently marked as follows:

(a) — With the letters "AA."

(b) — The pressure in pounds per square inch gauge (psig) at which the valve is set to start to discharge.

(c) — The rate of discharge of the valve at its full open position in cubic feet per minute of air at 60° F and atmospheric pressure.

(d) — The manufacturer's name and catalog number. For example, a safety relief valve marked AA-250-4050 (air) would mean that this valve is suitable for use on an Anhydrous Ammonia container; that it is set to start to discharge at 250 psig; and that its rate of discharge at full open position is 4050 cubic feet per minute of air.

(6) — Connections such as couplings, flanges, nozzles and discharge lines for venting, to which relief valves are attached shall have internal dimensions of sufficient size to avoid any restrictions of flow through the relief valves.

(7) — A safety relief valve, venting to atmosphere as a safe location, shall be installed between each pair of shutoff valves in an ammonia line where liquid may be trapped. The start to discharge pressure of such relief valves shall not be less than 240 psig, and not in excess of 300 psig. Discharge from safety relief devices shall not terminate in or beneath any building.

(8) — Any type fitting or hose that proves to be unsatisfactory and does not function in a safe and proper manner shall be condemned and the further use of such hose or fitting shall be prohibited.

(J) TRANSFER OF LIQUIDS

(1) — At least one attendant shall supervise the transfer of liquids from the time the connections are first made until they are finally disconnected.

(2) — Containers shall be filled or used only upon authorization of owner. Containers shall be gauged and charged only in the open air or in buildings especially provided for that purpose.

(3) — Pumps used for transferring ammonia shall be recommended and labeled for ammonia service by the manufacturer.

(4) — Liquid pumps may be of piston, rotary, centrifugal or regenerative type, designed for not less than 250 psig working pressure.

(5) — Positive displacement pumps shall have, installed off the discharge port, a constant differential relief valve discharging through a line of sufficient size to carry the full capacity of the pump at relief valve setting. This setting and installation shall be according to pump manufacturer's recommendation.

(6) — On the discharge side of the pump, before the relief valve line, there shall be installed a pressure gauge graduated from 0 to 400 psi.

(7) — Centrifugal or regenerative pumps do not require a bypass relief valve, but the installation shall incorporate a line from the discharge side of the pump to the vapor space of the supplying tank and in this line, at accessible

level, must be installed a shutoff valve.

~~(8) — Shutoff valves shall be installed within three feet of the inlet of the pump and within two feet of the discharge.~~

~~(9) — Compressors used for transferring and refrigerating ammonia shall be recommended and labeled for ammonia service by the manufacturer.~~

~~(10) — Compressors may be of reciprocating or rotary type designed for not less than 250 psig working pressure.~~

~~(11) — Plant piping shall contain shutoff valves located as close as practicable to compressor connections.~~

~~(12) — A relief valve large enough to discharge the full capacity of the compressor shall be connected to the discharge before any shutoff valve. The discharging pressure of this valve shall not exceed 300 psig.~~

~~(13) — Compressors shall have pressure gauges graduated from 0 to 400 psig as suction discharge.~~

~~(14) — Adequate means, such as a drainable liquid trap, shall be provided on the compressor suction to minimize the entry of liquid into the compressor.~~

~~(15) — The pipe line to which the loading or unloading hoses are connected shall be equipped with a backflow check valve or excess flow check valve to prevent discharge of ammonia from the containers and the line in case of hose or fitting failure.~~

~~(K) — TANK CAR LOADING POINTS AND OPERATIONS~~

~~(1) — Tank car siding shall be substantially level.~~

~~(2) — Unloading operations should be performed only by reliable persons properly instructed and made responsible for careful compliance with the following:~~

~~(a) — Brakes must be set and wheels blocked on all cars being unloaded.~~

~~(b) — Caution signs must be so placed on the track or car as to give necessary warning to persons approaching from open end or ends of siding and must be left up until after car is unloaded and disconnected from discharge connections. Sign must be of metal or other suitable material, at least 12 by 15 inches in size and bear the words "STOP—Tank Car Connected" or "STOP—Men at Work," the word "STOP" being at least 4 inches high and the other works in letters at least 2 inches high. The letters must be white on a blue background.~~

~~(L) — LIQUID LEVEL GAUGING DEVICES~~

~~(1) — Each container, except containers covered by ICC Regulations, shall be equipped with a liquid level gauging device of approved design.~~

~~(2) — All gauging devices shall be arranged so that the maximum liquid level to which the container may be filled is readily determinable.~~

~~(3) — Gauging devices that require bleeding of the product to the atmosphere, such as the rotary tube, fixed tube and slip tube, shall be so designed that the bleed valve maximum opening is not larger than a No. 54 drill size, unless provided with an excess flow valve. (EXCEPTION—Applicator tank may have bleed valve not more than 5/16 inch in diameter).~~

~~(4) — Gauging devices shall have a design working pressure of at least 250 psig.~~

~~(5) — Fixed liquid level gauges shall be so designed that the maximum volume of the container filled by liquid shall not exceed 85 percent of its water capacity. The coupling into which the fixed liquid level gauge is threaded must be placed at the 85 percent level of the container. If located elsewhere, the dip tube of this gauge must be installed in such a manner that it cannot be readily removed.~~

~~(6) — Gauge glasses of the columnar type shall be restricted to bulk storage installations. They shall be equipped with valves having metallic handwheels, with excess flow valves, and with extra heavy glass adequately protected with a metal housing applied by the gauge manufacturer. They shall be shielded against the direct rays of the sun.~~

~~(M) — BULK STORAGE~~

~~(1) — The following apply to location, assembling, painting and protection of bulk storage plants. No storage container shall exceed 30,000 water gallon capacity; nor shall any Anhydrous Ammonia container be buried underground. Before any storage container may be installed, the location must be checked and approved by a representative of the Boiler Inspection Division. Bulk storage containers should be equipped with approved type manifold safety relief valves.~~

~~(2) — Containers used for the storage of Anhydrous Ammonia shall be located not less than fifty (50) feet from nearest important building or group of buildings or line of adjoining property which may be built on. They shall be located not less than fifty (50) feet from main line or passing track of a railroad or public highway. Waiver of this requirement may be made by the Chief Boiler Inspector providing no undue hazards exist, but in no case shall they be located closer than twenty-five (25) feet, and in no case shall they be located closer than four hundred (400) feet from any school, hospital, church or other place of public assembly.~~

~~(3) — Permits for the installation of any storage container must be obtained before installations are made.~~

~~(4) — Storage containers shall be provided with substantial reinforced concrete footings and foundations, or structural steel supports mounted on reinforced concrete foundations. In either case, the reinforced concrete foundations must be below the established frost line, and in no case less than twenty four (24) inches below the ground level, and shall be of sufficient width and thickness to support adequately the total weight of the container and contents. Every container shall be mounted on saddles in such a manner as to permit expansion and contraction, and shall be so supported to prevent the concentration of excessive loads on the supporting portion of the shell. Suitable means of preventing corrosion shall be provided on that portion of the container in contact with the foundation or saddles. There shall be a resilient cushion of road expansion, or other suitable material, with a thickness of not less than one half (1/2) inch placed between the saddle and tank to allow for minor imperfections in pier surface to protect the tank from corrosion and to act as a lubricant in tank expansion. That portion of the tank surface that is to be in contact with the pier, or saddle, shall be painted with at least two (2) coats of approved primer, before installing on the supports. Blueprints or approved type footings and foundations may be obtained from the Department upon request.~~

~~(5) — Containers shall be equipped with the necessary fittings and piping as outlined herein, (Exception — Installation of 15 percent outage gauge not required). The safety relief valve shall discharge upward and away from the container. Loose fitting rain caps shall be used. If riser pipes are used they shall not be attached to the shell by the use of clip angles or brackets; or they may be supported by the use of guy wires. Any method of attaching risers to relief valves that does not induce any undue stress to the relief valve itself will be acceptable to the Department. Size of discharge lines from safety relief valves shall not be smaller than the normal size of the relief valve outlet connection. Suitable provision shall be made for draining condensate which may accumulate in the discharge pipe. The vapor return valve on all storage containers exceeding 1200 water gallon capacity shall be not less than one and one fourth (1 1/4) inches standard pipe size. Each container shall be effectively grounded. Stop valves, where required, shall be installed as near the outlet opening in the container as possible. Piping from the excess flow check valves shall not be reduced in size. Any portion of the piping between the tank and the pump inlet which at any time may be closed at both ends shall be provided with a relief valve to prevent excessive pressure developing in the hose or piping.~~

~~(6) — Containers shall be painted at the time of installation with a light colored, heat reflective paint, equivalent to white or aluminum paint, and shall have the words "DANGER — AMMONIA" or "CAUTION — AMMONIA" painted on both sides and heads in red letters at least six (6) inches in height. The owner's name and address and owners number shall be painted on at least one side of the container in letters not less than two (2) inches in height. Containers shall be protected or enclosed by a steel or wire fence, or provisions shall be made for locking the service line valves at the container. Where a steel or wire fence is used there shall be two (2) means of exit, located preferably at the front and rear of the fence. Such exits shall be of a size that will easily and quickly admit one or more persons. The premises around the container shall be maintained in good order. Combustible material of any type shall not be allowed to accumulate near the container.~~

~~(7) — Provisions shall be made at bulk storage tanks to have the following articles available for use and protection of employees; goggles, rubber gloves and rubberized aprons or slickers. There shall also be available an ample supply of clean water located so that in the event leaks should occur in the piping or containers, the water facilities will not be rendered inoperative.~~

~~(8) — Railway tank cars shall not be considered as bulk storage, and the transferring of Anhydrous Ammonia from railway tank cars to truck or trailer units is prohibited. Truck and trailer units shall be filled at designated bulk storage plants constructed and equipped as outlined herein.~~

~~(N) — TANK TRUCKS — CONSTRUCTION AND ASSEMBLY~~

~~The following applies to the construction and assembly of tank trucks used for the transportation and delivery of Anhydrous Ammonia:~~

~~(1) — Blueprints of the design of all containers to be used on transport and delivery trucks showing the location of pump, (measuring device if used), and piping arrangement shall be submitted to the Department for approval before the container is constructed.~~

~~(2) — All truck tanks used for the transportation and delivery of Anhydrous Ammonia shall be equipped with the necessary fittings as outlined previously. (Exception — Installation of 15 percent outage gauge not required)~~

~~(3) — Safety relief valves shall be installed in the top center line of the container and shall be recessed within the shell to a sufficient depth that no part of the valve will extend above the shell of the tank. The safety valves shall have direct communications with the vapor space of the container and shall be protected from rain or snow with a loose fitting covering.~~

~~(4) — Each container to be mounted on a delivery truck, transport truck or semi trailer shall be equipped with~~

suitable baffle plates. Baffle plates shall be attached in such a manner as to allow for any expansion or contraction of shell plates under internal pressure due to any out-of-roundness.

(5) — Fittings shall not be installed in the ends of the tank between the tractor and the tank on trailers and semi-trailers, but shall be located at the rear or the bottom portion of the container at a distance from the front of the container of not less than one-third (1/3) the length of the container. Fittings such as liquid level gauges (rotary or float), fixed outage gauge, pressure gauge, and thermometer may be located in the side of the container at a distance from the front of the container of less than one-third (1/3) the container length, providing the fittings are recessed to the extent that no portion of the fittings extends beyond the outer surface of the shell or recess.

(6) — All piping shall be installed in a straight line as nearly as possible with a minimum amount of pipe, and shall not be restricted by an excessive amount of elbows and bends. The piping between the excess flow valve and the pump shall not be reduced in size. The pipe must be of the same size as the outlet of the excess flow check valve. When possible, the piping shall be on the outside of the excess flow check valve. All piping, tubing and fittings shall be securely mounted and protected against damage and breakage. Fittings on the bottom of the containers shall be adequately guarded.

(7) — Twin or multiple installations on all tank trucks, trailers or semi-trailers shall have flexible connections between the tanks. All tanks equipped with a pump shall have flexible connections between the tank and pump. This flexible connection shall consist of a hose fabricated in compliance with these regulations; or the connection may be flexible metal with a minimum bursting pressure of 1750 psig and a working pressure of not less than 500 psig.

(8) — Pumps of suitable design and properly protected shall be mounted on Anhydrous Ammonia tank trucks and may be driven by the truck motor power take off or internal combustion engine, hand hydraulic or electric motor. The pump shall be equipped with suitable pressure actuated bypass valve permitting flow from pump discharge to pump suction when the pump discharge pressure rises above the safety relief valve. The pump shall be mounted on the chassis of the truck or trailer at a location where it can be under the observation of the operator while being used. In all cases where the pump extends below the chassis of the truck, it must be adequately protected.

(9) — Truck tanks shall be painted with a light colored, heat reflective paint, equivalent to white or aluminum, and shall have painted on the sides and rear heads the words "DANGER AMMONIA" or "CAUTION AMMONIA" in red letters at least six (6) inches in height.

(10) — The owner's name and address and owner's number shall be painted on at least one side of the container in letters not less than two inches in height.

(11) — A suitable "stop" or "stops" shall be mounted on the truck, trailer or semi-trailer, or on the container, in such a way that the container shall not be dislodged from its mounting due to the vehicle coming to a sudden stop. Back slipping shall also be prevented by proper methods. A suitable "hold-down" device shall be provided which will anchor the container at one or more places on each side of the container to the truck, trailer or semi-trailer frame so as to minimize loosening caused by vibration.

(12) — There shall be a resilient cushion of belting or other suitable material, with a thickness of not less than one-fourth (1/4) inch, placed between the saddle and tank to allow for minor imperfections in saddle support, and reduce vibrational and frictional wear between tank and supports.

(13) — Tank trucks, tank trailers and tank semi-trailers, shall not be equipped with any artificial light other than electricity. Lighting circuits shall have suitable overcurrent protection (fuses or automatic circuit breakers); the wiring shall have sufficient carrying capacity and mechanical strength, and shall be suitably secured, insulated and protected against physical damage.

(14) — All trailers shall be firmly and securely attached to the vehicle drawing them by means of suitable drawbars. Every trailer or semi-trailer shall be equipped with a reliable system of brakes, and adequate provision shall be made for efficient operation from the driver's seat of the vehicle drawing the trailer. Every trailer or semi-trailer shall be provided with side and a tail light.

(15) — Where a fifth wheel is employed, it shall be ruggedly designed, securely fastened on both units, and equipped with a positive locking mechanism which will prevent separation of the two units, except by manual release.

(16) — The exhaust system, including muffler and exhaust line, shall have ample clearance from the fuel system and combustible materials. Truck muffler and exhaust pipe shall be placed as far as practicable from any tank valves, pumps or piping. Muffler cutout shall not be used.

(17) — Each tank truck, trailer and semi-trailer shall be provided with properly attached steel bumpers or the chassis extension shall be so arranged as to protect the tank, piping, valves and fittings in case of collision.

(18) — Tank trucks and trailers owned and operated by bonded dealers and having previously been approved by

the Boiler Inspection Division may be allowed to remain in service, but in the event such truck tank or trailer is shopped for major repairs, it shall then be equipped to meet all the requirements of these Regulations.

(O) — FARM TRAILERS

(1) — The following applies to the construction, assembly and painting of tanks mounted on four wheeled trailers of the farm type used in transporting ammonia from bulk storage plants to the farm, commonly called farm trailers. Such tanks shall not exceed one thousand two hundred (1200) water gallon capacity.

(2) — Blueprints of the design, showing location of fittings and method of protection of the fittings shall be submitted to the Boiler Inspection Division for approval before vessels are fabricated for shipment into the State.

(3) — Farm trailer tanks shall be equipped with the necessary fittings as outlined herein. Fittings installed in the top portion of the shell shall be located in the center of the container and shall be adequately protected from physical damage by means of a rigid guard securely fastened to the container. The guard shall be so designed as to give a rolling effect to the container in the event the trailer overturns. The guard shall also be designed to give a skid effect in the event the trailer overturns and continues to move forward. Fittings installed in the rear head of the container shall be protected with a permanent fixture without hinges of a material the same tensile strength as the container itself, and a thickness of not less than three eighths (3/8) inch. The safety relief valves shall have direct communication with the vapor space of the container and shall be protected from rain and snow with a loose fitting covering.

(4) — Dip tubes shall be provided for the safety valve, vapor valve, filler valve, vapor gauge and 15 percent outage gauge. They shall consist of heavy duty piping curved or bent without cutting and welding. Dip tubes for safety valves, vapor valves and vapor gauge shall extend up into the vapor space of the container not less than three fourths (3/4) inch from top of container. The dip tube for the outage gauge shall extend up to a point in the container which will indicate the presence of liquid when the container is not more than eighty five (85) percent full. Dip tubes for filler valves shall extend to within not less than three fourths (3/4) inch from the bottom of the container. All dip tubes shall be screwed directly into the coupling not less than five (5) full threads and seal welded. They shall also be firmly anchored at point of termination with a bracket and clamp. Provision shall be made for the expansion or contraction of the bracket or clamp in the event of any out of roundness of shell plate.

(5) — All containers shall be equipped with suitable baffle plates which will eliminate the surging of the liquid in the container when the trailer is in motion and when making sudden stops. Baffle plates shall be attached in such a manner as to allow for any expansion or contraction of shell plates under internal pressure due to any out of roundness.

(6) — Four wheeled trailers shall be of a type construction which will prevent the towed vehicle from whipping or swerving from side to side in a dangerous or unreasonable manner but will enable it to follow substantially in the path of the towing vehicle.

(7) — All trailers shall be firmly and securely attached to the vehicle drawing them by means of drawbars of the pintle hook type, equipped with a positive locking device which will prevent separation of the two units, and supplemented by suitable safety chains.

(8) — All trailers shall be equipped with axle and wheel assemblies of sufficient size to support the weight of the container and contents adequately and safely when loaded to capacity.

(9) — All containers shall be mounted on trailers in such a manner that the bottom of the container will be as close to the ground level as possible, but in no case shall they be over 36 inches above ground level.

(10) — Containers shall be painted with a light colored, heat reflective paint, equivalent to white or aluminum paint, and shall have painted on the sides and rear head the words "DANGER AMMONIA" or "CAUTION AMMONIA" in red letters at least six (6) inches in height.

(11) — The owner's name and address and owner's number shall be painted on at least one side of the container in letters not less than two inches in height.

(12) — Containers used for the storage or transportation of Anhydrous Ammonia shall not be used for any other purpose. The filling of containers of this type with liquefied petroleum gases is strictly forbidden.

(P) — DISPENSING UNITS

(1) — All containers mounted on tractors used for dispensing Anhydrous Ammonia shall be equipped to comply with the regulations as described in "Container Valves and Accessories" (page 148), with the exception of the requirement for the excess flow check valve in the liquid outlet and the vapor return valve. Containers used for dispensing purposes shall not exceed 250 water gallon capacity.

(2) — Should any provision of these Rules and Regulations be held invalid for any reason, such holding shall not affect the validity of any remaining portion of the Rules and Regulations, it being the intent of the Boiler Inspection Division

that these Rules and Regulations shall stand, notwithstanding the invalidity of any provision.

FLOW CHART

Minimum required rate of discharge in cubic feet per minute of air at 120 percent of the maximum permitted start to discharge pressure for safety relief valves to be used on Anhydrous Ammonia containers.

Surface		Surface		Surface	
Area	Flow Rate	Area	Flow Rate	Area	Flow Rate
<u>Sq. Ft</u>	<u>C.F.M. Air</u>	<u>Sq. Ft</u>	<u>C.F.M. Air</u>	<u>Sq. Ft</u>	<u>C.F.M. Air</u>
20	258	185	1600	900	5850
25	310	190	1640	950	6120
30	360	195	1670	1000	6380
35	408	200	1710	1050	6640
40	455	210	1780	1100	6900
45	501	220	1850	1150	7160
50	547	230	1920	1200	7410
55	591	240	1980	1250	7660
60	635	250	2050	1300	7910
65	678	260	2120	1350	8160
70	720	270	2180	1400	8410
75	762	280	2250	1450	8650
80	804	290	2320	1500	8900
85	845	300	2380	1550	9140
90	885	310	2450	1600	9380
95	925	320	2510	1650	9620
100	965	330	2570	1700	9860
105	1010	340	2640	1750	10090
110	1050	350	2700	1800	10330
115	1090	360	2760	1850	10560
120	1120	370	2830	1900	10800
125	1160	380	2890	1950	11030
130	1200	390	2950	2000	11260
135	1240	400	3010	2050	11490
140	1280	450	3320	2100	11720
145	1310	500	3620	2150	11950
150	1350	550	3910	2200	12180
155	1390	600	4200	2250	12400
160	1420	650	4480	2300	12630
165	1460	700	4760	2350	12850
170	1500	750	5040	2400	13080
175	1530	800	5300	2450	13300
180	1570	850	5590	2500	13520

Surface Area = Total outside surface area of container in square feet. When the surface area is not stamped on the nameplate or when the marking is not legible, the area can be calculated by using one of the following formulas:

1. Cylindrical container with hemispherical heads: Area = overall length in feet X outside diameter in feet X 3.1416.
2. Cylindrical container with semi-ellipsoidal heads: Area = (Overall length in feet + 0.3 outside diameter in feet) X outside diameter in feet X 3.1416.
3. Spherical containers: Area = Outside diameter in feet square X 3.1416.

Flow Rate—C.F.M. Air = Cubic feet per minute of air required at standard conditions, 60° F and atmospheric pressure (14.7 PSIA)

The rate of discharge may be interpolated for intermediate values of surface area.

CHAPTER 11 PRESSURE PIPING

(A) — GENERAL PROVISIONS

(1) — The requirements of this chapter refer only to system piping connecting to the external limits shown by ASME Code in pressure vessels and boilers. ANSI B31.1 is the accepted code which prescribes the minimum requirements for the designing materials, erection, test, and inspection of power and auxiliary service piping systems for electric generation stations, industrial and institutional plants, central and district heating plants, and district heating systems. This chapter will be effective on January 1, 1994.

(B) — DEFINITIONS

For the purpose of these regulations, the terms listed below shall be construed to have the following meanings:

(1) — "Pressure Piping" means any power piping system, both steam and hot water, and their component parts within or forming a part of the pressure piping system connected to the boiler external piping system of any boiler covered by the provisions of the Boiler and Pressure Vessel Law, A.C.A. §20-23-102 *et seq.* This includes only boiler external piping for power boilers and high temperature, high pressure water boilers in which:

- (a) — Steam or vapor is generated at a pressure of more than 15 psig; and
- (b) — High temperature is generated at pressures exceeding 160 psig; and/or
- (c) — Temperatures exceeding 250°F (120°C). The boiler external piping shall be considered as that

piping which begins where the boiler proper terminates at:

- (i) — the first circumferential joint for welding and end connections; or
- (ii) — the face of the first flange in bolted flanged connections; or
- (iii) — the first threaded joint in that type of connection; and which extends up to and including

the valve or valves required by Code for Pressure Piping Para 122.1 of ASME B31.1 (1992). The terminal points themselves are considered part of the boiler external piping.

(2) — "PSIG" means pounds per square inch gauge pressure.

(3) — "New installation" means the fabrication and installation of any steam or hot water pressure piping that did not previously exist and is to be connected to a boiler or pressure vessel. This shall also apply to a previously existing system which relocated from one location to another such as from one building to another or from one plant to another. This chapter does not apply to repair or modifications of existing piping.

(C) — QUALIFICATIONS AND LICENSE

All persons, firms, or corporations engaged in the fabrication or installation of pressure piping must be licensed by the Boiler Inspection Division prior to performing the work. The pressure piping license shall consist of an endorsement to a valid license issued by the Boiler Inspection Division. There will be no additional fee for the endorsement.

(D) — INSTALLATION PERMIT

Prior to the installation or the movement of pressure piping a permit must be obtained from the Boiler Inspection Division. One application is required for each installation regardless of the size of the installation. The fee for the permit shall be One Hundred Dollars (\$100.00).

(E) — INSPECTIONS

All examinations, inspections, and testing shall be performed in accordance with Chapter VI of ANSI B31.1 with regard to frequency and manner. The owner shall be responsible for all examinations and inspections whether or not the owner performs the examinations and inspections himself. The examinations and inspections shall be performed by an authorized inspector as defined in Chapter I, Subchapter 3, of these rules and regulations. Verification must be reported to the Boiler

Inspection Division after the work is completed and prior to the installation becoming operational.

(F) — PIPING TO CONFORM

All pressure piping installed in this state shall conform to such regulations and standards as shall from time to time be adopted by the Boiler Inspection Division with the approval of the Director of the Department of Labor. The regulations and standards shall not exceed those set out in the American Society of Mechanical Engineers Code for Pressure Piping, Power Piping Code, B31.1.

Should any of these rules and regulations be held invalid for any reason, such holding shall not affect the validity of any remaining portion of these rules and regulations, it being the intent of the Boiler Advisory Board that these rules and regulations shall stand, notwithstanding the invalidity of any provision.

All rules and regulations previously adopted by the Boiler Inspection Division of the Arkansas Department of Labor with the advice of the Boiler Advisory Board are hereby repealed.

The foregoing rules and regulations were adopted, with the advice of the Boiler Advisory Board, by the Boiler Inspection Division, Department of Labor on October 1, 1999, and approved by the Director of Labor on October 1, 1999.

EFFECTIVE: October 1, 1999

Chapter 12
Owner — User Program

(a) — Owner/User Certification

Any owner of a boiler or pressure vessel who also uses and operates the boiler or vessel (Owner/User) may apply for certification under this Chapter. Upon receiving an Owner/User certification from the Boiler Division of the Arkansas Department of Labor, an Owner/User of a boiler or pressure vessel may perform any inspection required by the Arkansas Boiler and Pressure Vessel laws and regulations on such vessels owned and operated by them, with the exception of the initial installation inspection. The Owner/User must first meet the requirements prescribed by regulations as set forth by the Director of the Department of Labor.

(b) — Inspectors

An Owner/User must employ boiler inspectors holding a valid Owner/User commission issued by the National Board of Boiler and Pressure Vessel Inspectors.

(c) — Certification By The National Board Of Boiler And Pressure Vessel Inspectors Required

(1) Before receiving certification by the Arkansas Boiler Inspection Division, an Owner/User must first receive an Owner/User certification from the National Board of Boiler and Pressure Vessel Inspectors.

(2) Subsequent to certification from the National Board of Boiler and Pressure Vessel Inspectors, the Arkansas Boiler Division shall inspect all boilers to be covered under the Owner/User program and shall conduct an on site review of the owner/user program before issuing a certification under this Chapter.

(3) The Arkansas Boiler Inspection Division may audit the Owner/User's quality system at any time for just cause or upon request of the Owner/User or the National Board of Boiler and Pressure Vessel Inspectors.

(4) The National Board Inspection Code Committee may at any time change the rules for the issuance of Owner/User Certificates. All Owners/Users holding operating certificates from the Boiler Inspection Division must adhere to the most current rules.

(d) — General Requirements

(1) An Owner/User holding a certificate issued by the National Board Inspection Code Committee and certification under this chapter may perform in service inspections and certification of pressure retaining items owned/operated by them if such inspections are within the scope of the owner/user program as outlined in the Owner/User's quality control manual. However, the initial inspection upon any pressure retaining vessel shall be performed by the Arkansas Boiler Inspection Division.

(2) A certified Owner/User may perform authorized, in process and acceptance inspections (including signing the National Board Inspection Code report forms) associated with repairs and alterations of pressure retaining items owned and operated by the Owner/User. This includes repairs and alterations performed by an owner or user holding an "R" Certificate or by other "R" Certificate holders performing work on pressure retaining items owned/operated by the Owner/User. A description of the process for performing these inspections must be included in the Quality System written program and included with the application for certification by the Arkansas Boiler Inspection Division.

————— (3) ——— All welded repairs and/or alterations shall be documented on appropriate forms and distributed to the Arkansas Boiler Division. All repairs or alterations shall be made to the original code of construction; if this is not possible or practical, the latest edition of the National Board Inspection Code shall be followed..

————— (4) ——— The Owner/User must maintain on the premises where the pressure vessel is located a current edition and any addendums of the National Board Inspection Code, the Arkansas laws, rules and regulations governing boiler and pressure vessel inspection and the appropriate sections of the American Society of Mechanical Engineers Code (“ASME”).

(e) ——— Operations Requirements

————— (1) ——— Owner/Users certified by the Arkansas Boiler Inspection Division pursuant to this Chapter must possess a National Board “R” stamp before making welded repairs or alterations.

————— (2) ——— A copy of any form required for a welded repair or alteration by the National Board of Boiler Inspectors shall be provided to the Arkansas Boiler Inspection Division.

————— (3) ——— It shall be the responsibility of the Owner/User to ensure all required applications to install pressure retaining items or pressure piping or other installation permits and license requirements are met, prior to starting any work.

————— (4) ——— The Boiler Division shall be notified and a report filed when objects that require licensing or operating certificates are removed from service.

————— (5) ——— Inspection of objects requiring operating certificates shall be conducted within sixty (60) days of the due date.

————— (6) ——— The Boiler Division reserves the right to inspect objects that are overdue more than sixty (60) days.

————— (7) ——— Boilers must be inspected internally and externally at least once each year. The inspection should be made during the same calendar month each year if possible.

————— (8) ——— Unfired pressure vessels shall be inspected biennially, externally and internally where conditions permit.

————— (9) ——— The inspector employed by the Owner/User and commissioned by the National Board and the Arkansas Boiler Division is expected and required by law to shutdown equipment that is determined to be a public hazard. The Boiler Division and Chief Inspector shall be advised should this be necessary.

————— (10) ——— Explosions and accidents must be reported to the Boiler Division within 24 hours of any occurrence, **EXCEPT** that any explosion or accident that involves loss of life or serious injury shall be reported **IMMEDIATELY**. An investigation report shall be filed with the Boiler Division. The Director of the Department of Labor and the Chief Inspector shall be kept informed of the status and all changes.

————— (11) ——— Equipment that has been shutdown because it is a public hazard, will not be returned to service until repairs have been satisfactorily made, the equipment is no longer deemed to be a hazard, and the Boiler Division has been informed of the nature and extent of repairs.

————— (12) ——— Explosions and accidents shall be reported immediately if possible or as soon as practicable, especially those which involve loss of life or serious injury.

————— (13) ——— New or used objects to be installed require proper identification. A data report for each object shall be forwarded to the Boiler Division office when requesting an installation permit.

————— (14) ——— The Arkansas Boiler Division will to complete the first inspection upon new and newly installed objects, unless an Arkansas “AR” number has already been assigned to the object. The Owner/User should contact the Boiler Division with all appropriate data and request an installation permit. Upon receipt of the request for an installation permit, a state inspection will be scheduled. Each object installed which comes under the law, and is not already registered with the Boiler Division, shall have a metal tag with identifying numbers preceded by “AR” attached to it.

————— (15) ——— All boilers and pressure vessels installed or to be installed in any location within the State of Arkansas shall be constructed to a code that has been adopted by or is acceptable to the Chief Boiler Inspector and the Boiler Division. They shall also be registered with the National Board Of Boiler And Pressure Vessels.

————— (16) ——— All new and used boilers and pressure vessels installed or to be installed within the State of Arkansas shall be properly identified. Application for installation of said vessels shall be accompanied by a manufacturer’s data report that verifies its construction.

————— (17) ——— All installations of new or used vessels may only be performed by installers licensed by the Boiler Division pursuant to Arkansas Code 20-23-401, and the Owner/User must also comply with Arkansas Code Annotated 20-23-307; 20-23-308; 20-23-309.

————— (18) ——— All new and used objects to be installed shall be properly identified. Each object shall have a legible nameplate installed; this nameplate data shall be furnished to the Boiler Division with the request for installation permit.

————— (19) ——— Should this Chapter not cover needed areas of inspection, repairs, or other information which may be

required, refer to other applicable chapters of the Arkansas Boiler and Pressure Vessel Inspection codebook.

(20) Should there be a discrepancy between the rules and regulations set forth in this Chapter and the National Board Inspection Code or applicable sections of the "ASME" Code, the Arkansas Boiler and Pressure Vessel Inspection code and/ or this Chapter take precedence.

(21) Should conflicts arise in the enforcement of these rules and regulations as set forth here, the Chief Boiler Inspector may act to interpret the rules in a manner which will be satisfactory to the Code and the Owner/User organization.

(f) Fees

The following fees for review by the Arkansas Boiler Division shall be paid before any Owner/User self-inspection program will be recognized and issued a certificate by the Arkansas Boiler Division:

(1) A full day review: \$440.00

(2) A half day review: \$220.00

Expenses shall be charged including mileage, meals and lodging not to exceed the rate authorized by the General Assembly to employees of state agencies.

(g) Revocation

(1) A certificate received pursuant to this Chapter will be automatically revoked if, for any reason, the Owner/User's certification by the National Board of Boiler Inspectors is revoked.

(2) If periodic inspections of pressure retaining vessels are not performed in a timely manner, the Owner/User may be subject to revocation of the certificate issued by the Arkansas Boiler Division.

(H) EFFECTIVE DATE:

This regulation shall be effective March 1, 2002.

Chapter 13 Restricted Lifetime Licenses

(a) Boiler Inspectors

To qualify for a restricted lifetime boiler inspector's certificate of competency and commission, an applicant shall:

(1) have been commissioned as a boiler inspector for no fewer than twelve (12) years;

(2) be at least sixty five (65) years of age;

(3) have a current boiler inspector commission issued by the Arkansas Boiler Division.

(b) Boiler Operators

To qualify for a restricted lifetime boiler operator's certificate of competency and commission, an applicant shall:

(1) have been commissioned as a boiler operator for no fewer than twelve (12) years;

(2) be at least sixty five (65) years of age;

(3) have a current boiler operator commission issued by the Arkansas Boiler Division.

(c) Installers, Sellers Or Repairers

To qualify for a restricted lifetime license as a boiler installer, seller or repairer, an applicant shall:

(1) have been licensed for no fewer than twelve (12) years;

(2) be at least sixty five (65) years of age;

(3) have a current license issued by the Arkansas Boiler Division.

(d) Application

An application for a restricted license to be issued pursuant to this Chapter, shall be on a form approved by the Chief Boiler Inspector.

(1) An applicant for any restricted lifetime license listed above must submit satisfactory proof of age which may include one of the following:

(a) a birth certificate;

(b) a passport or certificate of arrival in the United States;

(c) a state issued driver's license or identification card;

(d) any document issued by the U.S. Military which includes a photograph or information including name, sex, date of birth, and other identifying information; or

(e) any other document of similar reliability.

(e) Restrictions

A person holding a restricted lifetime license issued under this Chapter must meet all qualifications for licensure

~~pursuant to Arkansas Code Annotated 20-23-401 et seq.~~

~~(f) — Fees~~

~~Each applicant for license under this Chapter shall pay a one time fee of Fifty Dollars (\$50.00).~~

~~(g) — Effective Date~~

~~This regulation shall be effective March 1, 2002.~~

010.01 Administrative Regulations of the Boiler Inspection Division of the Arkansas Department of Labor

010.01-001 Statement of Organization and Operations

The Commissioner of Labor was authorized to appoint a State Boiler Inspector by Act 428 of 1917. This act created what is now known as the Boiler Inspection Division of the Arkansas Department of Labor. Ark. Code Ann. §§ 20-23-101 et seq. The legislature has delegated to the agency regulatory authority over the manufacture, repair, installation, operation, and inspection of steam boilers, hot water heating and supply boilers, pressure piping, and unfired pressure vessels, including anhydrous ammonia containers and equipment. Additionally, the legislature has delegated to the agency the power to oversee the licensure of boiler manufacturers, sellers, and repairers; boiler operators; and boiler inspectors. Ultimate authority for the operation of the agency is in the Director of the Department of Labor. The individual charged with the day-to-day operations is referred to as the Chief Boiler Inspector, who is selected by the Director and is directly supervised by the Code Enforcement Administrator. From time to time the division promulgates rules and regulations.

010.01-002 Information for Public Guidance

The mailing address and telephone number for the Boiler Inspection Division is:

Boiler Inspection Division
Arkansas Department of Labor
10421 West Markham Street
Little Rock, AR 72205
(501) 682-4513

The Department of Labor makes available a list of persons holding certain responsibilities for handling FOIA requests, licensing questions, complaints against licensees, and compliance requests or assistance so that the public may obtain information about the agency or make submissions or requests. The names, mailing addresses, telephone numbers and electronic addresses can be obtained from the agency's office or Web site. The Department of Labor's Web site is: <http://www.arkansas.gov/labor/>. The Boiler Inspection Division's Web site is: http://www.arkansas.gov/labor/divisions/boiler_p1.html.

The division has a list of official forms used by the division and a list of all formal, written statements of policy and written interpretative memoranda, and orders, decisions and opinions resulting from adjudications, which may be obtained from the division's office or Web site.

Copies of all forms used by the division, written statements of policy and written interpretive memoranda, and all orders issued by the division may be obtained from the division's office.

010.01-003 General Organization

A. The division is generally divided into an office staff and a field staff. The field staff is composed of Boiler Inspectors.

B. The Boiler Advisory Board was created by the legislature, Ark. Code Ann. § 20-23-201, to assist the division regarding the adoption and amendment of regulations, as well as to provide advice and counsel to the division on other matters. The Advisory Board consists of four (4) members, with the Director serving as ex-officio chairman.

C. All public meetings, including meetings of the Boiler Advisory Board will be conducted pursuant to Robert’s Rules of Order and in conformity with the Arkansas Freedom of Information Act. Regular meetings will be held quarterly. Special meeting may be held on the call of the Chairman, but in no event shall the Board meet more than 4 times a year.

D. A quorum for the transaction of business by the Boiler Advisory Board is three (3) members.

E. The division or the Advisory Board may create standing and ad hoc committees. The Director/Chairman will select members of committees. A quorum for the transaction of committee business is a majority of the number of voting members of the committee.

F. The Chief Boiler Inspector will prepare the agenda for regular and special meetings of the Boiler Advisory Board. The agenda will be distributed to Board members and agency staff and made available to the public in advance of the meeting. The agenda should state specifically the items that will be considered at the meeting. The agenda should include the following topics as applicable:

1. Call to Order
2. Review of Minutes
3. Old Business
4. New Business
5. Other Business
6. Adjudicatory Hearings
7. Rule-making Hearings; and
8. Public Comment

The order of the agenda items is intended to be flexible and may be adjusted to meet the needs of the division. Additionally, the agenda may be amended by appropriate motion.

010.01-004 Rule-Making

A. Authority

The division has been authorized by the Legislature to promulgate rules. Ark. Code Ann. § 20-23-301(a)(2). The division follows the procedural requirements of the Arkansas Administrative Procedure Act, in particular Ark. Code Ann. §§ 25-15-203 and -204. Additionally, the division is required to abide by the provisions of Ark. Code Ann. § 10-3-309.

B. Initiation of Rule-Making

The process of adopting a new rule or amending or repealing an existing rule (hereinafter referred to as “rule-making”) may be initiated by request of the Boiler Advisory Board or the Director that the Department staff submit proposed drafts. Additionally, staff of the Department may request permission to

initiate rule-making. Third persons outside the agency may petition for the issuance, amendment, or repeal of any rule.

C. Petition to Initiate Rule-Making

Third parties may initiate rule-making to adopt, amend, or repeal a rule by filing a petition with the division to initiate rule-making. The petition must contain the name, address, and telephone number of the petitioner, the specific rule or action requested, the reasons for the rule or action requested, and facts showing that the petitioner is regulated by the division or has a substantial interest in the rule or action requested.

The petition to initiate rule-making shall be filed with the Director of the Department of Labor.

Within thirty (30) days after submission of the petition, the division will either deny the petition, stating its reasons in writing or will initiate rule-making. A special meeting of the Boiler Advisory Board may be called.

D. Pre-filing with the Bureau of Legislative Research

Thirty (30) days before the public-comment period ends, the division will file with the Bureau of Legislative Research the text of the proposed rule or amendment as well as a financial impact statement and a Bureau of Legislative Research questionnaire as provided by Ark. Code Ann. § 10-3-309.

E. Public Input

1. Before finalizing language of a proposed new rule or an amendment to, or repeal of, an existing rule, the division will receive public input through written comments and/or oral submissions. The division will designate in its public notice the format and timing of public comment.

2. Any public hearing will provide affected persons and other members of the public a reasonable opportunity for presentation of evidence, arguments, and oral statements within reasonable conditions and limitations imposed by the division to avoid duplication, irrelevant comments, unnecessary delay, or disruption of the proceedings.

3. The Director or his designee may preside at the public hearing. The division will ensure that the department personnel responsible for preparing the proposed rule or amendment are available, and will notify third parties initiating rule changes to be available to explain the proposal and to respond to questions or comments regarding the proposed rule.

4. The division will preserve the comments made at the public hearing by a tape recording.

5. Any person may submit written statements within the specified period of time. All timely, written statements will be considered by the division and be made a part of the rule-making record.

F. Notice of Rule-Making

The division will give notice of proposed rule-making to be published pursuant to A.C.A. §25-15-204. The notice will set any written comment period and will specify the time, date, and place of any public hearing.

G. The Decision to Adopt a Rule

1. The division will not finalize language of the rule or decide whether to adopt a rule until the period for public comment has expired.

2. Before acting on a proposed rule, the division will consider all of the written submissions and/or oral submissions received in the rule-making proceeding or any memorandum summarizing such oral submissions, and any regulatory analysis or fiscal impact statement issued in the rule-making proceedings.

3. The division may use its own experience, specialized knowledge, and judgment in the adoption of a rule.

H. Variance Between Adopted Rule and Published Notice of Proposed Rule

1. The division may not adopt a rule that differs from the rule proposed in the published notice of the intended rule-making on which the rule is based unless:

- a. The final rule is in character with the original scheme and was a logical outgrowth of the notice and comments stemming from the proposed rule, or
- b. The notice fairly apprised interested persons of the subject and the issues that would be considered so that those persons had an opportunity to comment.

2. In determining whether the final rule is in character with the original scheme and was a logical outgrowth of the notice and comments, and that the notice of intended rule-making provided fair warning that the outcome of that rule-making proceeding could be the rule in question, the division must consider the following factors:

- a. The extent to which persons who will be affected by the rule should have understood that the rule-making proceeding on which it is based could affect their interests; and
- b. The extent to which the subject matter of the rule or issues determined by the rule are different from the subject matter or issues contained in the notice of intended rule-making; and
- c. The extent to which the effects of the rule differ from the effects of the proposed rule contained in the notice of intended rule-making.

I. Concise Statement of Reasons

1. When requested by an interested person, either prior to the adoption of a rule or within thirty (30) days after its adoption, the division shall issue a concise statement of the principal reasons for and against its adoption of the rule. Requests for such a statement must be in writing and be delivered to Director of the Department of Labor. The request should indicate whether the statement is sought for all or only a specified part of a rule. A request will be considered to have been submitted on the date on which it is received by the Director.

2. The concise statement of reasons must contain:

a. The division's reasons for adopting the rule;

b. An indication of any change between the text of the proposed rule and the text of the rule as finally adopted, with explanations for any such change; and

c. The principal reasons urged in the rule-making procedure for and against the rule, and the division's reasons for overruling the arguments made against the rule.

J. Contents

The division shall cause its rules to be published and made available to interested persons. The publication must include:

1. The text of the rule; and

2. A note containing the following:

(a) The date(s) the division adopted or amended the rule;

(b) The effective date(s) of the rule;

(c) Any findings required by any provisions of law as a prerequisite to adoption for effectiveness of the rule; and

(d) Citation to the entire specific statutory or other authority authorizing the adoption of the rule;

3. The publication of the rule(s) must state the date of publication.

K. Format

The published rules of the division will be organized substantially in the following format:

I. Statement of Organization and Operations

II. Information for Public Guidance

III. General Organization

IV. Rule-making

V. Emergency Rule-making

VI. Declaratory Orders

VII. Adjudicative Hearings

VIII. Licensing,

IX. Et seq. Substantive rules and other rules of Agency

L. Incorporation by Reference

By reference in a rule, the division may incorporate all or any part of a code, standard, rule, or other matter

if the division finds that copying the matter in the division's rule would be unduly cumbersome, expensive, or otherwise inexpedient. The reference in the division rule will fully and precisely identify the incorporated matter by title, citation, date, and edition, if any; briefly indicate the precise subject and general contents of the incorporated matter; and state that the rule does not include any later amendments or editions of the incorporated matter. The division may incorporate such a matter by reference in a proposed or adopted rule only if the agency makes copies of the incorporated matter readily available to the public. The rules must state how and where copies of the incorporated matter may be obtained at cost from this division, and how and where copies may be obtained from an agency of the United States, this state, another state, or the organization, association, or persons originally issuing that matter. The division will retain permanently a copy of any materials incorporated by reference in a rule of the division.

M. Filing

1. After the division formally adopts a new rule or amends a current rule or repeals an existing rule, and after the rule change has been reviewed by the Legislative Council, the staff will file final copies of the rule with the Secretary of State, the Arkansas State Library, and the Bureau of Legislative Research, or as otherwise provided by A.C.A. §25-15-204(d).

2. Proof of filing a copy of the rule, amendment, or repeal with the Secretary of State, the Arkansas State Library, and the Bureau of Legislative Research will be kept in a file maintained by the Legal Division of the Arkansas Department of Labor.

3. Notice of the rule change will be posted on the Department Web page.

010.01-005 Emergency Rule-Making

A. Request for Emergency Rule-Making

The proponent of a rule may request the division to adopt an emergency rule. In addition to the text of the proposed rule or amendment to an existing rule and any other information required by Rule 010.01.004(C), the proponent will provide a written statement setting out the facts or circumstances that would support a finding of imminent peril to the public health, safety, or welfare.

B. Finding of Emergency

Upon receipt of the written statement requesting an emergency rule-making and documents or other evidence submitted in support of the assertion that an emergency exists, the division will make an independent judgment as to whether the circumstances and facts constitute an imminent peril to the public health, safety, or welfare requiring adoption of the rule upon fewer than 30 days notice. If the division determines that the circumstances warrant emergency rule-making, it will make a written determination that sets out the reasons for the division's finding that an emergency exists. Upon making this finding, the division may proceed to adopt the rule without any prior notice or hearing, or it may determine to provide an abbreviated notice and hearing.

C. Effective Date of Emergency Rule

The emergency rule will be effective immediately upon filing, or at a stated time less than ten (10) days thereafter, if the division finds that this effective date is necessary because of imminent peril to the public

health, safety, or welfare. The division will file with the rule its written findings justifying the determination that emergency rule-making is appropriate and, if applicable, the basis for the effective date of the emergency rule being less than ten days after the filing of the rule pursuant to A.C.A. §25-15-204(e). The division will take appropriate measures to make emergency rules known to persons who may be affected by them.

010.01-006 Declaratory Orders

A. Purpose and Use of Declaratory Orders

A declaratory order is a means of resolving a controversy or answering questions or doubts concerning the applicability of statutory provisions, rules, or orders over which the division has authority. A petition for declaratory order may be used only to resolve questions or doubts as to how the statutes, rules, or orders may apply to the petitioner's particular circumstances. A declaratory order is not the appropriate means for determining the conduct of another person or for obtaining a policy statement of general applicability from an division. A petition or declaratory order must describe the potential impact of statutes, rules, or orders upon the petitioner's interests.

B. The Petition

The process to obtain a declaratory order is begun by filing with Director of the Department of Labor, a petition that provides the following information:

1. The caption shall read: Petition for Declaratory Order Before Boiler Inspection Division.
2. The name, address, telephone number, and facsimile number of the petitioner.
3. The name, address, telephone number, and facsimile number of the attorney of the petitioner.
4. The statutory provision(s), agency rule(s), or agency order(s) on which the declaratory order is sought.
5. A description of how the statutes, rules, or orders may substantially affect the petitioner and the petitioner's particular set of circumstances, and the question or issue on which petitioner seeks a declaratory order.
6. The signature of the petitioner or petitioner's attorney.
7. The date.
8. Request for a hearing, if desired.

C. Division Disposition

1. The division may hold a hearing to consider a petition for declaratory statement. If a hearing is held, it shall be conducted in accordance with A.C.A. §25-15-208 and §25-15-213, and the division's rules for adjudicatory hearings.

2. The division may rely on the statements of fact set out in the petition without taking any position with regard to the validity of the facts. Within ninety (90) days of the filing of the petition, the division will render a final order denying the petition or issuing a declaratory order.

010.01-007 Adjudicative Hearings

A. Scope of This Rule

This Rule applies in all administrative adjudications conducted by the Boiler Inspection Division of the Arkansas Department of Labor. This procedure is developed to provide a process by which the agency formulates orders, including orders revoking a permit or license or making a final administrative determination regarding the imposition of a civil penalty or fine.

B. Presiding Officer

The Director of the Department of Labor shall preside at the hearing or may designate a hearing officer, examiner or referee to preside at a hearing.

C. Appearances

1. Any party appearing in any agency proceeding has the right, at his or her own expense, to be represented by counsel.
2. The respondent may appear on his or her own behalf.
3. Any attorney representing a party to an adjudicatory proceeding must file notice of appearance as soon as possible.
4. Service on counsel of record is the equivalent of service on the party represented.
5. On written motion served on the party represented and all other parties of record, the presiding officer may grant counsel of record leave to withdraw for good cause shown.

D. Consolidation

If there are separate matters that involve similar issues of law or fact, or identical parties, the matters may be consolidated if it appears that consolidation would promote the just, speedy, and inexpensive resolution of the proceedings.

E. Notice to Interested Parties

If it appears that the determination of the rights of parties in a proceeding will necessarily involve a determination of the substantial interests of persons who are not parties, the presiding officer may enter an order requiring that an absent person be notified of the proceeding and be given an opportunity to be joined as a party of record.

F. Service of Papers

Unless the presiding officer otherwise orders, every pleading and every other paper filed for the proceeding, except applications for witness subpoenas and the subpoenas, shall be served on each party or the party's representative at the last address of record.

G. Initiation & Notice of Hearing

1. An administrative adjudication is initiated by the issuance by the division of a notice of hearing.

2. The notice of hearing will be sent to the respondent by U.S. Mail, return receipt requested, delivery restricted to the named recipient or his agent. Notice shall be sufficient when it is so mailed to the respondent's latest address on file with the agency.

3. Notice will be mailed at least thirty (30) days before the scheduled hearing.

4. The notice will include:

a. a statement of the time, place, and nature of the hearing;

b. a statement of the legal authority and jurisdiction under which the hearing is to be held;

and

c. a short and plain statement of the matters of fact and law asserted.

H. Motions

All requests for relief will be by motion. Motions must be in writing or made on the record during a hearing. A motion must fully state the action requested and the grounds relied upon. The original written motion will be filed with the division. When time allows, the other parties may, within seven (7) days of the service of the written motion, file a response in opposition. The presiding officer may conduct such proceedings and enter such orders as are deemed necessary to address issues raised by the motion. However, a presiding officer, other than the Director, will not enter a dispositive order unless expressly authorized in writing to do so.

I. Answer

A respondent may file an answer.

J. Discovery

1. Upon written request, the division will provide the information designated in A.C.A §25-15-208(a)(3).

2. Such requests should be received by the division at least ten (10) days before the scheduled hearing.

K. Continuances

1. The presiding officer may grant a continuance of hearing for good cause shown. Requests for continuances will be made in writing. The request must state the grounds to be considered and be made as soon as practicable and, except in cases of emergencies, no later than five (5) days prior to the date noticed for the hearing. In determining whether to grant a continuance, the presiding officer may consider:

- a. Prior continuances;
- b. The interests of all parties;
- c. The likelihood of informal settlements;
- d. The existence of an emergency;
- e. Any objection;
- f. Any applicable time requirement;
- g. The existence of a conflict of the schedules of counsel, parties, or witnesses;
- h. The time limits of the request; and
- i. Other relevant factors.

2. The presiding officer may require documentation of any grounds for continuance.

L. Hearing Procedures

1. The presiding officer presides at the hearing and may rule on motions, require briefs, and issue such orders as will ensure the orderly conduct of the proceedings; provided, however, any presiding officer other than the Director of the Department of Labor shall not enter a dispositive order or proposed decision unless expressly authorized in writing to do so.

2. All objections must be made in a timely manner and stated on the record.

3. Parties have the right to participate or to be represented by counsel in all hearings or pre-hearing conferences related to their case.

4. Subject to terms and conditions prescribed by the Administrative Procedure Act, parties have the right to introduce evidence on issues of material fact, cross-examine witnesses as necessary for a full and true disclosure of the facts, present evidence in rebuttal, and, upon request by the division, may submit briefs and engage in oral argument.

5. The presiding officer is charged with maintaining the decorum of the hearing and may refuse to admit, or may expel, anyone whose conduct is disorderly.

N. Order of Proceedings

The presiding officer will conduct the hearing in the following manner:

1. The presiding officer will give an opening statement, briefly describing the nature of the proceedings.
2. The parties are to be given the opportunity to present opening statements.
3. The parties will be allowed to present their cases in the sequence determined by the presiding officer.
4. Each witness must be sworn or affirmed by the presiding officer, or the court reporter, or any other person authorized by law to administer oaths and be subject to examination and cross-examination as well as questioning by the presiding officer or the Boiler Advisory Board as applicable. The presiding officer may limit questioning in a manner consistent with the law.
5. When all parties and witnesses have been heard, parties may be given the opportunity to present final arguments.

N. Evidence

1. The presiding officer shall rule on the admissibility of evidence and may, when appropriate, take official notice of facts in accordance with all applicable requirements of law.
2. Stipulation of facts is encouraged. The division may make a decision based on stipulated facts.
3. Evidence in the proceeding must be confined to the issues set forth in the hearing notice, unless the parties waive their right to such notice or the presiding officer determines that good cause justifies expansion of the issues. If the presiding officer decides to admit evidence outside the scope of the notice, over the objection of a party who did not have actual notice of those issues, that party, upon timely request, will receive a continuance sufficient to prepare for the additional issue and to permit amendment of pleadings.
4. A party seeking admission of an exhibit must provide three (3) copies of each exhibit at a hearing before a designated hearing officer and seven (7) copies of each exhibit at a hearing before the Boiler Advisory Board. The presiding officer must provide the opposing parties with an opportunity to examine the exhibit prior to the ruling on its admissibility. All exhibits admitted into evidence must be appropriately marked and be made part of the record.
5. Any party may object to specific evidence or may request limits on the scope of the examination or cross-examination. A brief statement of the grounds upon which it is based shall accompany such an objection. The objection, the ruling on the objection, and the reasons for the ruling will be noted in the record. The presiding officer may rule on the objection at the time it is made or may reserve the ruling until the written decision.
6. Whenever evidence is ruled inadmissible, the party offering that evidence may submit an offer of proof on the record. The party making the offer of proof for excluded oral testimony will briefly summarize the testimony or, with permission of the presiding officer, present the testimony. If the excluded evidence consists of a document or exhibit, it shall be marked as part of an offer of proof and

inserted in the record.

7. Irrelevant, immaterial, and unduly repetitive evidence will be excluded. Any other oral or documentary evidence, not privileged, may be received if it is of a type commonly relied upon by reasonably prudent men and women in the conduct of their affairs.

8. Reasonable inferences. The finder of fact may base its findings of fact upon reasonable inferences derived from other evidence received.

O. Default

If a party fails to appear or participate in an administrative adjudication after proper service of notice, the division may proceed with the hearing and render a decision in the absence of the party.

P. Subpoenas

1. At the request of any party, the Director of Labor shall issue subpoenas for the attendance of witnesses at the hearing. The requesting party shall specify whether the witness is also requested to bring documents and reasonably identify said documents.

2. A subpoena may be served by any person specified by law to serve process or by any person who is not a party and who is eighteen (18) years of age or older. Delivering a copy to the person named in the subpoena shall make service. Proof of service may be made by affidavit of the person making service. The party seeking the subpoena shall have the burden of obtaining service of the process and shall be charged with the responsibility of tendering appropriate mileage fees and witness fees pursuant to Rule 45, Arkansas Rules of Civil Procedure. The witness must be served at least two (2) days prior to the hearing. For good cause, the Director may authorize the subpoena to be served less than two (2) days before the hearing.

3. Any motion to quash or limit the subpoena shall be filed with the division and shall state the grounds relied upon.

Q. Recording the Proceedings

The responsibility to record the testimony heard at a hearing is borne by the division. Upon the filing of a petition for judicial review, the agency will provide a transcript of testimony taken before the agency.

R. Factors to be Considered in Imposing Sanctions

In addition to any other considerations permitted by Ark. Code Ann. §§ 20-23-101 *et seq.*, if applicable, the division in imposing any sanction may consider the following:

1. The nature and degree of the misconduct for which the sanction is being imposed.
2. The seriousness and circumstances surrounding this misconduct.
3. The loss or damage to clients or others.
4. The assurance of future compliance.

5. The profit to the wrongdoer.
6. The avoidance of repetition.
7. Whether the conduct was deliberate, intentional, or negligent.
8. The deterrent effect on others.
9. The conduct of the individual, corporation or other entity during the course of the disciplinary proceeding.
10. Any prior enforcement actions or sanctions, including warnings.
11. Matters offered in mitigation or extenuation, except that a claim of disability or impairment resulting from the use of alcohol or drugs may not be considered unless the individual demonstrates that he or she is successfully pursuing in good faith a program of recovery.

S. Final Order

The division will serve on the respondent a written order that reflects the action taken by the division. The order will include a recitation of facts found based on testimony and other evidence presented and reasonable inferences derived from the evidence pertinent to the issues of the case. It will also state conclusions of law and directives or other disposition entered against or in favor of the respondent.

The order will be served personally or by mail on the respondent. If counsel represents respondent, service of the order on respondent's counsel shall be deemed service on the respondent.

010.01-008 Licensing

A. General

1. All division action regarding licensure shall be governed by Ark. Code Ann. §§ 20-23-101 et seq.; these Rules and, when applicable, Ark. Code Ann. §§25-15-208 to -213.

2. The division is responsible for licensure of boiler inspectors employed by insurance companies, Ark. Code Ann. § 20-23-402; boiler operators, Ark. Code Ann. § 20-23-404; and sellers, installers, and repairers of boilers, unfired pressure vessels, hot water storage containers and pressure piping, Ark. Code Ann. § 20-23-405.

B. Requirement to Keep Current Address on File

All persons holding a license or permit issued by the division are required to provide the division with information so that the division can remain in contact and provide notice of complaints and/or hearings. The licensee is required to provide written notice to the board of any change in business and/or residence address within ten (10) working days of the change. Service of notices of hearing sent by mail will be addressed to latest address on file with the division.

C. Review of Application

The application and supporting documentation will be reviewed by division staff. The division will inform the applicant in writing if it determines that the application is incomplete, and will specify why the application is incomplete. When a completed application, a supplemental application, or the requested information is returned, the agency will reinstate action on the application for license. If all requirements are met, a license will be issued or the applicant will be allowed to take the licensing examination, whichever is applicable.

D. Denial of License

1. If a preliminary determination is made that the application should be denied, the division will inform the applicant of the opportunity for a hearing on the application.

2. The grounds or basis for the proposed denial of a license will be set forth in writing by the division. Any hearing on the denial of a license will be conducted in accordance with A.C.A. § 25-15-208 and A.C.A. § 25-15-213, and unless otherwise provided by law, the applicant has the burden of establishing entitlement to the license.

E. Suspension, Revocation, Annulment or Withdrawal

1. Prior to the entry of a final order to suspend, revoke, annul, or withdraw a license, or to impose other sanctions upon a licensee, the division will serve the licensee a notice of hearing in the manner set out in A.C.A. § 25-15-208 and Rule 010.01.007(G).

2. The division has the burden of proving the alleged facts and violations of law stated in the notice.

3. A license will not be renewed if there is an unpaid administrative fine. Further failure to pay an administrative fine may result in suspension or revocation of a license.

F. Emergency Action

1. If the division finds that the public health, safety, or welfare imperatively requires emergency action and incorporates that finding in its order, the division can summarily suspend, limit, or restrict a license. The notice requirement in 010.01.007(G) does not apply and must not be construed to prevent a hearing at the earliest time practicable.

2. Emergency Order:

An emergency adjudicative order must contain findings that the public health, safety, and welfare imperatively require emergency action to be taken by the division. The written order must include notification of the date on which division proceedings are scheduled for completion.

Written Notice. The written emergency adjudicative order will be immediately delivered to persons who are required to comply with the order. One or more of the following procedures will be used:

a. Personal delivery;

- b. Certified mail, return receipt requested, to the last address on file with the division;
- c. First class mail to the last address on file with the division;
- d. Fax. Fax may be used as the sole method of delivery if the person required to comply with the order has filed a written request that division orders be sent by fax and has provided a fax number for that purpose.
- e. Oral notice. Unless the written emergency order is served by personal delivery on the same day that the order issues, the division shall make reasonable immediate efforts to contact by telephone the persons who are required to comply with the order.

3. Unless otherwise provided by law, within ten (10) days after emergency action taken pursuant to paragraph E1 of this rule, the division must initiate a formal suspension or revocation proceeding.

G. Voluntary Surrender of License

The licensee, in lieu of formal disciplinary proceedings, may offer to surrender his or her license, subject to the division's determination to accept the proffered surrender, rather than conducting a formal disciplinary proceeding.

H. Duty of Sanctioned Licensee

In every case in which a license is revoked, suspended, or surrendered, the licensee shall, within thirty (30) days of the revocation, suspension, or surrender, do the following:

1. Return his or her license and any license pocket cards to the division's office;
2. Notify all of his or her clients or employer in writing that his or her license has been revoked, suspended, or surrendered;
3. Notify all clients or his or her employer to make arrangements for other services, calling attention to any urgency in seeking the substitution of another licensee;
4. Deliver to all clients or employer any papers or property to which they are entitled, or notify the client or employer of a suitable time and place where the papers and other property may be obtained, calling attention to any urgency for obtaining the papers or other property;
5. Refund any part of the fees paid in advance that have not been earned;
6. Keep and maintain a record of the steps taken to accomplish the foregoing;
7. File with the division a list of all other state, federal, and administrative jurisdictions by which he or she is licensed. Upon such filing, the division will notify those entitled of the revocation, suspension, or surrender; and
8. The sanctioned licensee shall, within thirty (30) days of revocation, suspension, or surrender of the license, file an affidavit with the agency that he or she has fully complied

with the provisions of the order and completely performed the foregoing or provide a full explanation of the reasons for his or her non-compliance. Such affidavit shall also set forth the address where communications may thereafter be directed to the respondent.

I. Reinstatement After Suspension

1. An order suspending a license may provide that a person desiring reinstatement may file with the Director of the Department of Labor a verified petition requesting reinstatement.

2. The petition for reinstatement must set out the following:

a. That the individual has fully and promptly complied with the requirements of section 010.01.008(H) of these rules pertaining to the duty of a sanctioned licensee;

b. That the individual has refrained from practicing in this occupation or business during the period of suspension;

c. That the individual's license fee is current or has been tendered to the division; and

d. That the individual has fully complied with any requirements imposed as conditions for reinstatement.

3. Any knowing misstatement of fact may constitute grounds for denial or revocation of reinstatement.

4. Failure to comply with the provisions of sections 101.01.008(H)7 and (H)8 of this Rule precludes consideration for reinstatement.

5. No individual will be reinstated unless the Director of Labor approves reinstatement upon a recommendation from the Boiler Advisory Board by a majority vote.

J. Re-Licensure for Revoked or Surrendered License

1. No individual who has had his or her license revoked or who has surrendered his or her license will be licensed, except on petition made to the division. The application for re-licensure is not allowed until at least two (2) years after the revocation or surrender of license took effect.

2. The applicant bears the burden of proof that he is rehabilitated following the revocation or surrender of his license, that he can engage in the conduct authorized by the license without undue risk to the public health, safety, and welfare, and that he is otherwise qualified for the license pursuant to Ark. Code Ann. § 20-23-101 et seq.

3. The division may impose any appropriate conditions or limitations on a license to protect the public health, safety, and welfare.

4. The division may require that the person seeking re-licensure take the licensing examination if applicable.

K. Sellers, Installers, and Repairers

1. All persons, firms, or corporations engaged in the sale or installation of boilers, unfired pressure vessels, hot water storage containers, or pressure piping or engaged in the repair of boilers or unfired pressure vessels shall be licensed by the division. Ark. Code Ann. § 20-23-405.

2. The annual license fee shall be seventy-five dollars (\$75) per year, payable in advance on or before January 31 of each calendar year.

3. Applicants for a license who are manufacturers shall have the appropriate ASME stamp as required in the ASME Codes adopted in Rule 010.01.012.

4. Applicants for a license that perform welded repairs shall possess the National Board “R” stamp or shall certify that they perform welded repairs only on vessels owned and operated by the applicant.

L. Inspectors

1. Inspectors of boilers employed by insurance companies insuring boilers in Arkansas, must have a certificate of competency and commission issued by the division. Ark. Code Ann. § 20-23-401.

2. The initial license fee shall be twenty-five dollars (\$25), and the renewal fee shall be fifteen (\$15) annually.

3. Applicants for a license must be employed by an insurance company and must have passed the written examination for boiler inspectors administered by the National Board of Boiler and Pressure Vessel Inspectors.

4. This Rule, 010.01.008(L), does not apply to boiler inspectors in the employ of the department.

M. Boiler Operators

1. Boiler operators shall be licensed by the Boiler Inspection Division. Ark. Code Ann. § 20-23-404.

2. An applicant for a boiler operator’s license shall:

a. have six (6) months of training under the supervision of a licensed boiler operator, which shall be confirmed by the applicant’s employer and submitted to the division with the application; and

b. pass an examination administered by the division. Such examination may be in writing or may be administered orally. The applicant must score 70% for a passing grade on the examination.

3. An applicant shall pay an initial fee of twenty-five dollars (\$25) for examination and licensure. The license shall be renewed annually at a fee of seventeen dollars (\$17).

4. A restricted license may be issued to an applicant who has passed the examination, but does

not have the requisite six (6) months of training. Such a restricted license shall authorize the license holder to work under the direction and supervision of a regularly licensed boiler operator and is effective for one (1) year from the date of issue. The fee for a restricted license shall be twenty-five dollars (\$25).

N. Restricted Lifetime Licenses, Ark. Code Ann. § 20-23-406

1. Boiler Inspectors

To qualify for a restricted lifetime boiler inspector's certificate of competency and commission, an applicant shall:

a. have been commissioned as a boiler inspector for no fewer than twelve (12) years;

b. be at least sixty-five (65) years of age; and

c. have a current boiler inspector commission issued by the Boiler Inspection Division.

2. Boiler Operators

To qualify for a restricted lifetime boiler operator's certificate of competency and commission, an applicant shall:

a. have been commissioned as a boiler operator for no fewer than twelve (12) years;

b. be at least sixty-five (65) years of age; and

c. have a current boiler operator license issued by the Boiler Inspection Division.

3. Installers, Sellers Or Repairers

To qualify for a restricted lifetime license as a boiler installer, seller or repairer, an applicant shall:

a. have been licensed for no fewer than twelve (12) years;

b. be at least sixty-five (65) years of age; and

c. have a current license issued by the Boiler Inspection Division.

4. Application

a. An application for a restricted lifetime license shall be on a form approved by the division.

b. An applicant for any restricted lifetime license listed above must submit satisfactory proof of age which may include one of the following:

- (i) a birth certificate;
- (ii) a passport or certificate of arrival in the United States;
- (iii) a state-issued driver's license or identification card;
- (iv) any document issued by the U.S. Military which includes a photograph or information including name, sex, date of birth, and other identifying information; or
- (v) any other document of similar reliability acceptable to the division.

5. Restrictions

A person holding a restricted lifetime license must comply with Ark. Code Ann. §§ 20-23-101 et seq. and these Rules in the same manner and to the same extent as any regularly licensed individual.

6. Fees

Each applicant for a restricted lifetime license pursuant to this Rule shall pay a one time fee of fifty dollars (\$50.00).

010.01-009 Permuting

A. Installation permits

1. Installation permits are required by Ark. Code Ann. § 20-23-307. The fees for such permits are established by Ark. Code Ann. § 20-23-308.

2. In the event an installation permit is denied by the division, the applicant may request an adjudicative hearing pursuant to Rule 010.01.007 within twenty (20) days of notice of the denial.

B. Operating certificates or permits

1. Operating certificates or permits are required by Ark. Code Ann. § 20-23-301. The fees for such permits or certificates are established by Ark. Code Ann. § 20-23-306 and are fifteen dollars (\$15) for boilers and thirty dollars (\$30) for unfired pressure vessels.

2. In the event an operating certificate or permit is suspended or revoked by an inspector or the division, the owner or user may request an adjudicative hearing within twenty (20) days of the suspension or revocation. Failure to request a timely hearing shall mean that the suspension or revocation is a final administrative determination.

3. An operating certificate will not be renewed if there is an unpaid administrative fine.

010.01-010 General Requirements and Exemptions

A. Construction Requirements

All boilers and pressure vessels must be constructed in accordance with the ASME Code, as adopted

by Rule 010.01.012 and registered with the National Board of Boiler and Pressure Vessel Inspectors, except for those vessels stamped “UM” pursuant to U-1 and UG-115 of Section VIII-Division 1 of the ASME Code as adopted by Rule 101.01.012 and air vessels of twelve (12) gallons or less containing 150 psi or less as exempted by Ark. Code Ann. § 20-23-102(a)(2).

B. Installation Requirements

Installers, sellers, or repairers of boilers and pressure vessels must be licensed by the Boiler Inspection Division. Installers must obtain installation permits from the division.

C. Inspection Requirements

1. All boilers shall be inspected as follows: High pressure steam boilers shall be inspected internally and externally at least once each year. All low pressure steam boilers shall be inspected externally annually and internally once each three years as far as construction permits. All hot water heating boilers shall be inspected externally annually and internally if required by the inspector. These times may be shortened at any time an inspector feels there is reason to question the boiler or controls integrity.

2. Pressure vessels shall be inspected biennially externally and internally where conditions permit.

3. Insurance companies shall employ inspectors licensed pursuant to Ark. Code Ann. § 20-23-402 and shall inspect all boilers and pressure vessels insured by them. Insurance companies shall file annual reports of all boilers and pressure vessels insured and inspected by the company with the Boiler Inspection Division by January 30 of each year. Insurance company inspectors must report all boilers and pressure vessels found during their inspections that are in use, but not insured by their insurance company.

4. Authorized inspectors can shut down equipment they consider unsafe. Any inspector knowingly reporting an unsafe boiler as safe to operate may be subject to sanction, fines, or criminal prosecution.

5. Inspectors shall attach state numbers to vessels as follows:

a. High-Pressure Boiler State Number shall be preceded by the letters “AR”.

b. Low-Pressure Boilers used for Heating or Hot Water Supply and Unfired Pressure Vessels State Numbers shall be preceded by the letter “AR”.

c. All Fired and Unfired Hot Water Heaters which come under the law shall have a State Number assigned which shall be preceded by the letters “AR”.

6. Insurance companies shall notify the Boiler Inspection Division of any cancellation of insurance coverage or any new insurance policy issued within thirty (30) days of the event on a form approved by the division. In the event insurance coverage is canceled due to an existing dangerous defect, the Boiler Inspection Division shall be notified immediately. If insurance companies do not file their inspection reports with the division within sixty (60) days from the date the inspection is

due, the division shall make the required inspection, and charge the insurance company for a special inspection fee of \$100.00 per vessel, plus mileage, meals and motel expenses incurred not to exceed the rates authorized for state employees.

D. Exemptions from permit and inspection

The following are exempt from installation permits and inspections to the extent stated:

1. Hot water heating boilers below 200,000 BTU/HR input, except that such objects located in schools, day care centers, hospitals, and nursing homes shall be inspected.

2. Air tanks in garages and service stations that perform vehicular service or do vehicular repair work as part of daily operations.

3. Air tanks of five (5) cubic feet capacity (37.5 gallons) or less containing 200 psig or less are exempt from inspection and permitting, however tanks above 12 gallons or 150 psig must be "UM" stamped.

4. Boilers and pressure vessels subject to inspection by the U.S. Department of Transportation.

5. Boilers and pressure vessels used in private residences and apartment complexes with (8) apartments or less.

6. Pressure vessels with six (6) inches internal diameter or less, with no limit on length of vessel or pressure.

7. Pressure vessels, other than air tanks, with a maximum allowable working pressure of fifteen (15) psi or less, or a volume of five (5) cubic feet or less.

8. Liquefied Petroleum Gas Vessels. (Propane & Butane Tanks).

9. Boilers and pressure vessels used in the production, transmission or storage of oil, natural gas or casinghead gas. (Refineries)

10. Coil Type Steam Generators that do not have accumulator drum. Coil-type hot water boilers where the water can flash into steam when released directly to the atmosphere through a manually operated nozzle may be exempted from these Rules provided the following conditions are met:

1. There is no drum, header, or other steam space;

2. No steam is generated within the coil;

3. Tubing outside diameter does not exceed 1 inch;

4. Pipe size does not exceed nominal pipe size ¾;

5. Nominal water capacity does not exceed six (6) gallons;

6. Water temperature does not exceed 350 degrees Fahrenheit; and

7. Adequate safety relief valves and controls are provided.

11. Fired and Unfired Water Heaters below 200,000 Btu/hr., however, such objects located in schools, day care centers, hospitals, and nursing homes shall be inspected.

12. Hot Water Supply Storage Tanks. Tanks which are heated by steam or any other direct or indirect means, when none of the following are exceeded:

a. Heat input of less than 200,000 Btu/hr.

b. Water temperature of less than 210 degrees F.

c. Nominal water containing capacity of less than 120 gallons.

13. a. Pressure vessels which are an integral part of components of rotating or reciprocating mechanical devices and hydraulic or pneumatic cylinders where the primary design considerations and/or stresses are derived from the functional requirements of the device; or

b. Pressure vessels which are an integral part of the structure that have a primary function of transporting fluids from one location to another within the system.

14. Vessels with a capacity of 120 gallons or less for containing water under pressure, including those containing air, the compression of which serves only as a cushion.

15. Fired swimming pool heaters, except those in publicly-owned swimming pools.

E. Repair Requirements

Major repairs and all welding repairs must have division approval. Repairs must be done in accordance with ASME and the National Board Inspection Code as adopted by Rule 101.01.012. Repairs must be accomplished by licensed entity. Repair firms must obtain a license to engage in repair work from the division. Plants with qualified maintenance personnel may perform their own repairs on their own boilers and pressure vessels, but all such repairs shall comply with the National Board Inspection Code as adopted by Rule 101.01.012.

F. Miscellaneous

1. There are special requirements pertaining to anhydrous ammonia equipment and facilities contained elsewhere in these rules and in Ark. Code Ann. § 20-23-101 et seq.

2. Explosions and accidents must be reported by the owner/operator to the Boiler Inspection Division within twenty-four (24) hours.

3. Steam boilers fifty (50) horsepower and over, and steam boilers used in hospitals, hotels, motels, schools, day cares, nursing homes, theatres and office buildings must be under regular

attendance by a licensed operator.

4. Manually operated boilers must be under constant attendance when fired.

5. Inspection certificates to operate power and heating boilers shall be posted in the boiler room. Inspection certificates for unfired pressure vessels and portable boilers shall be kept on the premises with the vessel.

6. Safety valves must meet ASME Code requirements, as adopted by Rule 010.01.012.

7. Blow-off piping and tanks must meet ASME Code requirements as adopted by Rule 010.01.012.

8. Water columns must meet ASME Code requirements as adopted by Rule 010.01.012.

9. All boilers, whether gas, oil or mechanically fired, shall be provided with an automatic low water fuel cutout so located as to automatically cut off the fuel supply in case the water level falls to a point not lower than the bottom of the water glass.

010.01-011 General Definitions

As used in these Rules, unless the context otherwise requires:

A. “ASME Boiler and Pressure Vessel Construction Code” is the title of the accepted reference for construction, operation, and inspection of boilers and pressure vessels, compiled and written by the American Society of Mechanical Engineers. This code is the basis of these rules;

B. “Authorized inspector” or “inspector” is a deputy inspector duly appointed by the Chief Inspector; or an insurance inspector holding a National Board and an Arkansas Commission;

C. “Boiler” means a closed vessel or container in which water is heated and/or steam is generated, steam is superheated, or any combination thereof, under pressure or vacuum by the direct application of heat, and shall be classified as defined by the several sections of the ASME Boiler Construction Code as follows; Power Boilers, Section No. 1; Low Pressure heating boiler, (Boiler used exclusively for low pressure steam heating, hot water heating, and hot water supply), Section No. 4; and Miniature boilers, as defined in Section I;

D. “Boiler, automatically fired” means a boiler which cycles automatically in response to a control system;

E. “Boiler, high-pressure, steam or vapor” means a boiler in which steam or vapor is generated at a pressure exceeding fifteen (15) psig;

F. “Boiler, hot-water heating” means a boiler in which no steam is generated and from which hot water is circulated for heating purposes, and then returned to the boiler;

G. “Boiler, hot-water supply” means a boiler that furnishes hot water to be used externally to itself at pressure not exceeding 160 psig or a temperature not exceeding 250 degrees Fahrenheit (120

degrees Celsius) at or near the boiler outlet.

H. “Boiler, low-pressure, steam or vapor” means a boiler in which steam or vapor is generated at a pressure not exceeding fifteen (15) psig;

I. “Boiler, miniature” means a boiler that does not exceed any of the following limits:

1. 16 in. inside diameter of shell

2. 20 sq. ft. heating surface

3. 5 cu. ft. gross volume¹, exclusive of casing and insulation

4. 100 psig maximum allowable working pressure

J. “Department” means the Arkansas Department of Labor;

K. “Director” means the Director of the Arkansas Department of Labor;

L. “Division” means the Boiler Inspection Division of the Arkansas Department of Labor;

M. “Existing Installation” means any power boiler or miniature boiler which was in service on or before January 1, 1938, and any low pressure heating boiler or unfired pressure vessel which was in service on or before June 10, 1959, and which was at that time recognized by the Department as an existing installation;

N. “Factor of Safety” means the ratio of the ultimate strength of materials to the allowable stress;

O. “Fittings and “Appliances” means such necessary safety devices as are attached to a boiler and/or an unfired pressure vessel for safety purposes;

P. “National Board” means the National Board of Boiler and Pressure Vessel Inspectors. When a boiler or pressure vessel bears an ASME symbol stamp and is stamped “National Board” or “N.B.”, it shall mean that the boiler or vessel is constructed to comply with the recognized standard of construction and has been inspected by an inspector holding a National Board commission;

Q. “Owner or User” means any person, firm, partnership, or corporation or other entity-owning or operating, or in charge or in control of any boiler and/or any unfired pressure vessel;

R. “Second-Hand Boiler” or “Second-Hand Pressure Vessel” means any boiler or pressure vessel which has undergone both a change of ownership and location;

T. “State Special” means a boiler or fired/unfired pressure vessel of any type or size, which carries neither the ASME symbol nor National Board stamping, which may be acceptable for use provided the manufacturer, installer, or owner obtains a variance pursuant to Rule 010.01.013.

¹ This gross volume is intended to include such gas passages as are integral with the assembled pressure parts.

U. **“Unfired pressure vessel or pressure vessels”** mean any unfired pressure vessel constructed for the accumulation, storage, or transportation of air, liquids, or gases that are under induced pressure, and as defined by Section VIII, Division 1, of the ASME Boiler Construction Code, except containers used for liquefied petroleum gases.

010.01-012 **Minimum Standards**

A. **All new and used boilers, unfired pressure vessels and steam generating apparatuses installed in the state shall be built to conform with the several specifications and provisions of The Boiler and Pressure Vessel Construction Codes of the American Society of Mechanical Engineers, (ASME)(2004 edition), specifically, the following sections of the ASME Codes (2004 edition) are adopted by reference and incorporated herein:**

<u>Sec. I</u>	<u>Power Boilers</u>
<u>Sec. II</u>	<u>Material Specifications</u>
<u>Sec. III</u>	<u>Subsection NCA, General requirements for Divisions 1 & 2</u>
<u>Sec. IV</u>	<u>Heating Boilers</u>
<u>Sec. V</u>	<u>Nondestructive Examination</u>
<u>Sec. VI</u>	<u>Recommended Rules for care and operation of heating boilers</u>
<u>Sec. VII</u>	<u>Recommended guidelines for the care of power boilers</u>
<u>Sec. VIII</u>	<u>Pressure Vessels Divisions 1 and 2</u>
<u>Sec. IX</u>	<u>Welding and Brazing Qualifications</u>
<u>Sec. X</u>	<u>Fiberglass- Reinforced plastic pressure vessels</u>
<u>Sec. XI</u>	<u>Rules for in service inspections of nuclear power plants</u>
<u>B31.1</u>	<u>Power Piping</u>

B. **The minimum standards for controls and safety devices shall be Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME, CSD-1. (1998 Edition and 1999 Addenda), which is adopted by reference and incorporated herein.**

C. **The minimum standards for conducting inspections of boilers and pressure vessels shall be Part RB (Inservice Inspection of Pressure-Retaining Items) of the National Board Inspection Code (2004 edition), which is adopted by reference and incorporated herein.**

D. **The minimum standards for repairs shall be Part RC (Repairs & Alterations) of the National Board Inspection Code (2004 edition), which is adopted by reference and incorporated herein.**

E. **The minimum standards for storage and handling of anhydrous ammonia shall be the American National Standards Institute, (ANSI) K61.1(Safety Requirements for the Storage and Handling of Anhydrous Ammonia) (1989 edition), which is adopted by reference and incorporated herein, as well as applicable ASME Code provisions.**

F. **This Rule does not include any later amendments or editions of the standards incorporated by reference.**

G. **Copies of these standards incorporated by reference can be viewed in the offices of the division or can be obtained by contacting the following:**

1. The ASME Codes are available through:

American Society of Mechanical Engineers
22 Law Drive
P. O. Box 2300
Fairfield, NJ 07007-2300
1-800-843-2763
www.asme.org

2. The National Board Inspection Code is available through:

National Board of Boiler and Pressure Vessel Inspectors
1055 Crupper Avenue
Columbus, OH 43229-1183
614-888-8320
www.nationalboard.org

3. The American National Standards Institute (ANSI) Standards are available through:

American National Standards Institute
25 West 43rd Street
New York, NY 10036
www.ansi.org

H. Exemptions are listed under Ark. Code Ann. § 20-23-102; Rule 010.01.010(D); and the referenced ASME Codes listed above.

I. The provisions of Ark. Code Ann. §§ 20-23-101 *et seq.* and these Rules may differ from the language of the ASME Codes concerning construction or exemptions. In such cases, state statutes and these rules override the ASME. In the event there is a conflict between an ASME Code and a statute or other rule or regulation adopted by the Boiler Inspection Division, such statute or other rule or regulation shall apply and control.

J. All boilers and pressure vessels shall be stamped “National Board” unless exceptions are made by these Rules.

K. Fired storage water heaters rated 200,000 Btu and below are exempt from ASME construction and National Board registration. These objects are not exempt from state inspection. All such objects located in schools, hospitals, nursing homes, and day care centers shall be inspected annually.

L. The hydrostatic test pressure of both new and used boilers and pressure vessels shall be obtained from the vessel’s **data report**, or **vessel nameplate**. For boilers, the test pressure shall at no time exceed 90% of its yield strength. For unfired pressure vessels, the test pressure shall at no time exceed 1.3 times the MAWP (maximum allowable working pressure) at any point within the vessel. **Pneumatic testing** of a pressure vessel shall not exceed 1.1 times the MAWP stamped on the vessel.

M. Boilers below fifty (50) horsepower are not subject to the additional hydrostatic test requirements outlined in the ASME Code for boilers that have been hydrostatically tested at the

manufacturer, and for which the boiler external piping has not been shipped with the boiler. Boiler external piping for these boilers, which must be separately manufactured, shall be tested in accordance with B31.1 and Code stamped if required.

010.01-013 Variances

A. The Boiler Inspection Division may, in any particular case grant an exception or variance from the literal requirements of the minimum standards for construction, installation, repair and operation set out in the ASME Codes as adopted in Rule 010.01.012. A variance shall be granted only when both of the following conditions are present:

1. Existing conditions or undue hardship prevent compliance with the literal requirements of the rules; and
2. Equivalent safety will be secured.

B. Procedure

1. An application for a variance shall be submitted by the owner, operator, or installer to the division on a form approved by the division. The application shall be accompanied by an application for installation or repair and detailed plans and specifications for the vessel, together with any other information requested by the Chief Boiler Inspector. The applicant shall state with specificity the Rule or ASME standard for which a variance is sought. Failure to comply may result in dismissal of the application for a variance.

2. The Chief Boiler Inspector may grant or deny the variance or impose conditions upon the granting of the variance. If the variance is denied, the applicant may request an adjudicative hearing pursuant to Rule 010.01.007. Such a hearing shall be before the Boiler Advisory Board who shall make a recommendation to the Director of the Department of Labor. The Director shall make a final administrative determination.

3. The Chief Boiler Inspector may neither grant nor deny the variance but refer it for an adjudicative hearing pursuant to Rule 010.01.007. Such a hearing shall be before the Boiler Advisory Board who shall make a recommendation to the Director of the Department of Labor. The Director shall make a final administrative determination.

C. The owner or operator shall maintain the variance certificate or order at the location of the boiler and make it accessible to any licensed boiler inspector.

010.01-014 Administrative Penalties

A. Types of Fines

The division is authorized to issue the following administrative fines:

1. Ark. Code Ann. § 20-23-301 authorizes a fine of no less than \$25.00 and not more than \$1000.00 for the following:

a. Operating a boiler or pressure vessel without a certificate of inspection or operating permit;

b. Operating a boiler or pressure vessel at a pressure greater than permitted by the certificate of inspection or operating permit;

c. Installing, repairing, or operating a boiler or pressure vessel in violation of these Rules, including the ASME standards adopted by Rule 010.01.012;

d. Operating a boiler or pressure vessel on which the permit has been suspended or operation has been forbidden by a licensed inspector; and

e. Installing pressure piping in violation of these Rules or the ASME standards adopted by Rule 010.01.012.

2. Ark. Code Ann. § 20-23-302 authorizes an administrative fine of \$100.00 for any owner or operator who fails to report the location of a boiler or pressure vessel to the Boiler Inspection Division.

3. Ark. Code Ann. § 20-23-311(d) provides that any owner or user who fails to pay an inspection fee within thirty (30) days of it being due, shall be subject to a civil penalty equal to the amount of the inspection fee.

4. Ark. Code Ann. § 20-23-404(b)(2) authorizes an administrative fine of not less than \$25.00 and not more than \$100.00 for operating a boiler without a boiler operator's license.

5. Ark. Code Ann. § 20-23-407 authorizes an administrative fine of not less than \$100 and not more than \$5,000.00 per violation per day to any owner/user participating in the owner/user program in Rule 010.01.025 for the failure to comply with these Rules, including the ASME standards adopted by Rule 010.01.012.

B. Procedure

1. In administrative fine cases, the Code Enforcement Administrator of the Arkansas Department of Labor shall notify the person(s) or entity charged with the violation(s) by certified mail of the following:

a. A statement identifying the boiler or pressure vessel by state-issued identification number, as well as the physical address of the boiler or pressure vessel;

b. A short plain statement of the facts constituting the violation(s), together with a citation to the statute, rule or standard violated;

c. The amount of the administrative fine or civil penalty;

d. The date of the boiler inspection, if applicable;

e. A statement that the administrative fine or penalty shall be final unless;

(i) within ten (10) days after receipt of this notice the owner or user pays any

delinquent inspection fee required for issuance of an operating certificate; or

(ii) within twenty (20) days after receipt of this notice, the person, firm, corporation, partnership or association charged with the violation(s) notifies the Director of the Department of Labor in writing that he/she contests the penalty.

2. Notice of the fine or civil penalty will be sent by U. S. Mail, return receipt requested, delivery restricted to the named recipient or his agent. Notice shall be sufficient when it is so mailed to the respondent's latest address on file with the division. Notice may also be made in the same manner as authorized for a summons in a civil action.

3. If the person or entity charged with the violation has not filed notice that he/she contests the administrative fine within twenty (20) days after receiving notice in accordance with Rule 010.01.014(B)(1), the fine or penalty assessment by the Code Enforcement Administrator shall constitute a final administrative determination.

4. A fine or penalty may be contested by filing a written request for a hearing with the Director of Labor, 10421 West Markham Street, Little Rock, AR 72205. The written request must be received by the Department within twenty (20) days of person or entity's receipt of the notification of the fine or penalty.

5. A contested fine shall be set for an adjudicative hearing pursuant to Rule 010.01.007. The Director of Labor shall designate a hearing officer.

C. Assessment of an administrative fine shall be made no later than two (2) years from the date of the occurrence of the violation.

010.01-015 Installation

A. Generally

1. Every manufacturer, contractor, jobber, owner or user of a boiler or unfired pressure vessel shall obtain permission from the Boiler Inspection Division before any boiler or unfired pressure vessel may be installed or moved and reinstalled in the State of Arkansas. When boilers or unfired pressure vessels are to be installed, the manufacturer's data report for each boiler and unfired pressure vessel must be submitted with the application for installation. No boiler or unfired pressure vessel may be installed without approval from the Boiler Inspection Division. All persons, firms or corporations engaged in the installation of boilers, unfired pressure vessels or hot water storage tanks or fired/unfired storage water heaters 200,000 Btu/hr or greater input in any location shall be licensed by the Boiler Inspection Division to perform such work pursuant to Ark. Code Ann. § 20-23-405 and Rule 010.01.008.

2. All new and second-hand boilers and pressure vessels shall be installed and equipped to conform to the requirements of the ASME Boiler Construction Code and CSD-1 as adopted by Rule 010.01.012 and shall be inspected and approved by a state boiler inspector or an authorized insurance inspector before they are placed in service. All such work must be performed by persons or firms possessing the requisite license. Permits must be obtained for each boiler and/or pressure vessel before they may be installed.

B. Method of Support

1. 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 two 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 centers 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.

2. A horizontal-return tubular boiler, 14 ft or more in length, or over 54 inches and up to and including 72 inches in diameter, shall be supported by the outside suspension type of setting as specified above or at four points by not less than eight steel or cast iron lugs set in pairs. A horizontal-return tubular boiler up to and including 54 inches in diameter, shall be supported by the outside suspension type of setting as specified above, or by not less than two steel or cast-iron lugs on each side.

The distance girthwise of the boiler from the centers of the bottom rivets to the centers of the top rivets attaching the hangers shall be not less than the square of the shell diameter divided by 675. If more than four lugs are used they shall be set in four pairs, the lugs of each pair to be spaced not over 2 inches apart and the load to be equalized between them. If the boiler is supported on structural steel work, the steel supporting members must be so located or insulated that heat from the furnace cannot impair their strength.

3. Lugs or hangers, when used to support a boiler of any type, shall be properly fitted to the surfaces to which they are attached.

4. Where it is impracticable to use rivets, studs with not less than 10 threads per inch may be used. In computing the shearing stresses, the area at the bottom of the thread shall be used. The shearing and crushing stresses on the rivets or studs used for attaching the lugs or brackets shall not exceed 8 percent of the strength given in the ASME Code.

5. Lugs, hangers or brackets made of materials in accordance with the ASME Code requirements may be attached by fusion welding providing the welding meets the requirements of the ASME Code, as adopted, including stress-relieving but omitting radiographic examination, and provided that they are attached by fillet welds along the entire periphery or contact edges, of the size and form shown in the ASME Code. The stresses computed by dividing the total load on the lug, hanger or bracket by the minimum cross-sectional area of the weld shall not exceed, for tension and compression, 40 percent and for shear, 32 percent, of the stress values given multiplied by the welded joint efficiency specified in the ASME Code. The furnace setting shall have adequate means for expansion and contraction.

C. Settings

1. Steel boilers of the wet-bottom type having an external width of over 36 inches shall have not less than 18 inches between the bottom of the boiler and the floor line, with access for inspection. When the width is 36 inches or less, the distance between the bottom of the boiler and the floor line shall not be less than 6 inches, and when any part of the wet bottom is not farther from an outer edge than 12 inches, it shall be not less than 4 inches.

2. The minimum size of the access door used in a boiler setting shall be 12 x 16 inches, or equivalent area, the least dimension being 11 inches.

010.01-016 Inspections

A. No person shall operate or cause to be operated any new boiler or unfired pressure vessel which has been installed or erected, or any used boiler or unfired pressure vessel which has been reinstalled or re-erected in the State of Arkansas, until it has been inspected by a state boiler inspector or an authorized insurance inspector and a Certificate of Inspection has been issued as required by Ark. Code Ann. § 20-23-301. The certificate of inspection for power and heating boilers shall be posted in the boiler or engine room in a location where it may be easily read by the engineer or fireman. Certificates of inspection for unfired pressure vessels or portable boilers shall be kept on the premises where such pressure vessels or boilers are located and shall be accessible at all times.

B. The owner or user of a boiler which requires annual internal inspection shall prepare the boiler for inspection by cooling it down, blanking off connections to adjacent boilers if necessary, drawing off the water, removing the handhole and manhole plates, opening the low water cutout, removing the water column plugs, removing the grate bars from internally fired boilers. When considered necessary by the inspector, the brickwork, lagging, jacketing, appliances, other parts or fittings and any boiler covering shall be removed.

C. The combustion chamber and passages and the firebox shall be cleaned and soot and ashes removed. Water, scale and mud must be removed from the interior portions of the boiler. Unfired pressure vessels shall be prepared for inspection in a manner that will insure a thorough and proper inspection.

D. Where, in the opinion of the inspector, as a result of conditions, disclosed at an inspection, it is deemed advisable to remove interior or exterior lining, covering or brick-work to expose certain parts of the vessel not visible, the inspector shall require the removal of such materials to permit the proper inspection and the drilling of any part of the vessel when necessary to ascertain thickness.

E. When the tensile strength is not known, it shall be taken as 55,000 pounds per square inch for temperatures not exceeding 650° F.

F. If at any time the owner, user or agent of the owner of any boiler within the state shall desire a special inspection of any boiler or unfired pressure vessel, it shall be made by the Boiler Inspection Division after due request, and the inspector making the inspection shall collect a fee of one hundred dollars (\$100.00) for each boiler, together with his expenses from Little Rock to the place of inspection and return at the rate authorized for state employees. All inspection fees shall be paid by the owner, user or agent of the owner, and the inspector is authorized to receive such fee and issue his receipt therefore.

G. All boilers or unfired pressure vessels that have been inspected and found unsafe by an authorized inspector shall be stamped "XXOOOXX," which will designate it as an unsafe boiler. No person except an authorized inspector shall deface or remove such stamping.

H. If, upon an external inspection, there is evidence of a leak or crack, enough of the covering of the boiler or unfired pressure vessel shall be removed to enable the inspector to determine the safety of the boiler or unfired pressure vessel. If the covering cannot be removed at that time, the inspector may order the operation of the boiler or unfired pressure vessel stopped until the covering can be removed and proper examination made.

I. If in the judgment of an authorized inspector the condition of a boiler warrants the certificate being withheld or withdrawn, such reasons shall be stated fully in a report to the division. When a certificate has been withdrawn or withheld, it shall not be reissued until a "Repair" or inspection report has been filed with the division showing that the boiler has been placed in a safe working condition.

J. When an authorized inspector finds it necessary to change the pressure allowed on a boiler, either increasing or decreasing it, the reasons therefore shall be stated on the report and the certificate taken up and forwarded with the report to the division.

K. Inspectors

1. Inspectors of boilers and/or unfired pressure vessels employed by insurance companies are required to hold Certificates of Competency issued by the Boiler Inspection Division.

2. Any inspector of steam boilers who shall report a boiler for a certificate of inspection as safe to operate while knowing such report to be false and that the boiler is unsafe to operate; or who shall fail to perform his duties as required by these Rules or Ark. Code Ann. §§ 20-23-101 *et seq.*; or who shall cause the repair, installation or sale of a boiler that does not comply with the standards as set out in Ark. Code Ann. §§ 20-23-101 *et seq.* and these Rules, shall be subject to the criminal penalties provided by Ark. Code Ann. § 20-23-403, as well as sanctions or fines issued by the division pursuant Rule 010.01.008 and Rules 010.01.014.

3. All boilers inspected by insurance companies shall be inspected as follows: High pressure steam boilers shall be inspected internally and externally at least once each year. All low pressure steam boilers shall be inspected externally annually and internally once each three years as far as construction permits. All hot water heating boilers shall be inspected externally annually and internally if required by the inspector. These times may be shortened at any time an inspector feels there is reason to question the boiler or controls integrity. If the internal and external inspections are made on different dates, two inspection reports shall be filed with the division.

4. The annual internal inspection, or general inspection where internal inspection cannot be made, shall be made at least once each twelve (12) months, and should be made during the same calendar month each year if possible.

5. If annual inspection reports are not filed with the Boiler Inspection Division by insurance companies who have insurance on boilers in the State of Arkansas within sixty (60) days from the date they are due inspection, the Boiler Inspection Division shall make the required inspection, and a special fee of one hundred dollars (\$100.00) for each boiler or unfired pressure vessel inspected, plus mileage and expenses from Little Rock to the point of inspection and return, not to exceed the current rate authorized by the General Assembly to employees of state agencies who furnish their own transportation, plus meals and hotel bills incurred, shall be charged to the insurance company insuring the boilers or unfired pressure vessels unless extension of time is granted by the Chief Inspector.

6. All insurance companies authorized to inspect boilers in the State of Arkansas must have at least one resident inspector located in the State of Arkansas, in order that persons or firms who have their boilers insured may be in closer contact with their insurance company and this department.

7. When insurance on a boiler or pressure vessel is canceled or new business is written, the division shall be notified on approved forms. The reason for cancellation must be given. When insurance is canceled because of an existing dangerous defect, the division shall be notified immediately upon cancellation of the insurance.

8. All representations and recommendations made by authorized inspectors, departmental inspectors or insurance inspectors, in regard to necessary repairs and pressure to be allowed, are subject to the final approval or disapproval of the Chief Boiler Inspector.

9. Insurance companies must report to the Boiler Inspection Division any boiler and/or unfired pressure vessel that is in use and not insured by them in any location of their insured.

10. All authorized inspectors as well as the owner or user of a boiler or unfired pressure vessel shall notify the division of any explosion or accident involving a boiler or unfired pressure vessel. No part or parts of such boiler or unfired pressure vessel shall be disturbed or moved until authority to do so is granted by the Chief Boiler Inspector.

L. Data Reports

1. A data sheet shall be filled out and signed by the manufacturer and the inspector. When signing each data report, the manufacturer shall show under his signature the expiration date of his certificate of authorization to use the ASME symbol. This data sheet, together with the stamping on the vessel, shall be a guarantee by the manufacturer that he has complied with all requirements of the ASME Code.

2. A complete data report shall be furnished with the first internal inspection report on all new boilers and unfired pressure vessels. At the time of the first inspection, the boiler shall be stamped with a State Serial Number preceded by the letters AR, said letters and figures to be not less than ¼ inch in height. The stamping shall not be concealed by lagging, covering, or paint. On high-pressure boilers the State Number shall be attached as close to the code stamping as possible. On Cast Iron Boilers and boilers (encased) the State Number shall be stamped on a metal tag attached to the boiler.

010.01-017 Repairs

A. Major Repairs – Notice to Division

1. Each person, firm or corporation licensed to repair boilers shall have a written Quality Control (Q.C.) Program. The Q.C. Program shall be comprised of all planned and systematic actions necessary to provide adequate assurance that the boiler or pressure vessel will be installed or repaired in accordance with the standards adopted pursuant to Rule 010.01.012.

2. All welders and welding operators shall be qualified in accordance to ASME Section IX, "Welding and Brazing Qualifications," as adopted by Rule 010.01.012.

3. Each firm or corporation that intends to make weld repairs on boilers or pressure vessels shall submit written documentation to verify that they have a Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR). Performance qualification documentation as per ASME Section IX.

4. The division, either directly or through an authorized inspector, shall be notified of any contemplated major repairs to a boiler or pressure vessel. The repair firm or corporation as well as the owner or user of the vessel may give the aforementioned notice to the division before repair work is started and after it is completed.

5. All repairs shall be made to comply with the recommendations and standards specified by the Boiler Inspection Division.

6. Persons, companies, firms, and/or businesses that wish to perform repairs or alterations on ASME constructed pressure vessels, or within the vessels code boundaries, must have in place a written Quality Control system acceptable to the department, and/or have authorization from the ASME or the National Board to perform such repairs or alterations. In all cases, the department must be notified prior to starting repairs or alterations.

7. The original construction code of the vessel shall be used for any repairs or alterations. When this is not possible, it is permissible to use other codes, standards, or specifications, including the ASME code provided the repair firm has the concurrence of the inspector and the department.

8. The inspector's authorization to do repairs or alterations must be obtained prior to starting, and this inspector shall do the final acceptance inspection of the repair or alteration. In all cases, the inspector shall be an employee of the original organization or an inspector authorized by the department.

B. Materials and Workmanship

1. When repairs of any nature are made on a boiler the materials used in such repairs shall be only materials recommended by the ASME Code for new boilers, and the Division shall be furnished satisfactory evidence that there has been compliance with this requirement. The workmanship must be of a quality that will pass inspection by an inspector from the division, or by an authorized insurance inspector whose opinion shall be subject to the approval or disapproval of the Chief Boiler Inspector.

2. All welded repairs shall be made to conform to the recommended procedures outlined in the National Board Inspection Code, as adopted by Rule 010.01.012.

3. No welding of any type shall be performed on any boiler or unfired pressure vessel until permission is granted by the Boiler Inspection Division.

4. The shell or drum of a boiler in which a typical "lap seam crack" is discovered along a longitudinal riveted joint, either butt joint or lap joint, shall be permanently discontinued for use under pressure. "Lap seam crack" means the typical crack frequently found in lap seams extending parallel to the longitudinal joint and located either between or adjacent to rivet holes.

5. The maximum allowable working pressure on a water tube boiler, the tubes of which are secured to cast iron or malleable iron headers or which have cast iron and mud drums, shall not exceed 160 pounds per square inch.

C. Repairs – Patch

1. When damage or injury to a boiler is of a nature which apparently necessitates the use of a patch, the division or an authorized inspector shall be consulted before work is started on the patch so that one of the proper design may be prescribed to avoid a possible reduction in the approved pressure. All patches shall be designed and installed to comply with National Board requirements, as adopted by Rule 010.01.012.

2. Any person or persons who shall make or cause the repair, installation, or sale of a boiler that does not comply with the standards and regulations as set out in this Act shall be guilty of a felony and upon conviction thereof shall be punished by fine in any sum of not less than one hundred dollars (\$100) nor more than five hundred dollars (\$500), and in addition, may be imprisoned for not more than three (3) years, or both as provided by Ark. Code Ann. § 20-23-309.

D. Tubes

1. When the tubes are removed from any firetube boiler for the purpose of retubing the boiler, the division shall be notified by the owner, user, and/or the workman performing such work, so that inspection can be made of the internal surface of the shell by a state inspector or an authorized insurance inspector while the tubes are out of the boiler, and the boiler may be approved before new tubes are applied.

2. A fire tube boiler shall have the ends of the tubes firmly rolled and beaded, or rolled, beaded, and welded around the edge of the bead. Attachment methods as described in ASME Section I PFT 12.2 may also be used if acceptable to the inspector. Where the tubes do not exceed 1 ½ inches in diameter, the tube sheet may be beveled or recessed to a depth at least equal to the thickness of the tubes and the tubes rolled into place and welded. In no case shall the tube end extend more than 3/8-inch beyond the tube sheet.

3. Tube ends not subjected to direct radiant heat of the furnace may be rolled and seal-welded without beading, provided that:

a. The tube ends extend not less than ¼-inch nor more than 5/16-inch through the tube sheet; and

b. The throat of the seal-weld is not less than 3/16-inch, nor more than 5/16-inches.

4. After welding, the tubes are re-expanded.

5. In the case of tubes not exceeding 1 ½ inches in diameter, they may be expanded by the Prosser method instead of rolling. If tubes larger than 1 ½ inches in diameter are expanded by the Prosser method, the work shall be completed as required above.

6. The ends of all tubes, suspension tubes, and nipples shall be expanded and flared not

less than 1/8-inch over the diameter of the tube hole on all water-tube boilers and superheaters, or they may be flared not less than 1/8-inch, rolled and beaded, or flared, rolled and welded (except as provided in the ASME Code), or rolled and seal-welded without flaring, provided the throat of the seal-weld is not less than 3/16-inch, nor more than 3/8-inch, and the tubes are re-expanded after welding.

7. Tube ends or welded necks may be fusion-welded to the drums of water-tube boilers without expanding or flaring, provided the materials and welding comply with requirements of the ASME Code, except that the test plate requirements may be omitted, and the connections comply with the requirements of the ASME Code.

8. Where pipe as provided in the ASME Code is used for tubes in water-tube boilers, it may be screwed instead of rolled and flared, and the minimum number of threads shall conform to the requirements of the ASME Code. The ends of stub tubes may be closed by either forge or fusion welding.

9. Tubes may be seal-welded into fittings or headers for both boilers and superheaters after they have been expanded and flared, provided the materials in the fittings or headers complies with the ASME Code.

10. The ends of all tubes, suspension tubes, and nipples of water-tube boilers and superheaters shall project through the tube sheets or headers not less than 1/4-inch or more than 1/2-inch before flaring. Where the tubes enter at an angle, the maximum limit of 1/2-inch shall apply only at the point of least projection.

11. Re-ending of tubes in fire-tube boilers is permissible provided the division is notified and if after inspection it is found the remaining tube wall is not less than 75 percent of the original thickness, and providing further that the welding is performed in compliance with National Board rules as adopted by Rule 010.01.012.

12. Piecing or replacement of section of tubes or pipes in water-tube boilers is permissible, provided the remaining tube or pipe wall is not less than 75 percent of the original thickness, and that the welder is certified.

13. Repairing of bulges in tubes in water-tube boilers is permissible when the area to be repaired does not exceed 2 inches in maximum dimension and there are not more than three such repairs in any one tube.

010.01-018 Operators and Operation

A. All power boilers subject to the provisions of Ark. Code Ann. §§ 20-23-101 *et seq.* and these Rules shall be under attendance by a licensed operator whenever they are in use for any purpose. Boilers that are fired up are considered in use whether steam is being withdrawn or not, unless the boiler is in a building that is not occupied at any time.

B. Steam boilers 50 horsepower and over, as rated by the manufacturer, and steam boilers used in hospitals, hotels, schools, theaters and office buildings, but not limited to those, must be under regular attendance by a licensed operator who holds a license issued by the Boiler Inspection Division.

C. All power boilers and high pressure/high temperature water boilers without fully automatic controls shall have a full-time licensed operator while the boiler is in service.

D. Operator is defined as a competent attendant who is familiar with the particular boilers to be operated, and who has received proper instruction in their safe operation. He or she must also be licensed by the Boiler Inspection Division.

E. Operator Attendance

1. It should be noted that nothing will replace the need for one or more boiler operators being in attendance when the boilers are in operation.

2. High Pressure Steam Boilers:

a. Manual boilers shall be maintained by **constant attendance** by a boiler operator. (See definition of constant attendance in Rule 010.01-026).

b. High-pressure steam boilers, which meet CSD-1 recommendations for local alarms and safety devices, shall be maintained by **regular attendance** by a boiler operator. (See definition of regular attendance in Rule 010.01-026).

c. High pressure steam boilers, which meet CSD-1 as in paragraph 2 above, plus have installed remotely actuated alarms to detect low water condition, high pressure, high water condition, loss of operating boiler, etc., shall be maintained by **periodic attendance** by a boiler operator provided the operator has the prior approval of the Chief Boiler Inspector. (See definition of periodic attendance in Rule 010.01-026).

d. High temperature, high-pressure water boilers fall under the same guidelines as those for high-pressure boilers in (a), (b), and (c), above.

e. Remote monitoring for high pressure boilers (safety valve is set at greater than 15 psi) shall only be approved with a formal request, in writing, to the Chief Inspector; it must describe the system, the equipment, what is presently installed, and what the plans are for remote monitoring.

3. Low Pressure Steam, Hot Water Heating, and Hot Water Supply Boilers:

a. Low-pressure steam boilers shall meet the requirements of CSD-1 for controls, local alarms and safety devices, as adopted by Rule 010.01.012. Boiler operator attendance shall be as described for regular attendance, except the time frame shall be expanded to every two hours for inspections and readings. This can be extended to four hours by meeting the requirements for periodic attendance of a boiler.

b. Hot water heating boilers shall meet the requirements of CSD-1 for controls, local alarms, and safety devices, as adopted by Rule 010.01.012. Boiler operator attendance shall be a maximum of every twelve hours for inspection and any required readings with the boilers in operation, and more often should there be other extenuating circumstances.

c. Hot water supply boilers shall meet the requirements of CSD-1 for controls, local alarms, and safety devices, as adopted by Rule 010.01.012. Boiler operator attendance shall be a

maximum of every twelve hours for inspection and any required readings with the boilers in operation, and more often should there be other extenuating circumstances.

010.01-019 Boilers

A. Generally

1. Boilers are vessels in which water is heated and/or steam is generated, and shall be classified as defined by the several sections of the ASME Boiler Construction Code, as adopted by Rule 010.01.012.

2. Horizontal Return Tubular boilers externally fired of lap-joint construction exceeding 36 inches in diameter or any horizontal longitudinal joint exceeding 12 feet in length shall not be installed or reinstalled.

3. The factor of safety on all second-hand boilers moved into Arkansas from another state shall be determined at the time of the inspection and a complete report containing all construction data shall be submitted to the division for approval. All such boilers must be constructed in compliance with the ASME Code and be registered with the National Board.

4. The flat surface of boilers or pressure parts shall be stayed in accordance with the requirements of the ASME Boiler Construction Code for power boilers.

5. The furnace and setting shall be provided with sufficient openings to permit inspection and repairs. All boilers having an external width of over 36 inches shall have not less than 18 inches clearance between the bottom of the boiler and the floor line, with access for inspection. When the width is 36 inches or less, the distance between the bottom of the boiler and the floor line shall be not less than 6 inches.

6. Boilers installed after October 1, 1999, should be isolated from employees and the general public with a reinforced concrete block wall of not less than 8 inches in thickness, 6 feet in height; the length of such wall shall be governed by the size and positioning of the boiler, but should surround the boiler, leaving adequate openings for entry into the boiler space.

7. All boilers shall be located so that adequate space will be provided on all sides for the proper operation of the boiler and its appurtenances, for the inspection of all surfaces, tubes, water walls, economizers, piping, valves and other equipment and for their necessary maintenance and repair.

8. The gas train and boiler controls shall comply with ASME CSD-1, as adopted by Rule 010.01.012. Paragraph CE110 (a) pertaining to disconnect and remote emergency shutoff requirements shall only apply to steam boilers, however all other boilers must comply with the National Electrical Code, as adopted by the Arkansas Board of Electrical Examiners, for disconnect devices. Manifolding of fuel vents and bleeds will be allowed, although good engineering practice shall be used as described in CF 190. Owners reports and periodic testing as required in part CM are owners' responsibility and do not have to be submitted to this division, but shall be requested to be reviewed by the inspector.

9. “State Specials” can be any boiler or fired/unfired pressure vessel of any type or size, which carries neither the ASME symbol nor National Board stamping, and which has otherwise been proven acceptable to the Chief Boiler Inspector and assigned an Arkansas state number.

10. All steam boilers shall have installed an audible alarm system to work in union with their other operating control devices, unless the boiler is operated under constant attendance by a boiler operator.

B. Heating Boilers

1. Expansion Tanks

a. If the system is equipped with an open expansion tank, an internal overflow from the upper portion of the expansion tank must be provided in addition to an open vent, the internal overflow to be carried within the building to a suitable plumbing fixture or to the basement. If the system is of the closed type, an airtight tank or other suitable air cushion must be installed that will be consistent with the volume and capacity of the system.

b. If a system is equipped with a check valve or pressure-reducing valve in the cold water inlet line, consideration should be given to the installation of an airtight expansion tank or other suitable air cushion. Otherwise, due to the thermal expansion of the water, the safety relief valve may lift periodically. If an expansion tank is provided, it shall be constructed in accordance with Section VIII Division 1, for a maximum allowable working pressure equal to or greater than the water heater. Except for pre-pressurized tanks, provisions shall be made for draining the tank without emptying the system.

Recommended Expansion Tank Capacities for Gravity Hot Water Systems

Based on two-pipe system with average operating water temperature 170° F, using cast iron column radiation with heat emission rate 150 Btu/hr sq ft equivalent direction radiation

<u>Installed Equivalent Direct Radiation, sq ft</u>	<u>Tank Capacity,</u>
<u>[Note (1)]</u>	<u>gal</u>
<u>Up to 350</u>	<u>18</u>
<u>Up to 450</u>	<u>21</u>
<u>Up to 650</u>	<u>24</u>
<u>Up to 900</u>	<u>30</u>
<u>Up to 1100</u>	<u>35</u>
<u>Up to 1400</u>	<u>40</u>
<u>Up to 1600</u>	<u>2-30</u>
<u>Up to 1800</u>	<u>2-30</u>
<u>Up to 2000</u>	<u>2-35</u>
<u>Up to 2400</u>	<u>2-40</u>

NOTE: For systems with more than 2400 sq ft of installed equivalent direct water radiation, the required capacity of the cushion tank shall be increased on the basis of one gallon tank capacity per 33 sq ft of additional equivalent direct radiation.

Recommended Expansion Tank Capacities for Forced Hot Water Systems

Based on average operating water temperature 195° F, fill pressure 12 psig, and maximum operating pressure 30 psig

<u>System Volume,</u> gal	<u>Tank Capacities, gal</u>	
	<u>Prepressurized</u> <u>Diaphragm Type</u>	<u>Nonprepressurized</u> <u>Type</u>
<u>100</u>	<u>9</u>	<u>15</u>
<u>200</u>	<u>17</u>	<u>30</u>
<u>300</u>	<u>25</u>	<u>45</u>
<u>400</u>	<u>33</u>	<u>60</u>
<u>500</u>	<u>42</u>	<u>75</u>
<u>1000</u>	<u>83</u>	<u>150</u>
<u>2000</u>	<u>165</u>	<u>300</u>

NOTE: System volume includes volume of water in boiler, radiation, and piping, not including the expansion tank. Expansion tank capacities are based on an acceptance factor of 0.4027 for prepressurized types and 0.222 for nonprepressurized types. A procedure for estimating system volume and determining expansion tank sizes for other design conditions may be found in Chapter 13 of the 1987 Systems and Applications Volume of the ASHRAE Handbook.

2. The return water connections to all low pressure steam heating boilers supplying a gravity return heating system shall be so arranged as to form a loop substantially as shown in Section 4 of the ASME Boiler Construction Code, the bottom of the return pipe close nipple where it enters the equalizing loop being at the same level as the top of the lower water gauge glass nut. Equalizing pipe sizes shall not be less than the following:

<u>GRATE AREA</u>	<u>EQUALIZING PIPE INCHES</u>
<u>Under 4 sq. ft</u>	<u>1 ½</u>
<u>4 to 15 sq. ft</u>	<u>2 ½</u>
<u>15 sq. ft and over</u>	<u>4</u>

3. Provisions shall be made for cleaning the interior of the return piping at or close to the boiler.

4. When a stop valve is used in the supply pipe connection of a single boiler, there shall be one used in the return pipe connection. When stop valves over 2 inches in size are used, they shall be of the outside-screw-and-yoke-rising-spindle type or of such type as to indicate at a distance by the position of its spindle or other operating mechanism whether it is closed or open, and the wheel may be carried either on the yoke or attached to the spindle. If the valve is of the plug cock type it must be fitted with a slow-opening mechanism and an indicating device, and the plug must be held in place by a guard or gland. When stop valves are used, they shall be properly designated substantially as indicated by the following tags of metal or other durable material fastened to them:

<u>Supply Valve-Number ()</u>	<u>Return Valve-Number ()</u>
<u>Do Not Close Without Also</u>	<u>Do Not Close Without Also</u>
<u>Closing Return Valve -</u>	<u>Closing Return Valve -</u>
<u>Number ()</u>	<u>Number ()</u>

5. A stop valve shall be used in each supply and return pipe connection of two or more boilers connected to a common system.

6. Any cross connection between two or more boilers shall have a stop valve in the supply line with a stop valve and a check valve in each return line.

7. If a boiler may be closed off from the heating system by closing a steam stop valve, there shall be a stop valve and check valve in the condensate return line between the boiler and the system.

8. If any part of a heating system may be closed off from the remainder of the system by closing a steam stop valve, there shall be a stop valve and a check valve in the condensate return pipe from that part of the system.

9. When a valve is placed in the top connection from a hot water supply boiler to a storage tank, an additional connection without valve shall be made between the boiler and top storage tank.

10. Should a situation arise which is not covered by these Rules, the ASME Code Section One (I) for Power Boilers and Section Four (IV) for Heating Boilers shall be consulted. Should Section Four (IV) for Heating Boilers not cover the situation, Section One (I) shall be consulted, even though the object may come under Section Four (IV).

11. Feedwater connections

a. Feedwater connections shall be independent of any water gauge connections and it is recommended that the connection be made to the condensate return pipe or reservoir of the condensate return pump. There should be a stop valve and a check valve in the feedwater line of the boiler.

b. Feed or make-up water shall not be discharged directly into any part of the boiler exposed to the direct radiant heat of the fire.

c. A by-pass shall be provided around any pump or trap.

d. Feedwater shall not be introduced through the openings or connections used for the water column, the water gauge, or the gauge cocks.

e. The boiler-feed line shall be adequate to take care of the maximum demand of the boiler.

f. A manual by-pass shall be provided around any feedwater pressure reducing regulator on all hot water heating boilers.

g. Each boiler equipped with a condensate return pump, where practicable, shall be provided with a water level control arranged to automatically maintain the water level in the boiler within the range of the gauge glass.

h. Hot water heating and hot water supply boilers shall have a flow switch installed

to detect loss of water flow through the boiler. It shall be so located in the line that it cannot be isolated from the boiler through valve manipulation.

12. Bottom Blowoff

a. Each boiler shall have one or more blowoff pipe connections fitted with straightaway valve or cocks of not less than ¾-inch pipe size connected directly with the lowest water space and so located that the discharge shall not constitute a hazard.

b. All washout plugs and hand hole openings shall be accessible and shall not be obstructed in any way.

c. All hot-water heating systems shall be so installed that there will be no opportunity for the fluid-relief column to freeze or to be accidentally shut off.

13. Safety Valves

a. Each steam boiler shall have one or more safety valves of the spring-pop type adjusted and sealed to discharge at a pressure not to exceed 15 psi. Seals shall be attached in a manner to prevent the valve from being taken apart without breaking the seal. The safety valves shall be arranged so that they cannot be reset to relieve at a higher pressure than the maximum allowable working pressure of the boiler.

b. Each safety valve ¾-inch or over, used on a steam heating boiler, shall have a substantial device which will positively lift the disk from its seat at least 1/16-inch when there is no pressure on the boiler. The seats and disks shall be of suitable material to resist corrosion.

c. No safety valve for a steam boiler shall be smaller than ¾-inch except in case the boiler and radiating surfaces are a self-contained unit. No safety valve shall be larger than 4 ½-inch. The inlet opening shall have an inside diameter approximately equal to, or greater than, the seat diameter.

14. Relief Valves

a. Each hot-water heating or hot-water supply boiler shall have one or more 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 and so arranged that they cannot be reset to relieve at a higher pressure than the maximum allowable working pressure of the boiler.

b. Each relief valve shall have a substantial device which will positively lift the disk from its seat at least 1/16 inch when there is no pressure on the boiler.

c. The seats and disks shall be of material suitable to resist corrosion. No materials liable to fail due to deterioration of vulcanization when subjected to any temperature not exceeding 250° F. shall be used for any part.

d. No relief valve shall be smaller than ¾-inch nor larger than 2-inch standard pipe

size. The inlet opening shall have an inside diameter approximately equal to, or greater than, the seat diameter.

15. Installation of Safety and Relief Valves

a. Safety valves shall be connected to boilers, with the spindle vertical if possible, either directly to a tapped or flanged opening in the boiler, to a fitting connected to the boiler by a close nipple, to a Y base, to a valveless steam pipe between adjacent boilers, or to a valveless header connecting steam outlets on the same boiler.

b. Relief valves shall be connected to the top of boilers, with a spindle vertical if possible, either directly to a tapped or flanged opening in the boiler, to a fitting connected to boiler by a close nipple, to a Y base, to a valveless water pipe between adjacent boilers, or to a valveless header connecting water outlets on the same boiler.

c. When a Y base is used the inlet area shall be not less than the combined outlet areas.

d. When the size of the boiler requires a safety valve larger than 4 ½ inches in diameter or a relief valve larger than 2 inches in diameter, two or more valves having the required combined capacity shall be used. When two or more valves are used on a boiler, they may be single, directly attached, or mounted on a Y base.

e. No shutoff of any description shall be placed between the safety or relief valve and the boiler, or on discharge pipes between such valves and the atmosphere. Safety and relief valves shall not be connected to an internal pipe in the boiler.

f. When a discharge pipe is used, its area shall be not less than the area of the valve or aggregate area based on the nominal diameters of the valves with which it connects, and the discharge pipe shall be fitted with an open drain to prevent water from lodging in the upper part of the valve or in the pipe. When an elbow is placed on a safety or relief valve discharge pipe, it shall be located close to the valve outlet. The pipe shall be supported so that no undue stress is placed on the valve body. The discharge from safety or relief valves shall be so arranged that there will be no danger of scalding attendants.

16. Steam Gauges

a. Each steam boiler shall have a steam gauge connected to its steam space, or to its water column, or to its steam connection by means of a siphon or equivalent device exterior to the boiler and of sufficient capacity to keep the gauge tube filled with water and so arranged that the gauge cannot be shut off from the boiler except by a cock with tee or lever handle, placed in the pipe near the gauge. The handle of the cock shall be parallel to the pipe in which it is located when the cock is open.

b. The scale on the dial of a steam boiler gauge shall be graduated to not less than 30 pounds. The gauge shall be provided with effective stops for the indicating pointer at the zero point and at the maximum pressure point. The travel of the pointer from zero to 30 pounds pressure shall be at least 3 inches.

c. Connections to steam-gauge siphons shall be of nonferrous metal when smaller

than 1-inch pipe size and longer than 5 feet between the siphon and point of connection of pipe to boiler, and also when smaller than ½-inch pipe size and shorter than 5 feet between the siphon and point of connection of pipe to boiler.

d. On a compound gauge, effective stops shall be set at the limits of the gauge readings on both the pressure and vacuum sides.

17. Pressure or Altitude Gauges

a. Each hot-water boiler shall have a pressure or altitude gauge connected to it or to its flow connection in such a manner that it cannot be shut off from the boiler except by a cock with tee or lever handle, placed on the pipe near the gauge. The handle of the cock shall be parallel to the pipe in which it is located when the cock is open. It is recommended that this gauge be of the pressure type with its equivalent in altitude feet indicated.

b. The scale on the dial of the pressure or altitude gauge shall be graduated to not less than 1 ½ times the maximum allowable working pressure. The gauge shall be provided with effective stops for the indicating pointer at the zero point and at the maximum pressure point.

c. Pressure or altitude-gauge connections shall be of nonferrous composition when smaller than 1-inch pipe size and longer than 5 feet between the gauge and point of connection of pipe to boiler, and also when smaller than ½-inch pipe size and shorter than 5 feet between the gauge and point of connection of pipe to boiler.

18. Thermometers

Each hot-water boiler shall have a thermometer so located and connected that it shall be easily readable when observing the water pressure or altitude. The thermometer shall be so located that it shall at all times indicate the temperature in degrees Fahrenheit of the water in the boiler at or near the outlet.

19. Temperature – Combustion Regulators

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 heating and hot-water supply boilers. All hot water heating and hot-water supply boilers automatically fired must be equipped with an automatic device to automatically control the rate of combustion.

20. Pressure – Combustion Regulators

When a pressure-combustion regulator is used, it shall operate to prevent the steam pressure from rising above 15 pounds. All automatically fired boilers shall be equipped with an automatic pressure control.

21. Water – Gauge Glasses

Each steam boiler shall have one or more water-gauge glasses attached to the water column or boiler

by means of valved fittings, with the lower fitting provided with a valve or pet cock to facilitate cleaning. Gauge-glass replacement shall be possible under pressure. (Transparent material other than glass may be used for the water gauge provided that material has proved suitable for the pressure, temperature and corrosive condition met with in service.)

22. Water-Column Pipes

a. The minimum size of ferrous or nonferrous pipes connecting a water column to a steam boiler shall be 1 inch. No outlet connections, except for damper regulator, feedwater regulator, steam gauges, or apparatus which does not permit the escape of any steam or water except for manually operated blowdowns, shall be attached to a water column or the piping connecting a water column to a boiler. (See HG-705 of Section IV of the A.S.M.E. Code for introduction of feedwater into a boiler.) If the water column, gauge glass, low-water fuel cutoff, or other water level control device is connected to the boiler by pipe and fittings, no shutoff valves of any type shall be placed in such pipe, and a cross tee, or equivalent fitting, to which a drain valve and piping may be attached, shall be placed in the water piping connection at every right-angle turn to facilitate cleaning. The water column drain pipe and valve shall not be less than $\frac{3}{4}$ in. pipe size.

b. The steam connections to the water column of a horizontal firetube wrought boiler shall be taken from the top of the shell or the upper part of the head, and the water connection shall be taken from a point not above the center line of the shell. For a cast iron boiler, the steam connection to the water column shall be taken from the top of an end section or the top of the steam header, and the water connection shall be made on an end section not less than 6 in. below the bottom connection to the water gauge glass.

23. Automatic Low-Water Fuel Cutoff and Water Feeding Device

a. All automatically fired steam or vapor-system boilers must be equipped with an automatic low-water fuel cutoff and automatic water-feeding device so constructed that the water inlet valve cannot feed water into the boiler through the float chamber, and so located as to automatically cut off the fuel supply and supply requisite feedwater when the surface of the water falls to the lowest safe water line. This point should be not lower than 1 inch above the bottom of the water glass.

b. Such a fuel cutoff or water feeding device may be attached directly to a boiler. A fuel cutoff or water feeding device may also be installed in the tapped openings available for attaching a water glass direct to a boiler, provided the connections are made to the boiler with nonferrous tees or Y's not less than $\frac{1}{2}$ inch pipe size between the boiler and the water glass so that the water glass is attached directly and as close as possible to the boiler; the run of the tee or Y shall take the water glass fittings, and the side outlet or branch of the tee or Y shall take the fuel cutoff or water feeding device. The ends of all nipples shall be reamed to full-size diameter.

c. Designs embodying a float and float bowl shall have a vertical straightway valved drain pipe at the lowest point in the water equalizing pipe connections by which the bowl and the equalizing pipe can be flushed and the device tested.

C. Miniature Boilers

1. Boilers to which the classification "Miniature" applies embrace fired pressure vessels which do not exceed the following limits:

16 in inside diameter of shell
5 cubic feet gross volume, exclusive of casing and insulation
20 square feet of water heating surface
100 pounds per square inch maximum allowable working pressure

Where any one of the above limits are exceeded, the rules of power boilers shall apply.

2. The construction of miniature boilers, except where otherwise specified, shall conform to that required for power boilers. The factor of safety and method of computing the maximum allowable working pressure shall be the same as for power boilers. The flat surfaces of boilers or pressure parts shall be stayed in accordance with the ASME Code, as adopted by Rule 010.01.012.

3. For forced circulation boilers and boilers with no fixed steam or water line, the materials used shall comply with the ASME Boiler Construction Code. All other code requirements shall be met except where they relate to special features of construction made necessary in boilers of this type and to accessories that are manifestly not needed in connection with such boilers such as water gauge columns and gauge cocks.

4. Clearance

Each boiler shall be located so that adequate space will provide for an operation of the boiler and appurtenances and for inspection of all surfaces and their necessary maintenance and repair. Each boiler shall have at least 18 inches clearance on all sides. Each boiler shall have at least 36 inches clearance from electric meters and main line switches. They shall have at least 18 inches clearance from all other switches and fuse boxes. Each boiler shall not be located closer than 7 feet horizontally from any gas meter.

5. Safety Valves

a. Each miniature boiler shall be equipped with a sealed spring- loaded pop safety valve not less than ½-inch in diameter. Where there is no extraction of steam (closed system), a safety fracturing disk may be used in addition to the spring-loaded pop safety valve.

b. The minimum relieving capacity of the safety valve shall be determined on the basis of 3 pounds per hour per square foot of boiler heating surface, and shall be sufficient to discharge all the steam that can be generated by the boiler without allowing the pressure to rise more than 6 percent above the maximum allowable working pressure.

c. To insure the safety valve being free, each valve shall have a substantial lifting device by which the valve disk may be lifted from its seat when there is at least 75 percent of full working pressure in the boiler. All safety valves shall be mounted with their spindles vertical in an upright position and freely accessible.

6. Gauge Glass

Each miniature boiler shall be equipped with a water gauge glass. The lowest permissible water level shall be at a point one-third of the height of the shell except where the boiler is equipped with an internal furnace in which case it shall not be less than one-third the tube length above the top of the

furnace. In case of small generating units operated on a closed system where there is insufficient room for the usual water gauge, water level indicators of the glass bulls-eye type may be used.

7. Steam Gauge

Each miniature boiler shall be equipped with a steam gauge having its dial graduated to not less than one and one-half times the maximum allowable working pressure. The gauge shall be connected to the steam space or to the steam connection to the water column by a syphon tube or equivalent device that will keep the gauge tube filled with water.

8. Stop Valves

Each steam line from a miniature boiler shall be provided with a standard valve located as close as practicable to the boiler except in those cases where the boiler and steam receiver are operated as a closed system.

9. Feed Pumps

a. Each boiler shall be provided with at least one feed pump or other feeding device except where it is connected to a water main carrying sufficient pressure to feed the boiler or where the steam generator is operated with no extraction of steam (closed system). In the latter case, in lieu of a feeding device, a suitable connection or opening shall be provided to fill the generator when cold. Such connection shall not be less than ½-inch pipe size.

b. Each miniature boiler shall be fitted with feedwater and blowoff connections which shall not be less than ½-inch iron pipe size unless operated on a closed system as provided in the ASME. Code. The feed pipe shall be provided with a check valve and a stop valve. The feedwater may be delivered to the boiler through the blowoff, if desired. The blowoff shall be fitted with a valve or cock in direct connection with the lowest water space practicable. When the boiler is under pressure, feedwater shall not be introduced through the openings or connections used for the water columns, the water-gauge glass, or the gauge cocks. In closed systems the water may be introduced through any opening when the boiler is not under pressure.

10. Blow Down

Each boiler shall be provided with a blowoff connection which shall not be reduced in size and shall be led to a safe point of discharge. Whenever in the judgment of the boiler inspector such a place cannot be provided, a blow down tank shall be installed and vent leading to a safe point of discharge shall be provided on all such tanks. The blowoff shall be fitted with a valve or cock in direct connection with lowest water space practicable.

11. Low Water Fuel Cut Out

All boilers, gas, oil or mechanically fired, shall be provided with an automatic low water fuel cutout so located as to automatically cut off the fuel supply in case the water level falls to a point not lower than the bottom of the water glass.

12. Gas Burners

Where boilers are gas fired the burners shall in such cases be equipped with a fuel regulating governor which shall be automatic and regulated by steam pressure. This governor shall be so constructed that in the event of its failure there can be no possibility of steam from the boiler entering the gas chamber or supply pipe. The manual stop cock or throttle valve shall be located in the inlet pipe ahead of the fuel regulating governor. A safety ignition pilot shall be installed on all automatically fired boilers of this type.

13. Flue Connections

Each gas-fired boiler shall be connected to a 4-inch vent pipe or flue extending to an approved location outside of the building or connected to a chimney flue. A draft hood of approved design shall be provided on each boiler. Where the horizontal run is more than 10 feet, the vent shall be increased to 6 inches.

D. Electric Steam Generators

All appliances required for electric steam generators shall be attached in accordance with the following rules:

1. A cable at least as large as one of the incoming power lines to the generator shall be provided for grounding the generator shell. This cable shall be permanently fastened on some part of the generator and shall be grounded in an approved manner.

2. A suitable screen or guard shall be provided around high-tension bushings and a sign posted warning of high voltage. This screen or guard shall be so located that it will be impossible for anyone working around the generator to accidentally come in contact with the high tension circuits.

3. The minimum safety valve or safety relief valve capacity for electric boilers shall be 3 ½ lb/hr/kW (1.6 kg/hr/kW) input. The pressure setting shall not be higher than the maximum allowable working pressure on the completed boiler.

E. Potable Water Heater/Supply Tanks

1. Service Restrictions and Exceptions

This Rule, Rule 010.01.019(E) is restricted to potable water heaters and water storage tanks for operation not exceeding 160 psi, and water temperatures not in excess of 210 degrees F., except that water heaters and supply tanks are exempted when none of the following limitations is exceeded:

a. Heat input less than 200,000 Btu/hr;

b. Water temperature 210 degrees F; or

c. Nominal water-containing capacity of 120 gallons, except that they shall be equipped with appropriate safety valves.

2. “Boiler”, as defined by Arkansas Code Ann. § 20-23-101, means any boiler or like vessel or container in which water is heated and/or steam is generated by the application of heat. “Hot water heater/boiler” as defined above falls under the authority and responsibility of the Boiler

Inspection Division.

3. Minimum Controls

All fired storage water heaters and most electric water heaters and supply vessels shall be equipped with the following controls and devices:

a. Operating temperature control;

b. High-limit temperature control;

c. Positive flame failure cut-off;

d. Approved pressure temperature relief valve, set at or below the safe working pressure of the vessel, with such setting satisfactory for the application.

4. Location

All fired/unfired vessels and heaters shall be so located as to provide access to the controls, safety relief valve, and drain. All vessels shall also be raised sufficiently above the floor level to reduce/prevent rust and corrosion of the bottom and reduce possible early gas ignition from combustible fumes.

5. Discharge Lines

When a discharge line from a relief valve is installed, it shall not be reduced, but shall be full size and be piped to a safe location, and installed so that all water will drain from the valve without leaving water trapped in the line or on the valve.

6. Relief Valve Testing

The operator/owner shall manually test the relief valve semi-annually (every six months).

7. Alternate Use

Storage water heaters and supply vessels, fired or unfired, shall not be used as a heating boiler.

8. Vent Pipes

All fired heaters shall be equipped with a vent pipe or flue conforming to the requirements of the National Fire Protection Association or manufacturer. The flue or vent shall terminate at any acceptable location outside the building.

9. Shutoff Valves

A shutoff valve shall be provided in the cold water branch line next to each vessel.

10. Openings

Water heaters, both potable and domestic type, are provided with drain valves and/or removable handhole covers. The drain should be used to drain the water heater on a regular schedule, to keep it as clean internally as possible. The handhole covers should be removed and the unit cleaned internally on an as-needed schedule.

11. Certificate inspections are required on hot water heaters located in schools, hospitals, day care centers, and nursing homes.

010.01-020 Unfired Pressure Vessels

A. Unfired pressure vessels are any pressure vessel constructed for the accumulation, storage or transportation of air, liquids or gases that are under induced pressure. All vessels shall have the following:

1. The Official Code Symbol.
2. Name of the manufacturer of the pressure vessel, preceded by the words "Certified by".
3. Maximum allowable working pressure ___ psi at ___ ° F.
4. Minimum design metal temperature ___ ° F at ___ psi.
5. Manufacturer's serial number _____.
6. Year built _____.

The Manufacturer's nameplate shall not be permanently covered with any insulating or other material but shall be readily accessible at all times.

B. Manholes and Handholes

1. All unfired pressure vessels for use with compressed air or subject to internal corrosion shall be provided with suitable manhole, handhole or other inspection openings for examination and cleaning, except that such openings may be omitted from vessels containing compressed air when the actual service conditions or other material stored in them are such that the vessel is not subject to internal corrosion.

2. All access and inspection openings in a shell or unstayed head shall be designed in accordance with Section VIII Division 1, of the ASME Boiler and Pressure Vessel Code, as adopted by Rule 010.01.012.

C. Corrosive Substances

1. All pressure vessels which are to contain substances having a corrosive action upon the material of which the vessel is constructed, or those subjected to erosion or mechanical abrasion, shall be designed for the pressure they are to carry, and the thickness of all parts subject to corrosion, erosion or abrasion should be increased by a uniform amount to safeguard against early rejection.

2. Where a vessel goes into corrosive service without previous service experience, it is recommended that service inspections be made at frequent intervals until the nature and rate of corrosion in service can be definitely established. The data thus secured should determine the subsequent intervals between service inspections and the probable safe operating life of the vessel.

D. Inspection of Inaccessible Parts

Where, in the opinion of the inspector, as the result of conditions disclosed at the time of inspection, it is advisable to removed the interior or exterior lining, covering, or brickwork to expose certain parts of the vessel not normally visible, the owner or user shall remove such material to permit proper inspection and to establish construction details. Metal thickness shall be determined utilizing appropriate equipment including drilling if necessary.

E. Pressure Relief Devices

Pressure relief devices for each pressure vessel installation shall comply with the requirements of ASME Pressure Vessel Code Section VIII Division I, as adopted.

F. Safety Appliances

Each pressure vessel shall be protected by such safety devices, including relief valves and rupture disks, as will insure its safe operation. These valves and devices shall be so constructed, located, and installed that they cannot readily be rendered inoperative. The relieving capacity of the safety devices shall be such as to prevent a rise of pressure in the vessel of more than 10 percent above the maximum allowable working pressure, taking into account the effect of static head pressure. Safety device discharges shall be to a safe place. Device outlets shall not be reduced, and device header piping should not rely on the device body for its support.

G. Repairs and Renewals of Fittings and Appliances

1. All repairs and alterations shall be made by a person or company in possession of a repair license from the Boiler Inspection Division.

2. All cases not specifically covered by these requirements shall be treated as new installations, or may be referred to the Chief Inspector for instructions concerning the requirements.

3. The maximum allowable working pressure of an ASME vessel shall be determined by the nameplate information and/or the data report. Rerating of a pressure retaining item by increasing the maximum allowable working pressure (internal or external) or temperature, or decreasing the minimum temperature such that mechanical tests are required, shall be done only with prior approval of the Chief Boiler Inspector and to the original issue/addenda of the code of construction.

4. For information concerning noncode pressure vessels, refer to the ASME Code Section VIII Division I, as adopted.

010.01-021 Fittings and Appliances

A. Fittings and appliances on new boilers or new unfired pressure vessels shall comply with the applicable provisions of the ASME Boiler Construction Code, as adopted, or of these Rules.

B. Where pressure-reducing valves are used, one or more relief or safety valves shall be provided on the low pressure side of the reducing valve in case the piping or equipment on the low pressure side does not meet the requirements of the full initial pressure. The relief or safety valves shall be located adjoining to or as close as possible to the reducing valve. Proper protection shall be provided to prevent injury or damage caused by the escaping steam from the discharge of relief or safety valves if vented to the atmosphere. The combined discharge capacity of the relief valves shall be such that the safe working pressure of the lower pressure piping or equipment shall not be exceeded in case the reducing valve sticks in the open position.

C. The use of hand-controlled by-passes around reducing valves is permissible. The by-pass if used around a reducing valve shall not be greater in capacity than the reducing valve unless the piping or equipment is adequately protected by relief valves or meets the requirements of the high pressure system.

D. The flange dimensions, wall thicknesses, and material of reducing and relief valves shall conform to the requirements specified for valves and fittings for the pressures and temperatures to which they may be subjected.

E. It is mandatory that a pressure gauge be installed on the low-pressure side of the reducing valve.

F. Water Glasses

1. Each boiler shall have at least one water-gauge glass except that boilers operated at pressures over 400 psi shall be provided with two water gauge glasses which may be connected to a single water column or connected directly to the drum. The gauge glass connections and pipe connection shall be not less than ½-in pipe size. Each water gauge glass shall be equipped with a valved drain.

2. The lowest visible part of the water-gauge glass shall be at least 2 inches above the lowest permissible water level which level shall be that at which there will be no danger of overheating any part of the boiler when in operation at that level.

3. Boilers of the horizontal fire-tube type shall be so set that when the water is at the lowest reading in the water-gauge glass there shall be at least 3 inches of water over the highest point of the tubes, flues or crown sheet.

4. Each water-gauge glass shall be equipped with a top and a bottom shutoff valve of such through-flow construction as to prevent stoppage by deposits of sediment and to indicate by the position of the operating mechanism whether they are in operation or closed position. If stopcocks are used, they shall be of a type with the plug held in place by a guard or gland. The pressure-temperature rating shall be at least equal to that of the lowest set pressure of any safety valve on the boiler drum and the corresponding saturated steam temperature.

5. Straight-run globe valves of the ordinary type shall not be used on such connection. Where water columns are seven feet or more above the floor level, adequate means for operating gauge

cocks or blowing out the water glass must be provided.

6. When automatic shutoff valves are used, they shall conform to the requirements of the ASME Code, as adopted.

7. When shutoffs are used on the connections to a water column, they shall be either outside-screw-and-yoke or leverlifting type gate valves or stop cocks with levers permanently fastened thereto and marked in line with their passage, or of such other through-flow constructions to prevent stoppage by deposits of sediment and to indicate by the position of the operating mechanism whether they are in open or closed position; and such valves or cocks shall be locked or sealed open. Where stopcocks are used, they shall be of a type with the plug held in place by a guard or gland.

G. Gauge Cocks

1. Gauge Cocks are not required on new installations since the 1995 ASME Code, or on older installations that are CSD-1 compliant.

2. Boilers that have two water glasses located on the same horizontal lines are not required to have gauge cocks.

3. No outlet connections, except for control devices, drains, steam gauges or apparatus of such form which does not permit the escape of an appreciable amount of steam or water there from shall be placed on the pipes connecting a water column or gauge glass to a boiler.

H. Steam Gauges

1. Each boiler shall have a steam gauge connected to the steam space or to the water column or its steam connection. The steam gauge shall be connected to a syphon or equivalent device of sufficient capacity to keep the gauge tube filled with water and so arranged that the gauge cannot be shut off from the boiler except by a cock placed near the gauge and provided with a tee or level handle arranged to be parallel to the pipe in which it is located when the cock is open. For boilers carrying 500 lbs. pressure or over, valves may be used in place of cocks. Gauge connections which are filled with water at a temperature never greater than that of saturated steam at a pressure of 250 PSI or 460° F shall be of brass, copper, bronze or other non-corrosive composition suitable for the pressure and temperature conditions. Connections that are filled with steam or water of a temperature greater than that of saturated steam at a pressure of 250 PSI or 460° F shall be of steel pipe or of other material capable of safely withstanding the temperatures corresponding to the maximum allowable working pressure. Where steel or wrought-iron pipe connections are used they shall be not less than 1-inch pipe size.

2. The wall thickness of all pipe connections shall comply at least with the requirements of the ASME Code, as adopted.

3. Where the use of a pipe longer than 10 ft becomes necessary, an exception may be made to the rule that the gauge must be arranged so that it cannot be shut off except by a cock placed near the gauge, and a shutoff valve or cock arranged so that it can be locked or sealed open may be used near the boiler. Such a pipe shall be of ample size and arrangement so that it may be cleared by blowing out.

4. The dial of the steam gauge shall be graduated to approximately double the pressure at which the safety valve is set but in no case to less than 1 ½ times this pressure.

5. Each boiler shall be provided with a ¼-inch pipe size valved connection for the exclusive purpose of attaching a test gauge when the boiler is in service, so that the accuracy of the boiler steam gauge can be ascertained.

I. Valves

1. Each steam discharge outlet, except safety valve and super-heater connections, shall be fitted with a stop valve located at an accessible point in the steam delivery line and as near the boiler nozzle as convenient and practicable. When such outlets are over 2-inch pipe size, the valve or valves used on the connection shall be of the outside-screw-and-yoke rising-spindle type so as to indicate at a distance by the position of its spindle whether it is closed or open and the wheel may be carried either on the yoke or attached to the spindle. A plug-cock type valve may be used provided the plug is held in place by a guard or gland, and it is equipped to indicate at a distance whether it is closed or open and it is equipped with a slow-opening mechanism.

2. If a shutoff valve is used between the boiler and its superheater connections, the safety valve capacity on the boiler must comply with the requirements of the ASME Pressure Vessel Code Section 1 PG-68, as adopted, no credit being taken for the safety valve on the superheater, and the superheater must be equipped with a safety-valve capacity as required by the ASME Pressure Vessel Code, as adopted. In a separately fired superheater installation, a stop valve is not required at the inlet or the outlet of the superheater.

3. All stop valves and the fittings between them and the boiler shall be equal at least to the requirements in the ASME Code for the maximum allowable working pressure and the temperature in service and material used, subject to the provisions of the ASME Code, and except where heavier construction is specifically required.

4. Valves and fittings made of any material permitted by the ASME Code, as adopted, for pressure ratings of 100 lbs. or more, and marked as required by the ASME Code, as adopted, may be used for saturated steam service up to the rated pressure, except that in no case shall they be used for temperatures exceeding that permitted by the ASME Code, as adopted.

5. The nearest steam stop valve or valves to the superheater outlet shall have a pressure rating at least equal to the minimum set pressure of any safety valve on the boiler drum at the corresponding saturated steam temperature.

6. The nearest stop valve or valves to the superheater outlet shall have a pressure rating at least equal to the minimum set pressure of any safety valve on the superheater and at the expected superheated steam temperature; or at least equal to 85 percent of the lowest set pressure of any safety valve on the boiler drum at the expected steam temperature of the superheater outlet, whichever is greater.

7. When high pressure boilers are connected to a common steam main, the steam connection from each boiler having a manhole opening shall be fitted with two stop valves having an

ample freeblow drain between them. The discharge of this drain shall be visible to the operator while manipulating the valve. The stop valves shall consist preferable of one automatic non-return valve (set next to the boiler) and a second valve of the outside-screw-and-yoke type; or two valves of the outside-screw-and-yoke type shall be used.

8. When a second steam stop valve or valves is required, it shall have a pressure rating at least equal to that required for the expected steam temperature and pressure at the valve, or the pressure rating shall be not less than 85 percent of the lowest set pressure of any safety valve on the boiler drum and for the expected temperature of the steam at the valve, whichever is greater.

9. When a stop valve is so located that the water can accumulate, ample drains shall be provided. All drain lines, including pipes, fittings and valves, shall comply with the requirements for steam piping or water piping according to the service.

J. Steam Mains

1. Provisions 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.

2. Each superheater shall be equipped with at least one drain so located as to most effectively provide for the proper operation of the apparatus.

K. Blowoff Piping

1. A blowoff as required herein is defined as a pipe connection provided with valves through which the water in the boiler may be blown out under pressure, excepting drains such as are used on water columns, gauge glasses or piping to feed-water regulators, etc. used for the purpose of determining the operating condition of such equipment. Piping connections used primarily for continuous operation, such as deconcentrators on continuous blowdown systems, are not classed as blowoffs but the pipe connections and all fittings up to and including the first shutoff valve shall be equal at least to the pressure requirements for the lowest set pressure of any safety valve on the boiler drum and with the corresponding saturated steam temperature.

2. A surface blowoff shall not exceed 2 ½-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 property designed steel busing, similar to or equivalent to those shown in the ASME Code, or flanged connection shall be used.

3. Each boiler shall have a bottom blowoff pipe fitted with a valve or cock in direct connection with the lowest water space practicable.

4. The minimum size pipe and fittings shall be 1-inch and the maximum size shall be 2 ½-inches. The minimum size of pipe and fittings may be ¼-inch for boilers with 100 sq. ft of heating surface or less.

5. Straight-run globe valves of the ordinary type or valves of such type that dams or pockets can exist for the collection of sediment, shall not be used on such connections.

6. Straightway “Y”-type globe valves as shown in the ASME Code or angle valves may be used in vertical pipes or horizontal runs of piping provided they are so constructed or installed that the lowest edge of the opening through the seat shall be at least 25 percent of the inside diameter below the center line of the valve.

7. Return connections of the same size or larger than the size herein specified may be used, and the blowoff may be connected to them. In such case, the blowoff must be so located that the connection may be completely drained.

8. All integral economizers, waterwalls, or water screens forming parts of a steam boiler shall be equipped with drain or blowoff valves conforming to the requirements herein described.

9. 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.

10. The blowoff valve or valves and the pipe between them and the boiler shall be of the same size except where a larger pipe for the return of condensation is used, as described above.

11. All fittings between the boiler and valves shall be of steel for pressures not less than 125 psi.

12. In all cases the valves and fittings from the boiler to and including the required stop valves shall be equal at least to the requirements of the A.S.M.E. Code for pressure 1.25 times the maximum allowable working pressure of the boiler or 1.25 times the lowest set pressure of any safety valve on the boiler drum, except that for pressures not exceeding 100 psi, the valves and fittings shall be equal at least to the requirements of the ASME Code, as adopted, for 125 psi.

13. For pressure exceeding 100 psi, the valves shall, if of cast iron, be equal at least to the requirements for 250 lbs. as given in the ASME Code, as adopted; and if of steel construction shall be equal to the requirements of the ASME Code, as adopted.

14. For pressures over 200 psi, the valves or cocks shall be of steel construction equal at least to the requirements for 300 psi as given in the ASME Code, as adopted.

15. On all boilers, except those used for traction and/or portable purposes, when the allowable working pressure exceeds 100 psi, each bottom blowoff pipe shall have two slow-opening valves or one slow-opening valve and a quick-opening valve or cock complying with the above requirements.

16. By “slow-opening” valve is meant one which requires at least five 360-degree turns of the operating mechanism to change from full-closed to full-opening and vice versa.

17. 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. In this case either the master valve or the individual valves or cocks must be of the slow-opening type.

18. Two independent slow-opening valves, or a slow-opening valve and a quick-opening valve, or a cock may be combined in one body provided the combined fittings is the equivalent of two independent slow-opening valves, or a slow-opening valve and a quick-opening valve, or a cock so that the

failure of one to operate could not affect the operation of the other.

19. The drain or blowoff valves for waterwalls or water screens forming parts of a boiler shall conform to the requirements herein.

20. The bottom blowoff pipes of every traction and/or portable boiler shall have at least one slow-opening or one quick-opening blowoff valve or cock conforming to the above requirements.

21. A bottom blowoff pipe when exposed to direct furnace heat shall be protected by firebrick or other heat resisting material so arranged that the pipe may be inspected.

22. An opening in the boiler setting for a blowoff pipe shall be arranged to provide free expansion and contraction.

L. Blowoff Tanks

1. These rules do not contain details of all possible arrangements of boiler blowoff equipment. A Guide to Blowoff Vessels is NB-27, governing the installation of blowoff tanks should be consulted. Refer to the National Board's website for information at: nationalboard.org

2. The blowdown from a boiler or boilers that enters a sanitary 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 required by this rule.

3. All blowoff tanks shall be designed and stamped per the ASME Section VIII, Division 1, for a pressure of at least 50 psig.

4. The temperature of the water leaving the blowoff equipment shall not exceed 150 degrees Fahrenheit.

5. The pressure of the blowdown leaving any type of blowoff tank shall not exceed 5 psig.

6. The blowoff equipment shall be fitted with openings to facilitate cleaning and inspection.

7. The tank shall be fitted with an opening for a thermometer well, which shall be located close to the water outlet connection and in contact with the retained water in the tank.

8. All blowoff tanks shall have a vent to atmosphere of at least the size indicated in Table 1 of this rule.

TABLE 1
OPENING OF BLOWOFF TANKS
PIPE SIZE

<u>BOILER BLOWOFFLINE</u>	<u>WATER OUTLET</u>	<u>VENT</u>
<u>*3/4</u>	<u>3/4</u>	<u>2</u>
<u>1</u>	<u>1</u>	<u>2 1/2</u>
<u>1 1/4</u>	<u>1 1/4</u>	<u>3</u>
<u>1 1/2</u>	<u>1 1/2</u>	<u>4</u>
<u>2</u>	<u>2</u>	<u>5</u>
<u>2 1/2</u>	<u>2 1/2</u>	<u>6</u>

See Figures

TABLE EXPLANATION

From the blowoff column, pick the size of pipe which is the smallest size of pipe in the blowoff line from the boiler to the blowoff tank. The size of the water outlet and vent will be that as indicated on the same line of the table. Example: A boiler installation that has a 1 1/2-inch blowoff line from the drum to a 2 1/2-inch header which leads to the blowoff tank, the size of the water outlet and vent will be determined by the 1 1/2-inch size.

* To be used only with boilers of 100 sq. ft of heating surface or less.

Note: Vent size in the above table is based on the area of extra heavy pipe and is approximately 5 times the area of the blowoff line.

N. Feed Piping

1. The feedwater 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 any riveted joints of the furnace sheets or of the shell. For pressures of 400 lbs., or over, the feed water inlet through the drum shall be fitted with shields, sleeves or other suitable means to reduce the effects of temperature differentials in the shell or head. If necessary, the discharge end of a feed pipe shall be fitted with a baffle to divert the flow from the riveted joint. Feedwater, other than condensate returned as provided for in Blowoff Piping, shall not be introduced through the blowoff.

2. When the horizontal-return tubular boiler exceeds 40 inches in diameter, the feedwater shall discharge at about three-fifths the length from that end of the boiler which is subjected to the hottest gases of the furnace (except a horizontal-return tubular boiler equipped with an auxiliary feedwater heating and circulating device), above the central rows of tubes. The feed pipe shall be carried through the head or shall farthest from the point of discharge of the feedwater in the manner specified for a surface blowoff in the ASME Code, as adopted, and be securely fastened inside the shall above the tubes.

3. In vertical tubular boilers having tubes 4 ft or less in length, the feedwater shall be introduced at a point not less than one-fourth the length of the tube above the lower tube sheet. For tubes more than 4 ft in length, the feedwater shall be introduced at a point not less than 12 inches above the

crown sheet. When the boiler is under pressure, feedwater shall not be introduced through the openings or connections used for the water column, the water-gauge glass, the blowoff, or the gauge cocks. In closed systems the water may be introduced through any opening when the boiler is not under pressure.

4. In these and other types of boilers where both internal and external pipes making a continuous passage are employed, the boiler bushing or its equivalent shall be used.

O. Feed Piping-Check Valve Requirements

1. The feed pipe shall be provided with a check valve near the boiler and a valve or cock between the check valve and the boiler, and when two or more boilers are fed from a common source, there shall also be a globe or regulating valve on the branch to each boiler between the check valve and the source of supply. A typical arrangement is shown in the ASME Code. Wherever globe valves are used on feed piping, the inlet shall be under the disk of the valve.

2. When the supply line to a boiler is divided so as to feed a drum in more than one place or to feed more than one drum, it is recommended that each such branch line be equipped with a stop and check valve even though the common source is equipped as required above.

3. If a boiler is equipped with duplicate feed arrangements, each such arrangement shall be equipped as required by the ASME Code, as adopted.

4. A combination stop-and-check valve in which there is only one seat and disk, and a valve stem is provided to close the valve when the stem is screwed down, shall be considered only as a stop valve, and a check valve shall be installed as otherwise provided.

5. Where an economizer or other feedwater-heating device is connected directly to a boiler without intervening valves, the feed valves and check valves required shall be placed on the inlet of the economizer or feedwater-heating device.

6. a. For boilers having a water heating surface of not more than 100 sq. ft, the feed connection to the boiler shall not be smaller than 1/2-inch pipe size. For a water heating surface of more than 100 sq. ft, the feed connection to the boiler shall not be less than 3/4-inch pipe size.

b. High temperature water boilers shall be provided with a means of adding water to the boiler or to the system under pressure.

c. A forced flow steam generator with no fixed steam and waterline shall be provided with a source of feeding capable of supplying water to the boiler at a pressure not less than the expected maximum sustained pressure at the boiler inlet.

P. Selection of Feed Pumps

1. In selecting boiler feed pumps, the fact that boilers are often operated two or three hundred percent of their rating should be taken into consideration. The figures as outlined in Table 2 are of the actual boiler horsepower developed, based on 34.5 pounds of water evaporated per hour from and at 212° F.

TABLE 2
REQUIREMENTS IN U.S.G.P.M. BOILER FEEDING

<u>BOILER HP</u>	<u>GPM</u>	<u>BOILER HP</u>	<u>GPM</u>
<u>5</u>	<u>.345</u>	<u>350</u>	<u>24</u>
<u>10</u>	<u>.690</u>	<u>400</u>	<u>28</u>
<u>15</u>	<u>1.03</u>	<u>500</u>	<u>34</u>
<u>20</u>	<u>1.38</u>	<u>750</u>	<u>53</u>
<u>25</u>	<u>1.72</u>	<u>1000</u>	<u>69</u>
<u>30</u>	<u>2.07</u>	<u>1500</u>	<u>104</u>
<u>35</u>	<u>2.41</u>	<u>2000</u>	<u>138</u>
<u>40</u>	<u>3</u>	<u>2500</u>	<u>172</u>
<u>50</u>	<u>4</u>	<u>3000</u>	<u>207</u>
<u>75</u>	<u>5</u>	<u>3500</u>	<u>242</u>
<u>100</u>	<u>7</u>	<u>4000</u>	<u>276</u>
<u>150</u>	<u>10</u>	<u>4500</u>	<u>310</u>
<u>175</u>	<u>12</u>	<u>5000</u>	<u>345</u>
<u>200</u>	<u>14</u>	<u>10000</u>	<u>689</u>
<u>225</u>	<u>16</u>	<u>15000</u>	<u>1034</u>
<u>250</u>	<u>17</u>	<u>20000</u>	<u>1387</u>
<u>275</u>	<u>19</u>	<u>25000</u>	<u>1723</u>
<u>300</u>	<u>21</u>	<u>35000</u>	<u>2413</u>

2. Boiler feed pumps should have pressure in excess of the boiler rated pressure in order to compensate for frictional losses, entrance losses, regulating valve losses, and normal static head, etc. However, for estimating purposes, the following are fair values for feed pumps differential:

<u>Boiler Pressure</u>	<u>Feed Pump Discharge Pressure</u>
<u>200</u>	<u>250</u>
<u>400</u>	<u>475</u>
<u>800</u>	<u>925</u>
<u>1200</u>	<u>1350</u>

Q. Feedwater Supply

1. A boiler having more than 500 sq. ft. of water heating surface shall have at least two means of feeding water. Each source of feeding shall be capable of supplying water to the boiler at a pressure of 3% higher than the highest setting of any safety valve on the boiler. For boilers that are fired with solid fuel not in suspension, and for boilers whose setting or heat source can continue to supply sufficient heat to cause damage to the boiler if the feed supply is interrupted, one such means of feeding shall not be susceptible to the same interruption as the other, and each shall provide sufficient water to prevent damage to the boiler.

2. A boiler fired by gaseous, liquid, or solid fuel in suspension may be equipped with a single means of feeding water, provided means are furnished for shutting off its heat input prior to the water level reaching the lowest permissible level.

R. Water Fronts

Each boiler fitted with a water-jacketed boiler-furnace mouth protector, or similar appliance, having valves on the pipes connecting them to the boiler, shall have these valves locked or sealed open. Such valves, when used, shall be of the straightway type.

S. Water-Column Pipes

1. The minimum size of pipes connecting the water column to a boiler shall be 1-inch. For pressures of 400 lbs., or over, lower water column connections to drums shall be provided with shields, sleeves or other suitable means to reduce the effect of temperature differentials in the shells of heads. Waterglass fittings or gauge cocks may be connected direct to the boiler.

2. The design and materials of a water column shall comply with the requirements of the ASME Code. Water columns made of cast iron in accordance with Specifications SA-48 may be used for maximum boiler pressures not exceeding 250 psi. Water columns made of malleable iron in accordance with Specification SA-47 may be used for maximum boiler pressures not exceeding 350 psi. For higher pressures, steel construction shall be used.

3. The steam and water connections to a water column or a water gauge glass, including all pipes, fittings, valves and drains, shall comply with requirements of the ASME Code, as adopted. These connections shall be such that they are readily accessible for internal inspection and cleaning. Some acceptable methods of meeting this requirement would be by providing a cross or fitting with a back outlet at each right angle turn to permit inspection and cleaning in both directions, or by using pipe bends or fittings of a type which does not leave an internal shoulder or pocket in the pipe connection and with a radius of curvature which will permit the passage of a rotary cleaner. 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 water column drain, an additional drain shall be placed on this connection in order that it may be blown off to clear any sediment from the pipe. The water column blowoff pipe shall be at least ¾-inch pipe size.

4. When the gauge glasses and gauge cocks required above are not connected substantially directly to the shell or drum of a boiler, a water column shall be used into which the gauge glass and gauge cocks shall be connected, except as modified by the ASME Code, as adopted.

5. The lower edge of the steam connections to a water column and the boiler shall not be below the highest visible water level in the water gauge glass.

6. There shall be no sag or offset in the piping which will permit the accumulation of water.

7. The upper edge of the water connection to a water column and the boiler shall not be above the lowest visible water level in the gauge glass.

8. No part of this pipe connection shall be above the point of connection at the water column.

9. An acceptable arrangement is shown in the ASME Code.

T. Fusible Plugs

1. A fusible plug, if used, shall be placed at the lowest safe water line and in contact with the products of combustion.

2. Any or all of the fittings and appliances required by these rules may be installed inside the boiler jackets provided the water gauge and try cocks on a steam boiler are accessible without the use of tools and provided the water gauge and pressure gauge on a steam boiler or the thermometer and pressure gauge on a water boiler are visible through an opening or openings at all times.

U. Washout Opening

All steam and hot-water boilers shall be provided with suitable washout openings to permit the removal of any sediment that may accumulate therein. Washout openings may be used for return pipe connections and the washout plug placed in a tee so that the plug is directly opposite and as close as possible to the opening in the boiler.

010.01-022 Safety Valves

A. No person shall in any manner load the safety valve or relief valve to a greater pressure than that allowed in the Certificate of Inspection. Dead weight or weighted-lever safety valves shall not be used. Each boiler, if it is subject to the provisions of Section 1 of the ASME Code, shall have at least one safety valve and if it has more than 500 square feet of water heating surface it shall have two or more safety valves. The method of computing the steam-generating capacity of the boiler shall be in compliance with the ASME Code, as adopted.

B. The safety-valve capacity for each boiler shall be such that the safety valve or valves will discharge all the steam that can be generated by the boiler without allowing the pressure to rise more than 6 percent above the highest pressure at which any valve is set and in no case to more than 6 percent above the maximum allowable working pressure. The maximum steaming capacity of a boiler shall be determined by the manufacturer and shall be based on the capacity of the fuel-burning equipment, on the air supply, draft, etc.

C. One or more safety valves on the boiler proper shall be set at or below the maximum allowable working pressure. If additional valves are used the highest pressure setting shall not exceed the maximum allowable working pressure by more than 3 percent. The complete range of pressure settings of all the saturated steam safety valves on a boiler shall not exceed 10 percent of the highest pressure to which any valve is set.

D. 1. All safety valves shall be so constructed that the failure of any part cannot obstruct the free and full discharge of steam from the valve. Safety valves shall be of the direct springloaded pop type, with seat inclined at any angle between 45 and 90 degrees, inclusive, to the center line of the spindle. The maximum rated capacity of a safety valve shall be determined by actual steam flow at a pressure of 3 percent in excess of that at which the valve is set to blow, and shall operate without chattering and shall be set and adjusted as follows: To close after blowing down not more than 4 percent of the set pressure but not less than 2 lbs. in any case.

2. For spring-loaded pop safety valves for pressures between 100 and 300 psi, both inclusive, the blowdown shall be not less than 2 percent of the set pressure. To insure the guaranteed capacity of satisfactory operation, the blowdown as marked upon the valve shall not be reduced.

E. Safety valves used on forced-circulation boilers of the once through type may be set and adjusted to close after blowing down not more than 10 percent of the set pressure. The valve for this special use must be so adjusted and marked by the manufacturer.

F. The blowdown adjustment shall be made and sealed by the manufacturer.

G. The popping point tolerance plus or minus shall not exceed the following: 2 lbs. for pressures up to and including 70 lbs.; 3 percent for pressures from 71 to 300 lbs.; and 10 lbs. for pressures over 300 lbs.

H. Each safety valve shall be plainly marked by the manufacturer in such a way that the markings will not be obliterated in service. The markings may be stamped on the casing or stamped or cast on a plate or plates securely fastened to the casing, and shall contain the following markings:

1. The name or identifying trademark of the manufacturer.

2. Manufacturer's design or type number.

3. Size _____ in. Seat Diameter _____ in. (The pipe size of the valve inlet)

4. SET-Pressure _____ lb. (The steam pressure at which it is to blow)

5. Capacity _____ lb. per hr. (As stated above and with the valve adjusted to the blowdown given in the preceding item)

6. Capacity Lift _____ in. (Capacity lift: The distance the valve disc rises under the action of the steam when the valve is blowing under a pressure of 3 percent above set pressure)

7. Year Built _____

8. ASME symbol as shown in the ASME Code.

I. If the safety-valve capacity cannot be computed or if it is desirable to prove the computations, it may be checked in any one of the three following ways, and if found insufficient, additional capacity shall be provided:

1. By making an accumulation test, that is, by shutting off all other steam-discharge outlets from the boiler and forcing the fires to the maximum. The safety valve equipment shall be sufficient to prevent an excess pressure beyond that specified previously.

2. By measuring the maximum amount of fuel that can be burned and computing the corresponding evaporative capacity upon the basis of the heating value of the fuel as outlined in the ASME Code for Power Boilers, as adopted.

3. By determining the maximum evaporative capacity by measuring the feedwater. The

sum of the safety valve capacities marked on the valves shall be equal to or greater than the maximum evaporative capacity of the boiler.

J. All firms that are in the business of repairing safety or temp/relief valves shall be qualified and hold a VR certificate of authorization from the National Board.

K. Any firm or corporation operating within the state, that has their own qualified personnel and quality control program may repair and reset their own valves. Each firm or corporation shall submit a copy of their Q.C. Program to the Boiler Inspection Division.

L. When two 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 valves having two valves in the same body casing. Twin valves made by placing individual valves on Y bases, or duplex valves having two valves in the same body, shall be of equal size.

M. When not more than two valves of different sizes are mounted singly, the relieving capacity of the smaller valve shall be not less than 50 percent of that of the larger one.

N. The safety valve or valves shall be connected to the boiler independent of any other steam connection, and attached as close as possible to the boiler, without any unnecessary intervening pipe or fitting. Every safety valve or valves shall be connected so as to stand in an upright position, with spindle vertical.

O. The opening or connection between the boiler and the safety valve shall have at least the area of the valve inlet. In the case of fire-tube boilers, the openings in the boilers for safety valves shall not be less than in the ASME Code, as adopted (except fire-tube boiler used for waste heat purposes only, and which are not equipped for direct firing. This type boiler need not meet the requirements of the Code provided the rated steam capacity is stamped on the boiler and safety valves of the required relieving capacity are supplied so that the provisions of Rule 010.01.022(B) are satisfied). No valve of any description shall be placed between the required safety valve or valves and the boiler, or 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 valve outlet or of the total of the areas of the valve outlets discharging therein and shall be as short and straight as possible and so arranged as to avoid undue stresses on the valve or valves.

P. All safety-valve discharges shall be so located or piped as to be carried clear from the running boards or platforms. Ample provisions for gravity drain shall be made in the discharge pipe at or near each safety valve, and where water or condensation may collect. Each valve shall have an open gravity drain through the casing below the level of the valve seat. For iron and steel-bodied valves exceeding 2-in size, the drain hole shall be tapped not less than 3/8-in pipe size.

Q. If a muffler is used on a safety valve it shall have sufficient outlet area to prevent back pressure from interfering with the proper operation and discharge capacity of the valve. The muffler plates or other devices shall be so constructed as to avoid any possibility of restriction of the steam passages due to deposit.

R. When a boiler is fitted with two or more safety valves on one connection, this connection to the boiler shall have a cross sectional area not less than the combined areas of inlet connections of all the safety valves with which it connects.

S. Superheater Safety Valves

1. Every attached superheater shall have one or more safety valves near the outlet. If the superheater outlet header has a full, free steam passage from end to end and is so constructed that steam is supplied to it at practically equal intervals throughout its length so that there is a uniform flow of steam through the superheater tubes and the header, the safety valve or valves may be located anywhere in the length of the header.
2. The discharge capacity of the safety valve or 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 valve or valves on the boiler, as distinct from the superheater, is at least 75 percent of the aggregate valve capacity required.
3. Every independently-fired superheater which may be shut off from the boiler and permit the superheater to become a fired pressure vessel shall have one or more safety valves having a discharge capacity equal to 6 lbs. of steam per square foot of superheater surface measured on the side exposed to the hot gasses. The number of safety valves installed shall be such that the total capacity is at least equal to that required.
4. A soot-blower connection may be attached to the same outlet from the superheater that is used for the safety valve connection.
5. Every safety valve used on a superheater discharging superheated steam at a temperature over 450° F. shall have a casing, including the base, body, bonnet, and spindle of steel, steel alloy or equivalent heat-resistant material. The valve shall have a flanged inlet connection and shall have the seat and disk of suitable heat erosive and corrosive-resisting material, and the spring fully exposed outside of the valve casing so that it shall be protected from contact with the escaping steam.
6. Every superheater shall have adequate means of supplying sufficient steam circulation when equipment using superheated steam is out of operation or main steam valve is closed.
7. Every boiler shall have proper outlet connections for the required safety valve or valves independent of any other outside steam connection, the area of opening to be at least equal to the aggregate areas of inlet connections of all of the safety valves to be attached thereto. 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 connection of the attached safety valves. The holes in such collecting pipes shall be at least ¼-inch in diameter and the least dimension in any other form of opening for inlet of steam shall be ¼-inch.
8. Such dimensional limitations to operations for steam need not apply to steam scrubbers or driers provided the net free steam inlet area of the scrubber or dryer is at least 10 times the total area of the boiler outlets for the safety valves.
9. If safety valves are attached to separate steam drum or dome, the opening between the boiler proper and the steam drum or dome shall be not less than required above.

010.01-023 Anhydrous Ammonia

A. General Provisions

1. Under moderate pressure the gas liquefies, but upon release of the pressure, the liquid is readily converted into the gaseous phase. Advantage of this characteristic is taken by the industry, and for convenience the gas is shipped and stored under pressure as a liquid.
2. Anhydrous ammonia may cause varying degrees of irritation of the skin or mucous membrane, and may injure severely the respiratory tract and organs.
3. At atmospheric temperatures and pressures, ammonia is a pungent and colorless gas and serves as its own warning agent. Since ammonia gas is lighter than air, adequate ventilation is the best means of preventing any accumulation.
4. In the case of the pure product at atmospheric pressure and below - 28° F., Anhydrous Ammonia is a liquid. Anhydrous Ammonia freezes to a white crystalline mass at - 107.9° F.
5. The common metals are not affected by dry ammonia. Moist ammonia will not corrode iron or steel, but will rapidly react with copper, brass, zinc and many alloys, especially those containing copper. It is required that only iron, steel and certain non-ferrous alloys which have proved to be satisfactory for ammonia service, be used for ammonia containers, fittings and other equipment.
6. The flammable limits of ammonia are presently classified from 16 to 25 percent by volume in air. Experience has shown that ammonia is extremely hard to ignite in spite of these theoretical limits.

B. Definitions

For the purpose of this Rule 010.01.023, the terms listed below shall be construed to have the following meanings:

1. “Approved” as used in these standards means:
 - a. Tested and listed by a recognized testing laboratory, or
 - b. Inspected and approved by the Boiler Inspection Division;
2. “Appurtenances” refers to all devices such as safety devices, liquid level gauge devices, valves, pressure gauges, fittings, and metering or dispensing devices;
3. “Capacity” as used in these standards refers to the total volume of the container measured in standard U.S. gallons, unless other wise specified;
4. “The Code” or the “ASME Code” refers to the Unfired Pressure Vessel Code of the American Society of Mechanical Engineers, Section VIII, Division 1 of the ASME Code, as adopted;

5. “Design Working Pressure” is identical to the term “Maximum Allowable Working Pressure,” used in the Code;

6. “Filling Density” is defined as the percent ratio of the weight of the gas in a container to the weight of water the container will hold at 60° F.;

7. “Gas” refers to anhydrous ammonia in either the gaseous or liquefied state;

8. “Liquid fertilizer” means anhydrous ammonia or any ammonia solution generating a vapor pressure of twenty-five (25) psi gauge, and over, at 70 degrees Fahrenheit;

9. “Systems” refers to an assembly of equipment consisting essentially of the container or containers, appurtenances, pumps, compressors and interconnecting hose and piping; and

10. “Tank,” “container” or “vessel” refers to vessels designed and constructed for the storage, transportation and utilization of anhydrous ammonia.

C. License Requirement

1. Every manufacturer, jobber or dealer selling or offering for sale in the State of Arkansas, containers used for the storage, transportation and dispensing of anhydrous ammonia shall be licensed by the Boiler Inspection Division in compliance with Ark. Code Ann. § 20-23-405 and Rule 01.01.008 which states all persons, firms or corporations engaged in the sale and/or installation of unfired pressure vessels shall be licensed by the Boiler Inspection Division to perform such work.

2. The following fees shall be paid before permits may be issued for the installation of any unfired pressure vessel:

<u>500 Gallons or less</u>	<u>\$15.00</u>
<u>Over 500 Gallons to 1,000 Gallons, Incl.</u>	<u>\$20.00</u>
<u>Over 1,000 Gallons to 5,000 Gallons, Incl.</u>	<u>\$40.00</u>
<u>Over 5,000 Gallons</u>	<u>\$50.00</u>

3. A license may be revoked as provided in Rule 010.01.008.

4. It shall be unlawful to fill any container, requiring annual inspections, with anhydrous ammonia when such container is over 30 days past due annual inspection. Any dealer filling such container may be subject to license revocation.

E. Design and Construction

1. Vessels used for storage and dispensing of liquid fertilizer shall be constructed to comply with the provisions of Section VIII, ASME Boiler Code. All containers shall be constructed for a safe working pressure of not less than 250 psig with minimum head and shell thickness of not less than three-sixteenths (3/16)-inch. All trucks and transports used for the transportation of anhydrous ammonia shall be constructed for a safe working pressure of not less than 265 psig and in compliance with Section VIII of the ASME Code.

2. In addition to the above requirements, all anhydrous ammonia containers to be used for storage purposes, 36 inches in diameter or larger, and all vessels mounted on transport trucks, delivery trucks, and trailer units, regardless of size, shall be constructed to comply with either of the following requirements:

a. Stress relieve the container after fabrication in accordance with the ASME Code, Par. UW-40, Sub-par. (1) or (2);

b. Stress relieve cold formed heads in an approved manner; and

c. Used not formed heads.

3. It is strongly recommended that vessels of this type be stress relieved. All such containers shall be stamped "National Board" at the time of construction. Blueprints showing the type or types, of all containers shall be filed with the Boiler Inspection Division for approval before shipment of any container into the state.

4. Shop inspections shall be made of all containers during construction by a duly authorized inspector who holds a National Board Commission, and who is employed by an insurance company, state or municipality.

5. All containers shall have the manufacturer's name plate, firmly attached to the container, designating manufacturer's serial number, National Board number, year built, diameter, length, shell and head thickness, capacity in water gallons, pounds and surface area of vessel in square feet.

6. All containers, except storage tanks, shall be fully equipped with the required fittings by the manufacturer and shall be tested under air pressure of not less than 100 psig before delivery to the user. Air pressure of not less than twenty-five (25) or more than seventy-five (75) psig shall be left in the container when shipment is made into the State by the manufacturer or jobber, and this information shall be included in the report of shipment provided for in the following paragraph.

7. Manufacturers and jobbers shall forward to the Boiler Inspection Division notice of shipment and manufacturer's data report on the same day that shipment of containers is made in the state. Manufacturers and jobbers shall not sell containers to individuals. They shall sell containers and equipment to bonded and licensed dealers only.

8. Each container which is to be used for the transportation or utilization of Anhydrous Ammonia shall be inspected and approved by the Boiler Inspection Division at the dealer's place of business before being placed in service, and thereafter at such times and in such manner as may be determined under the Rules and Regulations of the Department.

9. The division shall notify all dealers when annual inspections will be made of their equipment requiring annual inspections, and it will be the dealer's responsibility to have all trailers and/or transports at his place of business in order that all equipment may be inspected. Dealers will notify their customers, who own their own containers, the date the inspector will be at the dealer's place of business.

10. All containers used for the storage and all transports and trailer units used for the delivery of anhydrous ammonia shall be inspected annually. For each inspection made by the Department there shall be paid a fee in accordance with the following schedule:

11. All containers used for dispensing purposes which are mounted on field tractors and have a capacity up to and including

<u>150 Gallons</u>	<u>\$ 9.00</u>
<u>151 Gallons and over</u>	<u>\$10.00</u>
<u>Containers used on trailer units, regardless of size</u>	<u>\$11.00</u>
<u>Containers used for storage, regardless of size</u>	<u>\$18.00</u>

12. Owners of all types of anhydrous ammonia vessels shall be responsible for the inspection fees.

13. Special inspection fees of \$15.00 per container plus mileage, not to exceed the rate authorized by the General Assembly to employees of the state agencies who furnish their own transportation, traveled from dealer's place of business to point of inspection and return shall be charged for any container moved from dealer's place of business before it is inspected and approved.

F. Container Valves and Accessories

1. Couplings and external flanges used on any container shall be welded both inside and outside. The use of nipples in lieu of couplings or flanges is prohibited. All couplings, piping and valves shall be wrought-iron or steel. The use of cast iron, copper, brass or galvanized fittings is prohibited.

2. All containers shall be equipped with necessary safety relief valves, filler valves, vapor return valves, liquid level gauge, outage gauge and a pressure gauge graduated from 0 to 400. The vapor return valve, filler valve and liquid outlet valve shall be equipped with excess flow check valves. It is not required that dispensing units be equipped with excess flow check valves in the liquid outlet. Safety relief valves shall have direct communication with the vapor space of the container.

3. All fittings to be attached to an Anhydrous Ammonia container of any type (liquid or vapor) shall be approved for use with Anhydrous Ammonia and designed for not less than the maximum pressure to which they may be subjected. Valves which may be subjected to container pressure shall have a rated working pressure not less than 250 psig.

4. All connections to containers, except safety relief connections and gauging devices, shall have shutoff valves located as close to the container as possible.

5. Liquid level gauging devices which are so constructed that outward flow of container content shall not exceed that passed by a No. 54 drill size opening, need not be equipped with excess flow valve.

6. Openings from the container or through fittings attached directly on container, to which pressure gauge connection is made, need not be equipped with excess flow valve if such openings are protected by not larger than No. 54 drill size openings.

7. All excess flow valves shall be plainly and permanently marked with the name or trademark of the manufacturer, the catalog number, and rated capacity.

8. Excess flow valves shall close automatically at the rated flows of vapor or liquid as specified by the manufacturer, and shall be set to close at not more than 80 percent of the maximum capacity of the normal pipe size into which they are discharging at 60 pounds container pressure.

9. Excess flow and back pressure check valves shall be located inside the container or at a point outside where the line enters the container. In the latter case, installation shall be made in such a manner that any undue strain, beyond the excess flow or back pressure check valve, will not cause breakage between the container and the valve.

10. Each filling connection or valve shall be fitted with one of the following:

a. Combination back-pressure check valve and excess flow valve;

b. One double or two single back-pressure check valves; or

c. A positive shutoff valve, in conjunction with either:

(i) An internal back-pressure valve, or

(ii) An internal excess flow valve.

11. Excess flow valves shall be designed with by-pass, not to exceed a No. 60 drill size opening to allow equalization of pressures.

G. Piping, Tubing and Fittings

1. All fittings where subjected to container pressure, shall be made of materials specified for use with Anhydrous Ammonia as described herein and designed for a minimum working pressure of not less than 250 psig. No cast iron bushings, plugs or pipe fittings shall be allowed.

2. Galvanized pipe shall not be used. Black steel or iron pipe, (Schedule 40), may be used provided pipe joints are welded or joined by means of welding type flanges. Screwed joints are permissible only with extra heavy (Schedule 80) pipe. Pipe joint compounds shall be resistant to ammonia.

3. All pipe lines shall be installed as nearly as possible in a straight line with a minimum amount of pipe, and shall not be restricted by an excessive amount of elbows and bends. Where nipples are used, they shall be of extra heavy seamless type.

4. Flexible connections with a bursting pressure of not less than 1750 psig shall be used for a permanent installation. Other type flexible connections may be used for temporary installation. Provisions shall be made for expansion, contraction, jarring, vibration and settling.

5. Adequate provisions shall be made to protect all exposed piping from physical damage that might result from moving machinery, automobiles or trucks, or any other undue strain that might be placed upon the piping.

6. After assembly, all piping and tubing shall be tested and proved to be free from leaks at a pressure not less than the normal operating pressure of the system, or at 150 psig, whichever is greater. All containers shall be purged of air on initial filling.

H. Hose Specifications

1. Hose and hose connectors shall be fabricated of materials that are resistant of the action of anhydrous ammonia.

2. Hose subject to container pressure shall be designed for a minimum bursting pressure of 1750 psig. Hose assemblies, when made up, shall be capable of withstanding a test pressure of not less than 500 psig.

3. Hose and hose connections located on the low-pressure side of flow control or pressure reducing valves or devices shall be designed for a minimum bursting pressure of 125 psig. All connections shall be designed, constructed and installed so that there will be no leakage when connected.

4. Where hose is to be used for transferring liquid, wet hose is recommended. Such hose shall be equipped with an approved shutoff valve at the discharge end. A safety relief valve shall be installed between the hand shutoff valves as near the containers as possible. The start-to-discharge pressure of such relief valve shall not be less than 240 psig and not in excess of 312 psig.

5. On all hose one-half (1/2) inch I.D. and larger, used for the transfer of Anhydrous Ammonia liquid or vapor, there shall be etched, cast or impressed on the hose at 5-foot intervals or on a nameplate permanently attached thereto, the following information:

“Anhydrous Ammonia”
Bursting Pressure
Manufacturer’s Name or Trademark
Year of Manufacture

I. Safety Devices

1. Every container used for Anhydrous Ammonia shall be provided with one or more safety relief valves of spring-loaded type. The discharge from safety relief valves shall be directed away from the container upward and unobstructed to the open air. The rate of discharge shall be in accordance with the provisions of the Flow Chart in this Rule, Rule 010.01.023(P)

2. Container safety relief valves shall be set to start-to-discharge as follows, with the relation to the design pressure of the container:

<u>Containers</u>	<u>Minimum</u>	<u>Maximum</u>
<u>ASME 1949</u> <u>or earlier Edition</u>	100%	125%
<u>ASME 1959</u> <u>or earlier Edition</u>	80%	100%

3. Safety relief valves used on containers or systems as outlined in these regulations shall be constructed to discharge at the rates required in the above paragraph. The design of these valves must insure such discharge before the pressure exceeds 120 percent of the maximum start-to-discharge pressure setting.

4. Safety relief valves shall be so arranged that the possibility of tampering will be minimized. If the pressure setting adjustment is external, the relief valves shall be provided with approved means for sealing the adjustment. Shutoff valves shall not be installed between the safety relief valves and the container.

5. Each safety relief valve shall be plainly and permanently marked as follows:

a. With the letters "AA";

b. The pressure in pounds per square inch gauge (psig) at which the valve is set to start-to-discharge;

c. The rate of discharge of the valve at its full open position in cubic feet per minute of air at 60° F and atmospheric pressure; and

d. The manufacturer's name and catalog number. For example, a safety relief valve marked AA-250-4050 (air) would mean that this valve is suitable for use on an Anhydrous Ammonia container; that it is set to start-to-discharge at 250 psig; and that its rate of discharge at full open position is 4050 cubic feet per minute of air.

6. Connections such as couplings, flanges, nozzles and discharge lines for venting, to which relief valves are attached shall have internal dimensions of sufficient size to avoid any restrictions of flow through the relief valves.

7. A safety relief valve, venting to atmosphere as a safe location, shall be installed between each pair of shutoff valves in an ammonia line where liquid may be trapped. The start-to-discharge pressure of such relief valves shall not be less than 240 psig, and not in excess of 300 psig. Discharge from safety relief devices shall not terminate in or beneath any building.

8. Any type fitting or hose that proves to be unsatisfactory and does not function in a safe and proper manner shall be condemned and the further use of such hose or fitting shall be prohibited.

J. Transfer of Liquids

1. At least one attendant shall supervise the transfer of liquids from the time the connections are first made until they are finally disconnected.

2. Containers shall be filled or used only upon authorization of owner. Containers shall be gauged and charged only in the open air or in buildings especially provided for that purpose.

3. Pumps used for transferring ammonia shall be recommended and labeled for ammonia service by the manufacturer.

4. Liquid pumps may be of piston, rotary, centrifugal or regenerative type, designed for not less than 250 psig working pressure.

5. Positive displacement pumps shall have, installed off the discharge port, a constant differential relief valve discharging through a line of sufficient size to carry the full capacity of the pump at relief valve setting. This setting and installation shall be according to pump manufacturer's recommendation.

6. On the discharge side of the pump, before the relief valve line, there shall be installed a pressure gauge graduated from 0 to 400 psi.

7. Centrifugal or regenerative pumps do not require a bypass relief valve, but the installation shall incorporate a line from the discharge side of the pump to the vapor space of the supplying tank and in this line, at accessible level, must be installed a shutoff valve.

8. Shutoff valves shall be installed within three feet of the inlet of the pump and within two feet of the discharge.

9. Compressors used for transferring and refrigerating ammonia shall be recommended and labeled for ammonia service by the manufacturer.

10. Compressors may be of reciprocating or rotary type designed for not less than 250 psig working pressure.

11. Plant piping shall contain shutoff valves located as close as practicable to compressor connections.

12. A relief valve large enough to discharge the full capacity of the compressor shall be connected to the discharge before any shutoff valve. The discharging pressure of this valve shall not exceed 300 psig.

13. Compressors shall have pressure gauges graduated from 0 to 400 psig as suction discharge.

14. Adequate means, such as a drainable liquid trap, shall be provided on the compressor suction to minimize the entry of liquid into the compressor.

15. The pipe line to which the loading or unloading hoses are connected shall be equipped with a backflow check valve or excess flow check valve to prevent discharge of ammonia from the containers and the line in case of hose or fitting failure.

K. Liquid Level Gauging Devices

1. Each container, except containers covered by U. S. Department of Transportation Regulations, shall be equipped with a liquid level gauging device of approved design.

2. All gauging devices shall be arranged so that the maximum liquid level to which the container may be filled is readily determinable.

3. Gauging devices that require bleeding of the product to the atmosphere, such as the rotary tube, fixed tube and slip tube, shall be so designed that the bleed valve maximum opening is not larger than a No. 54 drill size, unless provided with an excess flow valve. (EXCEPTION - Applicator tank may have bleed valve not more than 5/16-inch in diameter).

4. Gauging devices shall have a design working pressure of at least 250 psig.

5. Fixed liquid level gauges shall be so designed that the maximum volume of the container filled by liquid shall not exceed 85 percent of its water capacity. The coupling into which the fixed liquid level gauge is threaded must be placed at the 85 percent level of the container. If located elsewhere, the dip tube of this gauge must be installed in such a manner that it cannot be readily removed.

6. Gauge glasses of the columnar type shall be restricted to bulk storage installations. They shall be equipped with valves having metallic handwheels, with excess flow valves, and with extra heavy glass adequately protected with a metal housing applied by the gauge manufacturer. They shall be shielded against the direct rays of the sun.

L. Bulk Storage

1. The following apply to location, assembling, painting and protection of bulk storage plants. No storage container shall exceed 30,000 water gallon capacity; nor shall any Anhydrous Ammonia container be buried underground. Before any storage container may be installed, the location must be checked and approved by a representative of the Boiler Inspection Division. Bulk storage containers should be equipped with approved type manifold safety relief valves.

2. Containers used for the storage of anhydrous ammonia shall be located not less than fifty (50) feet from nearest important building or group of buildings or line of adjoining property which may be built on. They shall be located not less than fifty (50) feet from main line or passing track of a railroad or public highway. Waiver of this requirement may be made by the Chief Boiler Inspector providing no undue hazards exist, but in no case shall they be located closer than twenty-five (25) feet, and in no case shall they be located closer than four hundred (400) feet from any school, hospital, church or other place of public assembly.

3. Permits for the installation of any storage container must be obtained before installations are made.

4. Storage containers shall be provided with substantial reinforced concrete footings and foundations, or structural steel supports mounted on reinforced concrete foundations. In either case, the reinforced concrete foundations must be below the established frost line, and in no case less than twenty-four (24) inches below the ground level, and shall be of sufficient width and thickness to support adequately the total weight of the container and contents. Every container shall be mounted on saddles in such a manner as to permit expansion and contraction, and shall be so supported to prevent the concentration of excessive loads on the supporting portion of the shell. Suitable means of preventing corrosion shall be provided on that portion of the container in contact with the foundation or saddles. There shall be a resilient cushion of road expansion, or other suitable material, with a thickness of not less than one-half (1/2) inch placed between the saddle and tank to allow for minor imperfections in pier surface to protect the tank from corrosion and to act as a lubricant in tank

expansion. That portion of the tank surface that is to be in contact with the pier, or saddle, shall be painted with at least two (2) coats of approved primer, before installing on the supports. Blueprints or approved-type footings and foundations may be obtained from the Department upon request.

5. Containers shall be equipped with the necessary fittings and piping as outlined herein, (Exception - Installation of 15 percent outage gauge not required). The safety relief valve shall discharge upward and away from the container. Loose-fitting rain caps shall be used. If riser pipes are used they shall not be attached to the shell by the use of clip angles or brackets; or they may be supported by the use of guy wires. Any method of attaching risers to relief valves that does not induce any undue stress to the relief valve itself will be acceptable to the Department. Size of discharge lines from safety relief valves shall not be smaller than the normal size of the relief valve outlet connection. Suitable provision shall be made for draining condensate which may accumulate in the discharge pipe. The vapor return valve on all storage containers exceeding 1200 water-gallon capacity shall be not less than one and one-fourth (1 ¼) inches standard pipe size. Each container shall be effectively grounded. Stop valves, where required, shall be installed as near the outlet opening in the container as possible. Piping from the excess flow check valves shall not be reduced in size. Any portion of the piping between the tank and the pump inlet which at any time may be closed at both ends shall be provided with a relief valve to prevent excessive pressure developing in the hose or piping.

6. Containers shall be painted at the time of installation with a light colored, heat-reflective paint, equivalent to white or aluminum paint, and shall have the words "DANGER - AMMONIA" or "CAUTION - AMMONIA" painted on both sides and heads in red letters at least six (6) inches in height. The owner's name and address and owners number shall be painted on at least one side of the container in letters not less than two (2) inches in height. Containers shall be protected or enclosed by a steel or wire fence, or provisions shall be made for locking the service line valves at the container. Where a steel or wire fence is used there shall be two (2) means of exit, located preferably at the front and rear of the fence. Such exits shall be of a size that will easily and quickly admit one or more persons. The premises around the container shall be maintained in good order. Combustible material of any type shall not be allowed to accumulate near the container.

7. Provisions shall be made at bulk storage tanks to have the following articles available for use and protection of employees; goggles, rubber gloves and rubberized aprons or slickers. There shall also be available an ample supply of clean water located so that in the event leaks should occur in the piping or containers, the water facilities will not be rendered inoperative.

8. Railway tank cars shall not be considered as bulk storage, and the transferring of anhydrous ammonia from railway tank cars to truck or trailer units is prohibited. Trailer units shall be filled at designated bulk storage plants constructed and equipped as outlined herein.

M. Farm Trailers

1. The following applies to the construction, assembly and painting of tanks mounted on four-wheeled trailers of the farm type used in transporting ammonia from bulk storage plants to the farm, commonly called farm trailers. Such tanks shall not exceed one thousand two hundred (1200) water-gallon capacity.

2. Blueprints of the design, showing location of fittings and method of protection of the fittings shall be submitted to the Boiler Inspection Division for approval before vessels are fabricated for shipment into the state.

3. Farm trailer tanks shall be equipped with the necessary fittings as outlined herein. Fittings installed in the top portion of the shell shall be located in the center of the container and shall be adequately protected from physical damage by means of a rigid guard securely fastened to the container. The guard shall be so designed as to give a rolling effect to the container in the event the trailer overturns. The guard shall also be designed to give a skid effect in the event the trailer overturns and continues to move forward. Fittings installed in the rear head of the container shall be protected with a permanent fixture without hinges of a material the same tensile strength as the container itself, and a thickness of not less than three-eighths (3/8) inch. The safety relief valves shall have direct communication with the vapor space of the container and shall be protected from rain and snow with a loose-fitting covering.

4. Dip tubes shall be provided for the safety valve, vapor valve, filler valve, vapor gauge and 15 percent outage gauge. They shall consist of heavy duty piping curved or bent without cutting and welding. Dip tubes for safety valves, vapor valves and vapor gauge shall extend up into the vapor space of the container not less than three-fourths (3/4) inch from top of container. The dip tube for the outage gauge shall extend up to a point in the container which will indicate the presence of liquid when the container is not more than eighty-five (85) percent full. Dip tubes for filler valves shall extend to within not less than three-fourths (3/4) inch from the bottom of the container. All dip tubes shall be screwed directly into the coupling not less than five (5) full threads and seal-welded. They shall also be firmly anchored at point of termination with a bracket and clamp. Provision shall be made for the expansion or contraction of the bracket or clamp in the event of any out-of-roundness of shell plate.

5. All containers shall be equipped with suitable baffle plates which will eliminate the surging of the liquid in the container when the trailer is in motion and when making sudden stops. Baffle plates shall be attached in such a manner as to allow for any expansion or contraction of shell plates under internal pressure due to any out-of-roundness.

6. Four-wheeled trailers shall be of a type construction which will prevent the towed vehicle from whipping or swerving from side to side in a dangerous or unreasonable manner but will enable it to follow substantially in the path of the towing vehicle.

7. All trailers shall be firmly and securely attached to the vehicle drawing them by means of drawbars of the pintle hook type, equipped with a positive locking device which will prevent separation of the two units, and supplemented by suitable safety chains.

8. All trailers shall be equipped with axle and wheel assemblies of sufficient size to support the weight of the container and contents adequately and safely when loaded to capacity.

9. All containers shall be mounted on trailers in such a manner that the bottom of the container will be as close to the ground level as possible, but in no case shall they be over 36 inches above ground level.

10. Containers shall be painted with a light-colored, heat-reflective paint, equivalent to white or aluminum paint, and shall have painted on the sides and rear head the words "DANGER - AMMONIA" or "CAUTION - AMMONIA" in red letters at least six (6) inches in height.

11. The owner's name and address and owner's number shall be painted on at least one side of the container in letters not less than two inches in height.

12. Containers used for the storage or transportation of Anhydrous Ammonia shall not be used for any other purpose. The filling of containers of this type with liquefied petroleum gases is strictly forbidden.

N. Dispensing Units

All containers mounted on tractors used for dispensing Anhydrous Ammonia shall be equipped to comply with the regulations as described in “Container Valves and Accessories” (page 148), with the exception of the requirement for the excess flow check valve in the liquid outlet and the vapor return valve. Containers used for dispensing purposes shall not exceed 250 water-gallon capacity.

FLOW CHART

Minimum required rate of discharge in cubic feet per minute of air at 120 percent of the maximum permitted start-to-discharge pressure for safety relief valves to be used on Anhydrous Ammonia containers.

<u>Surface Area</u> <u>Sq. Ft</u>	<u>Flow Rate</u> <u>C.F.M. Air</u>	<u>Surface Area</u> <u>Sq. Ft</u>	<u>Flow Rate</u> <u>C.F.M. Air</u>	<u>Surface</u> <u>Area</u> <u>Sq. Ft</u>	<u>Flow Rate</u> <u>C.F.M. Air</u>
20	258	185	1600	900	5850
25	310	190	1640	950	6120
30	360	195	1670	1000	6380
35	408	200	1710	1050	6640
40	455	210	1780	1100	6900
45	501	220	1850	1150	7160
50	547	230	1920	1200	7410
55	591	240	1980	1250	7660
60	635	250	2050	1300	7910
65	678	260	2120	1350	8160
70	720	270	2180	1400	8410
75	762	280	2250	1450	8650
80	804	290	2320	1500	8900
85	845	300	2380	1550	9140
90	885	310	2450	1600	9380
95	925	320	2510	1650	9620
100	965	330	2570	1700	9860
105	1010	340	2640	1750	10090
110	1050	350	2700	1800	10330
115	1090	360	2760	1850	10560
120	1120	370	2830	1900	10800
125	1160	380	2890	1950	11030
130	1200	390	2950	2000	11260
135	1240	400	3010	2050	11490
140	1280	450	3320	2100	11720
145	1310	500	3620	2150	11950
150	1350	550	3910	2200	12180
155	1390	600	4200	2250	12400
160	1420	650	4480	2300	12630
165	1460	700	4760	2350	12850
170	1500	750	5040	2400	13080
175	1530	800	5300	2450	13300
180	1570	850	5590	2500	13520

Surface Area = Total outside surface area of container in square feet. When the surface area is not stamped on the nameplate or when the marking is not legible, the area can be calculated by using one of the following formulas:

1. Cylindrical container with hemispherical heads: Area = overall length in feet X outside diameter in feet X 3.1416.

2. Cylindrical container with semi-ellipsoidal heads: Area = (Overall length in feet + 0.3 outside diameter in feet) X outside diameter in feet X 3.1416.

3. Spherical containers: Area = Outside diameter in feet square X 3.1416.

Flow Rate - C.F.M. Air = Cubic feet per minute of air required at standard conditions, 60 °F and atmospheric pressure (14.7 PSIA)

The rate of discharge may be interpolated for intermediate values of surface area.

010.01-024 Pressure Piping

A. General Provisions

The requirements of this chapter refer only to system piping connecting to the external limits shown by

ASME Code in pressure vessels and boilers. ASME B31.1, as adopted, is the accepted code which prescribes the minimum requirements for the designing materials, erection, test, and inspection of power and auxiliary service piping systems for electric generation stations, industrial and institutional plants, central and district heating plants, and district heating systems.

B. Definitions

For the purpose of this Rule, the terms listed below shall be construed to have the following meanings:

1. “New installation” means the fabrication and installation of any steam or hot water pressure piping that did not previously exist and is to be connected to a boiler or pressure vessel. This shall also apply to a previously existing system which relocated from one location to another such as from one building to another or from one plant to another. This chapter does not apply to repair or modifications of existing piping.

2. “Pressure Piping” means any power piping system, both steam and hot water, and their component parts within or forming a part of the pressure piping system connected to the boiler external piping system of any boiler covered by the provisions of the Boiler and Pressure Vessel Law, A.C.A. §20-23-102 et seq. This includes only boiler external piping for power boilers and high temperature, high-pressure water boilers in which:

- a. Steam or vapor is generated at a pressure of more than 15 psig; and
- b. High temperature is generated at pressures exceeding 160 psig; and/or

c. Temperatures exceeding 250°F (120°C). The boiler external piping shall be considered as that piping which begins where the boiler proper terminates at:

(i) the first circumferential joint for welding and end connections; or

(ii) the face of the first flange in bolted flanged connections; or

(iii) the first threaded joint in that type of connection; and which extends up to and including the valve or valves required by Code for Pressure Piping Para 122.1 of ASME B31.1, as adopted. The terminal points themselves are considered part of the boiler external piping.

3. “PSIG” means pounds per square inch gauge pressure.

C. Qualifications and License

All persons, firms, or corporations engaged in the fabrication or installation of pressure piping must be licensed by the Boiler Inspection Division prior to performing the work as required by Ark. Code Ann. 20-23-405 and Rule 010.01.008. The pressure piping license shall consist of an endorsement to a valid license issued by the Boiler Inspection Division. There will be no additional fee for the endorsement.

D. Installation Permit

Prior to the installation or the movement of pressure piping a permit must be obtained from the Boiler

Inspection Division. One application is required for each installation regardless of the size of the installation. The fee for the permit shall be One Hundred Dollars (\$100.00).

E. Inspections

All examinations, inspections, and testing shall be performed in accordance with ASME B31.1, as adopted, with regard to frequency and manner. The owner shall be responsible for all examinations and inspections whether or not the owner performs the examinations and inspections himself. The examinations and inspections shall be performed by an authorized inspector. Verification must be reported to the Boiler Inspection Division after the work is completed and prior to the installation becoming operational.

010.01-025 Owner – User Program

A. Owner/User Certification

Any owner of a boiler or pressure vessel who also uses and operates the boiler or vessel (Owner/User) may apply for certification under this Rule, Rule 010.01.025. Upon receiving an Owner/User certification from the Boiler Inspection Division of the Arkansas Department of Labor, an Owner/User of a boiler or pressure vessel may perform any inspection required by Ark. Code Ann. §§ 20-23-101 *et seq.* and these Rules on such vessels owned and operated by them, with the exception of the initial installation inspection. The Owner/User must first meet the requirements prescribed by this Rule.

B. Inspectors

An Owner/User must employ boiler inspectors holding a valid Owner/User commission issued by the National Board of Boiler and Pressure Vessel Inspectors.

C. Certification By The National Board Of Boiler And Pressure Vessel Inspectors Required

1. Before receiving certification by the Arkansas Boiler Inspection Division, an Owner/User must first receive an Owner/User certification from the National Board of Boiler and Pressure Vessel Inspectors.

2. Subsequent to certification from the National Board of Boiler and Pressure Vessel Inspectors, the Arkansas Boiler Inspection Division shall inspect all boilers to be covered under the Owner/User program and shall conduct an on site review of the owner/user program before issuing a certification under this Rule, Rule 010.01.025.

3. The Arkansas Boiler Inspection Division may audit the Owner/User's quality system at any time for just cause or upon request of the Owner/User or the National Board of Boiler and Pressure Vessel Inspectors.

4. The National Board Inspection Code Committee may at any time change the rules for the issuance of Owner/User Certificates. All Owners/Users holding operating certificates from the Boiler Inspection Division must adhere to the most current rules.

D. General Requirements

1. An Owner/User holding a certificate issued by the National Board Inspection Code Committee and certification under this chapter may perform in-service inspections and certification of pressure retaining items owned/operated by them if such inspections are within the scope of the owner/user program as outlined in the Owner/User's quality control manual. However, the initial inspection upon any pressure retaining vessel shall be performed by the Arkansas Boiler Inspection Division.

2. A certified Owner/User may perform authorized, in-process and acceptance inspections (including signing the National Board Inspection Code report forms) associated with repairs and alterations of pressure retaining items owned and operated by the Owner/User. This includes repairs and alterations performed by an owner or user holding an "R" Certificate or by other "R" Certificate holders performing work on pressure retaining items owned/operated by the Owner/User. A description of the process for performing these inspections must be included in the Quality System written program and included with the application for certification by the Arkansas Boiler Inspection Division.

3. All welded repairs and/or alterations shall be documented on appropriate forms and distributed to the Arkansas Boiler Division. All repairs or alterations shall be made to the original code of construction; if this is not possible or practical, the National Board Inspection Code, as adopted, shall be followed.

4. The Owner/User must maintain on the premises where the pressure vessel is located a current edition and any addendums of the National Board Inspection Code, the Arkansas laws, rules and regulations governing boiler and pressure vessel inspection and the appropriate sections of the American Society of Mechanical Engineers Code ("ASME").

E. Operations Requirements

1. Owner/Users certified by the Arkansas Boiler Inspection Division pursuant to this Chapter must possess a National Board "R" stamp before making welded repairs or alterations.

2. A copy of any form required for a welded repair or alteration by the National Board of Boiler Inspectors shall be provided to the Arkansas Boiler Inspection Division.

3. It shall be the responsibility of the Owner/User to ensure all required applications to install pressure retaining items or pressure piping or other installation permits and license requirements are met, prior to starting any work.

4. The Boiler Division shall be notified and a report filed when objects that require licensing or operating certificates are removed from service.

5. Inspection of objects requiring operating certificates shall be conducted within sixty (60) days of the due date.

6. The Boiler Division reserves the right to inspect objects that are overdue more than sixty (60) days.

7. Boilers must be inspected internally and externally at least once each year. The inspection should be made during the same calendar month each year if possible.

8. Unfired pressure vessels shall be inspected biennially, externally and internally where conditions permit.

9. The inspector employed by the Owner/User and commissioned by the National Board and the Arkansas Boiler Division is expected and required by law to shutdown equipment that is determined to be a public hazard. The Boiler Division and Chief Inspector shall be advised should this be necessary.

10. Explosions and accidents must be reported to the Boiler Division within 24 hours of any occurrence, **EXCEPT** that any explosion or accident that involves loss of life or serious injury shall be reported **IMMEDIATELY**. An investigation report shall be filed with the Boiler Division. The Director of the Department of Labor and the Chief Inspector shall be kept informed of the status and all changes.

11. Equipment that has been shutdown because it is a public hazard, will not be returned to service until repairs have been satisfactorily made, the equipment is no longer deemed to be a hazard, and the Boiler Division has been informed of the nature and extent of repairs.

12. Explosions and accidents shall be reported immediately if possible or as soon as practicable, especially those which involve loss of life or serious injury.

13. New or used objects to be installed require proper identification. A data report for each object shall be forwarded to the Boiler Division office when requesting an installation permit.

14. The Arkansas Boiler Division will complete the first inspection upon new and newly installed objects, unless an Arkansas "AR" number has already been assigned to the object. The Owner/User should contact the Boiler Division with all appropriate data and request an installation permit. Upon receipt of the request for an installation permit, a state inspection will be scheduled. Each object installed which comes under the law, and is not already registered with the Boiler Division, shall have a metal tag with identifying numbers preceded by "AR" attached to it.

15. All boilers and pressure vessels installed or to be installed in any location within the State of Arkansas shall be constructed to a code that has been adopted by or is acceptable to the Chief Boiler Inspector and the Boiler Division. They shall also be registered with the National Board of Boiler and Pressure Vessels.

16. All new and used boilers and pressure vessels installed or to be installed within the State of Arkansas shall be properly identified. Application for installation of said vessels shall be accompanied by a manufacturer's data report that verifies its construction.

17. All installations of new or used vessels may only be performed by installers licensed by the Boiler Division pursuant to Arkansas Code 20-23-401, and the Owner/User must also comply with Arkansas Code Annotated 20-23-307; 20-23-308; 20-23-309.

18. All new and used objects to be installed shall be properly identified. Each object shall

have a legible nameplate installed; this nameplate data shall be furnished to the Boiler Division with the request for installation permit.

19. Should this Rule not cover needed areas of inspection, repairs, or other information which may be required, refer to other applicable Rules herein.

F. Fees

The following fees for review by the Arkansas Boiler Inspection Division shall be paid before any Owner/User self-inspection program will be recognized and issued a certificate by the Arkansas Boiler Division:

1. A full day review: \$440.00

2. A half day review: \$220.00

3. Expenses shall be charged including mileage, meals and lodging not to exceed the rate authorized by the General Assembly to employees of state agencies.

G. Revocation

1. A certificate received pursuant to this Rule will be automatically revoked if, for any reason, the Owner/User's certification by the National Board of Boiler Inspectors is revoked.

2. If periodic inspections of pressure retaining vessels are not performed in a timely manner, the Owner/User may be subject to revocation of the license issued by the Arkansas Boiler Division.

010.01-026 Technical Definitions

A

absolute pressure. The sum of gauge pressure and atmospheric pressure.

accessory. Piece of equipment not directly attached to the boiler but necessary for its operation.

accumulation test. Test used to establish the relieving capacity of boiler safety valves.

air cock. See boiler vent

air ejector. Steam-driven device that removes air and other noncondensable gases from the condenser, thus maintaining a higher vacuum.

air flow switch. Proves that primary air is supplied to the burner.

air to fuel ratio. Amount of air and fuel supplied to the burner over high and low fire.

air heater. Supplies heated air for combustion. Located in the breeching between the boiler and chimney.

ambient temperature. Temperature of the surrounding air.

alkalinity. Determined by boiler water analysis. Boiler water with a PH over 7 is considered alkaline.

anthracite coal. Hard coal that has a high fixed carbon content.

ash hopper. Large receptacle used to store ashes until they can be disposed of.

ASME code. Code written by the American Society of Mechanical Engineers that controls the construction, repairs and operation of boilers, unfired pressure vessels, and their related equipment.

atmospheric pressure. Pressure at sea level (14.7 psi).

atomize. To break up liquid into a fine mist.

automatic nonreturn valve. Valve located on the steam line closest to the shell of the boiler that cuts the boiler in on the line and off-line automatically. This valve also protects the system in the event of a large steam leak on any boiler.

auxiliaries. Equipment necessary for the operation of a boiler.

B

baffles. Direct the path of the gases of combustion so that the maximum heat will be absorbed by the water before the gases of combustion enter the breeching and chimney.

balanced draft. When the intake damper is automatically controlled by the pressure in the furnace. Furnace pressure is maintained slightly below atmospheric pressure.

bent-tube boiler. A water tube boiler with more than one drum in which the tubes connect the drums.

bituminous coal. Soft coal that has a high volatile content.

blowdown tank. Coded tank vented to the atmosphere that protects sewer lines from boiler pressure and high temperature when blowing down.

blowdown valves. Found on the boiler blowdown line at the lowest part of the water side of the boiler.

boiler capacity. Pounds of steam per hour that a steam boiler is capable of producing.

boiler explosion. Caused by a sudden drop in pressure (failure on the steam side) without a corresponding drop in temperature.

boiler horsepower. The evaporation of 34.5 pounds of water per hour from and at a feedwater temperature of 212°F.

boiler lay-up. Removing a boiler from service for an extended period of time. A boiler can be laid up wet or dry.

boiler operator. A person who has successfully completed the boiler operator's examination and been issued a boiler operator license from the Boiler Inspection Division.

boiler room. Any building, enclosed room, or space within a building other than residential dwelling, intended by design or by usage to contain a boiler which is connected and available for use.

boiler room log. A data sheet used to record pressures, temperatures and other operating conditions of a boiler on a continuous basis.

boiler shutdown. A sequence of operations completed when taking a boiler off-line.

boiler start-up. A sequence of operations completed when preparing a steam boiler for service.

boiler tubes. Used to carry water or heat and gases of combustion. May be straight or bent tubes.

boiler vent. Line coming off the highest part of steam side of the boiler that is used to vent air from the boiler when filling with water and when warming the boiler. Also used to prevent a vacuum from forming when taking the boiler off-line. Also known as air cock.

boiler external piping. Includes all piping from the boiler proper up to and including the second stop valve and the free-blow drain valve.

boilers in battery. Two or more boilers connected to a common steam header.

Bourdon tube. Connected by linkage to a pointer that registers pressure inside pressure gauges.

box header. Requires staybolts to prevent the headers from bulging. Found on older water tube boilers.

breeching. Duct connecting boiler to chimney.

British thermal unit (BTU). A measurement of the quantity of heat. The quantity of heat necessary to heat one pound of water to 1°F.

burning in suspension. Combustion of a fuel when burned in air without support.

butterfly valve. A balanced valve used to control gas flow to gas-fired boilers.
bypass damper. Controls the air temperature in air heaters to prevent corrosion.
bypass line. A pipeline that passes around a control, heater or steam trap. Used so that a plant can operate while equipment is serviced or repaired.

C

calibrate. Adjusting a pressure gauge to conform to a test gauge.
carryover. Particles of water that flow with the steam into the main steam line.
caustic embrittlement. The collection of high alkaline material that leads to breakdown and weakening of boiler metal.
centrifugal force. Force caused by a rotating impeller that builds up in a centrifugal pump.
centrifugal pump. Works on the principle of centrifugal force that is converted into pressure.
chain (traveling) grate stoker. A cross-feed stoker that is used with larger capacity boilers because of its ability to feed coal at a faster rate than other stokers.
check valve. Automatic valve that controls the flow of a liquid in one direction.
chemical compound. Formed when two or more chemical elements combine into a new substance.
chemical concentration. The amount of a specific chemical in the boiler water.
chemical energy. Energy in the fuel that converts to heat energy during the combustion process.
chimney. Used to create draft. Also an outlet to the atmosphere for the gases of combustion.
coal bunker. An overhead bin where large quantities of coal are stored.
coal conveyor. Mechanism on a stoker that moves coal to the coal scale.
coal feeder. Controls the flow of coal entering the pulverizer.
coal gate. Used to control the depth of coal entering the boiler furnace on chain grate stokers.
coal ram. Distributes coal evenly into the center retort on underfeed stokers and forces the coal up to the top where it is burned.
coal scale. Measures and records the amount of coal fed to stoker-fired or pulverized coal fired boilers.
combustible material. Any material that burns when it is exposed to oxygen and heat.
combustion. The rapid union of oxygen with an element or compound that results in the release of heat.
combustion control. Regulates the air to fuel ratio supplied to the burner.
complete combustion. The burning of all supplied fuel using the minimum amount of excess air.
compressive stress. Occurs when two forces of equal intensity act from opposite directions, pushing toward the center of an object. Fire tubes in a fire tube boiler are subjected to compressive stress.
condensate. Steam that has lost its heat and has returned to water.
condensate pump. Used to return condensed steam to the open feedwater heater.
condensate tank. Where condensed steam (water) is stored before it is delivered back to the open feedwater heater by the condensate pump.
condense. Process whereby steam turns back to water after the removal of heat.
conduction. A method of heat transfer in which heat moves from molecule to molecule.
conductivity. A measure of the ability of electrons to flow through a solution.
constant attendance. Boiler operator must be stationed at the boiler with no other significant job duties.
continuous blowdown. Used to control chemical concentrations and total dissolved solids in the boiler water.
convection. A method of heat transfer that occurs as heat moves through a fluid.
convection superheater. Located in a boiler and receives heat from convection currents.
counterflow. Principle used in heat exchangers where the medium being heated flows in one direction

and the medium supplying the heat flows in the opposite direction.

cracking open. Slowing opening a steam valve to allow pressure to equalize.

cross “T”. Used on connections on a water column for inspection of steam and water lines to ensure they are clean and clear.

cyclone separator. Separates water droplets from steam using centrifugal force and by changing direction.

D

damper. Used to control the flow of air or gases.

data plate. A plate that must be attached to a safety valve containing data required by the ASME code.

deadweight tester. Used to test a pressure gauge so that it can be recalibrated.

deaerating feedwater heater. Type of open feedwater heater equipped with a vent condenser.

desuperheating. Removing heat from superheated steam to make it suitable for process.

discharge piping. Piping attached to the outlet side of a safety valve that conveys steam to the atmosphere.

draft. The difference in pressure between two points that causes air or gases to flow.

dry pipe separator. A closed pipe perforated at the top with drain holes on the bottom that remove moisture from the steam.

duplex strainers. Remove solid particles from the fuel oil in fuel oil systems.

E

economizer. Uses the gases of combustion to heat the feedwater.

element. A basic substance consisting of atoms.

enthalpy. Total heat in the steam.

erosion. Wearing away of metal caused by wet steam.

equalizing line. Line used to warm up the main steam line and equalize the pressure around the main steam stop valve.

evaporation test. Test that checks the operation of the low water fuel cutoff.

excess air. Air more than the theoretical amount of air needed for combustion.

exhauster. Discharges a mixture of coal and warm air to the burner.

expansion bends. Installed on boiler main steam lines to allow for expansion and contraction of the lines.

external treatment. Boiler water treated before it enters the boiler to remove scale-forming salts, oxygen and noncondensable gases.

extraction steam. Steam that is extracted from a steam turbine at a controlled pressure for process.

F

factor of evaporation. A correction factor used to determine boiler horsepower.

feathering. That point when a safety valve is about to lift.

feedwater. Water that is supplied to the steam boiler.

feedwater heater. Used to heat feedwater before it enters the steam and water drum.

feedwater lines. Lines leaving the open feedwater pump and going to the boiler.

feedwater pump. Takes water from the open feedwater heater and delivers it to the boiler at the proper pressure.

feedwater regulator. Control used to maintain a NOWL that cuts down the danger of high or low

water.

feedwater treatment. Can be internal, using chemicals, or external, using water softeners. Protects boiler from scale and corrosion.

field-erected boiler. Boiler that must be erected in the field because of its size and complexity.

fire point. The temperature at which fuel oil burns continuously when exposed to an open flame.

firebox. The part of the boiler where combustion of fuel takes place.

fire tube boiler. Has heat and gases of combustion passing through tubes surrounded by water.

firing rate. Amount of fuel the burner is capable of burning in a given unit of time.

fittings. Trim found on the boiler that is used for safety, and/or efficiency.

flame failure. When the flame in the furnace goes out.

flame scanner. Device found on a boiler that proves pilot and main flame.

flareback. Flames discharging from the boiler through access doors or ports caused by delayed ignition or furnace pressure buildup.

flash economizer. A heat recovery system used to reclaim the heat from the boiler blowdown water and used in conjunction with the continuous blowdown system.

flash point. Temperature at which fuel oil, when heated, produces a vapor that flashes when exposed to an open flame.

flash steam. Created when water at a high temperature has a sudden drop in pressure.

flash tank. Used with a continuous blowdown system to recover the flash steam from the water being removed from the steam and water drum.

flat gauge glass. Type of gauge glass used for pressure over 250 psi.

flexible joint. Used to allow for expansion and contraction of steam or water lines.

flow meter. Meter used to measure the flow of steam or water in the system.

fly ash. Small particles of noncombustible material found in gases of combustion.

fly ash precipitator. An electric device that traps and holds fly ash until it is properly disposed of.

foaming. Rapid fluctuations of the boiler water level that can lead to priming or carryover. Caused by impurities on the surface of the boiler water.

forced draft. Mechanical draft produced by a fan supplying air to the furnace.

free-blowing drain. Used to remove condensate from the main steam line.

front header. Connected to the steam and water drum by downcomer nipples.

fuel oil heater. Used to heat fuel oil so it can be pumped and is at the correct temperature for burning. Can be electric or steam.

fuel oil pump. Pump that takes fuel oil from the fuel oil tank and delivers it to the burner at the proper pressure.

furnace explosion. Occurs when fuel or combustible gas build up in the fire side of the boiler.

furnace volume. Amount of space available in a furnace to complete combustion.

Fyrite analyzer®. Instrument used to measure the percentage of carbon dioxide in the gases of combustion.

G

galvanometer. Used to measure small electric currents.

gas analyzer. Used to analyze the gases of combustion to determine combustion efficiency.

gas calorimeter. Used to determine the BTU content of natural gas.

gas cock. A manual quick-closing shutoff valve.

gas leak detector. Device used to locate gas leaks in a boiler room.

gas mixing chamber. Where air and gas mix before they enter the furnace in low pressure gas burners.

gas pressure regulator. Used to supply gas to the burner at the required pressure needed for

combustion of the gas.

gases of combustion. Gases produced by the combustion process.

gate valve. Valve used on boilers as the main steam stop valve that when open offers no restriction to flow. Must be wide open or fully closed.

gauge glass blowdown valve. Valve used to remove any sludge and sediment from gauge glass lines.

gauge pressure. Pressure above atmospheric pressure that is read on a pressure gauge and is recorded as psi or psig.

globe valve. Used to take a piece of equipment out of service for maintenance. Used in conjunction with a bypass line and bypass valve.

grade. Refers to the size, heating value and ash content of coal.

grates. Where the combustion process starts in a coal-fired furnace.

H

handhole. A part found on both fire tube and water tube boilers that is removed when cleaning the water side of the boiler.

heat energy. Kinetic energy caused by molecular motion within a substance.

heat exchanger. Any piece of equipment where heat is transferred from one substance to another.

heat recovery system. Equipment that is installed to reclaim heat that is normally lost during the blowdown process.

heat transfer. Movement of heat from one substance to another that can be accomplished by radiant conduction or convection.

heating boilers. Boilers used exclusively for low pressure steam heating, hot water heating, and hot water supply.

heating surface. That part of the boiler that has heat and gases of combustion on one side and water on the other.

heating value. Expressed in BTU's per gallon or per pound. Heating value varies with the type of fuel used.

high and low water alarm. Warns the operator of high or low water. Found inside the water column.

high fire. Point of firing cycle when burner is burning the maximum amount of fuel per unit of time.

high pressure steam boiler. Boiler that operates at a steam pressure over 15 psi and over 6 boiler horsepower.

horizontal return tubular boiler. Type of fire tube boiler that consists of a drum suspended over the firebox.

hot well. A reservoir located at the bottom of a condenser where condensate collects.

huddling chamber. Part on a safety valve that increases the area of the safety valve disc, thus increasing the total upward force, causing the valve to pop open.

hydraulic coupling. Coupling between the drive element and fan or pump.

hydrogen. A basic element present in gas, coal and fuel oil.

hydrostatic pressure. Water pressure per vertical foot (.433) exerted at the base of a column of water.

hydrostatic test. Water test made on a PRI after repair work on the steam or water side or overheating of boiler metal.

I

ignition. The lightoff point of a combustible material.

ignition arch. Made of refractory material that absorbs the heat from the fire and radiates it back to the green coal.

impeller. The rotating element found in a centrifugal pump that converts centrifugal force into

pressure.

impingement (fuel oil). Fuel oil striking brickwork or the boiler heating surface that results in formation of carbon deposits and smoke.

impingement (steam). Steam that strikes the boiler heating surface, causing erosion of boiler metal.

incomplete combustion. Occurs when all the fuel is not burned, resulting in the formation of smoke and soot.

induced draft. Draft that is produced mechanically using a fan located between the boiler and the chimney.

infrared. Invisible light rays produced by the combustion process and detected by a flame scanner.

installer. A person, firm or corporation which sets up or adjusts for service any mechanical device, apparatus or pressure vessel.

insulation. Material used to cover steam, water, and fuel oil lines to cut down on radiant heat losses.

integrator. A calculating device used on differential-pressure flow meters to determine hourly or daily flow rates.

interlock. Used with burner controls to ensure proper operating sequence.

internal feedwater line. Perforated line located at the NOWL in the boiler that distributes the relatively cool feedwater over a large area to prevent thermal shock to the boiler metal.

internal furnace. Furnace that is located within the boiler and is surrounded by water in the scotch marine boiler.

internal overflow. A pipeline located in an open feedwater heater that prevents the water level from exceeding a fixed level and flooding the system.

internal treatment. The addition of chemicals directly into the boiler water to control pitting, scale and caustic embrittlement.

instrument (boiler). Device that measures, indicates, records and controls boiler room systems.

ion (zeolite) exchanger. Water softener that uses zeolite to soften water for use in the boiler.

J

jobber. One who deals as a wholesaler or one who does work by the job.

K

There are no definitions under this category.

L

lighting off. The ignition of the fuel.

lignite. Coal with a low heating value (BTU content) and a high moisture content.

lime-soda process. A process that uses lime and soda ash to soften water.

live steam. Steam that leaves the boiler directly without having its pressure reduced in process operations.

low fire. Point of firing cycle where burner is burning the minimum amount of fuel per unit of time.

low pressure steam boiler. Boilers that operate at a steam pressure of no more than 15 psi.

low water. Whenever the water level in the gauge glass is below the NOWL.

low water fuel cutoff. A device located a little below the NOWL that shuts off the boiler burner in the event of low water, preventing burning out of tubes and possible boiler explosion.

M

main header. That part of the system which connects boilers in battery and then distributes the steam to wherever it is needed.

main steam stop valve. Valve or valves found on the main steam line leaving the boiler.

makeup water. Water that must be added to the boiler to make up for leaks in the system, water that is lost through boiler blowdowns, or condensate that is dumped because of contamination.

malleable iron. Used for construction of water columns in boilers carrying a pressure between 250 psi and 350 psi.

manhole. Opening found on the steam and water side of a boiler that is used for cleaning and inspection of the boiler.

manometer. Instrument used to measure boiler draft.

manual reset valve. Used to secure the gas in the event of a low water condition or a pilot flame failure on a low pressure gas system.

master control. Unit that receives the primary signal and relays signals to individual control units.

MAWP (maximum allowable working pressure). Determined by the design and construction of the boiler in conformance with the code of construction.

mercury switch. Switch in which the movement of mercury in a capsule controls the flow of electricity in a circuit.

mica. Used to protect the flat gauge glass from the etching action of steam and water.

microprocessor. A computer acting as a flame-monitoring device that programs the burner, blower motor, ignition and fuel valves to provide for safe burner operation.

modulating motor. Receives signals from the modulating pressure control and repositions the air to fuel ratio linkage.

modulating pressure control. Located at the highest part of the steam side of the boiler and sends a signal to the modulating motor that controls firing rate.

mud drum. Lowest part of the water side of a water tube boiler.

multiple-pass boiler. Boilers that are equipped with baffles to direct the flow of the gases of combustion so that the gases make more than one pass over the heating surfaces.

N

natural draft. Caused by the difference in weight between a column of hot gases of combustion inside the chimney and a column of cold air of the same height outside the chimney.

natural gas. A combustible gas found in pockets trapped underground that consists mainly of methane.

nonadhering sludge. Residue formed in a boiler when scale-forming salts are created by adding feedwater chemicals.

noncondensable gases. Gases found in boiler makeup water (oxygen) and in condensate returns.

nonvolatile. Any substance not easily vaporized under average temperature.

NOWL (normal operating water level). Water level carried in the boiler gauge glass during normal operation (approximately one-third to one-half glass).

O

oil separator. A device that removes oil from the exhaust steam before it enters the open feedwater heater.

operating range. Range that must be set when using an ON/OFF combustion control in order to prevent extremes in firing rate.

operator. (see **boiler operator**)

orifice plate. Plate with a fixed opening that is installed in a pipeline to give a certain pressure drop

across the opening where liquid or steam is flowing.

Orsat analyzer. A flue gas analyzer that measures the percentage of carbon dioxide, oxygen and carbon monoxide in the gases of combustion.

outside stem and yoke valve (os&y). Shows by the position of the stem whether it is open or closed. Used as boiler main steam stop valves.

overfeed stoker. Air introduced over the fire to aid in complete combustion. Used mostly when burning soft coal that has a high volatile content.

P

package boiler. Comes completely assembled with its own feedwater pumps, fuel system and draft fans.

packing gland. Holds packing or seals in place on valves and pumps to minimize leakage.

perfect combustion. Burning of all the fuel with the theoretical amount of air. Can only be achieved in a laboratory.

periodic attendance. Boiler operator must inspect the boiler for proper operation every four hours to take and record any required readings. Boiler is equipped with the usual local operating and safety devices which include alarm lights and buzzers. In addition, there must be remotely actuated alarm devices to detect: (1), low water condition; (2), over pressure condition (set to operate before the safety valve operates); and (3), loss of operating boiler.

pilot. Used to ignite fuel at the proper time in a firing cycle.

pipeline heater. Electric heater attached to the fuel oil line in order to maintain proper fuel oil temperature (viscosity) for moving fuel oil.

pneumatic system. A system of control that uses air as the operating medium.

pneumercator. A fuel oil level indicating device that gives a direct reading in gallons.

popping pressure. Predetermined pressure at which a safety valve opens and remains open until the pressure drops.

pop-type safety valve. Valve with a predetermined popping pressure. Commonly found on steam boilers.

positioning controller. A control that regulates air and fuel going to a boiler furnace.

postpurge. The passing of air through a furnace after normal burner shutdown.

pour point. Lowest temperature at which fuel oil flows as a liquid.

prepurge. The passing of air through a furnace prior to lightoff.

pressure control. Attached to the highest part of the steam side of a boiler to control its operating range.

pressure gauge. Calibrated in pounds per square inch. Used to indicate various pressures in the system.

pressure-reducing governor. Used on low pressure gas burner systems to reduce the gas pressure to 0 psi.

pressure-reducing station. Where higher pressure steam is reduced in pressure for plant process.

PRI. Pressure retaining item.

primary air. Air supplied to the burner that regulates the rate of combustion.

process steam. Steam used in the plant for manufacturing purposes.

products of combustion. Gases that are formed as a fuel is burned in the furnace.

programmer. Control that puts the burner through a firing cycle.

proportioning chemical feed pump. Pump that can be adjusted to feed chemicals to a boiler over a 24-hour period.

proving pilot. Sighting the pilot through the scanner to verify that the pilot is lit.

proximate analysis. Provides information regarding moisture content, volatile matter, fixed carbon

and ash content of coal.

psi (pounds per square inch). Unit of measurement used to express the amount of pressure present in a given structure or system.

pulverizing mill. Grinds coal to the consistency of talcum powder before it is delivered to the furnace, where it burns in suspension.

pump controller. Starts and stops a feedwater pump, depending on the water level in the boiler.

purge period. Before ignition and after burner shutdown when explosive combustibles are removed.

pyrometer. High-pressure thermocouple used to measure furnace temperatures.

Q

quality of steam. Term used to express the moisture content present in saturated steam. Quality of steam effects the BTU content of the steam.

quick-closing valve. Valve that requires a one-quarter turn to be fully open or closed.

R

radiant superheater. A nest of tubes that the saturated steam passes through to acquire heat.

rank. Refers to how hard the coal is.

rate of combustion. The amount of fuel that is being burned in the furnace per unit of time.

raw water. Untreated water from wells or city water lines.

rear header. Found on straight-tube water tube boilers. Connected to front header by water tubes.

reciprocating pump. Positive-displacement pump used to pump liquids.

recorder. An instrument that records data such as pressures and temperatures over a period of time.

refractory. Brickwork used in boiler furnaces and for boiler baffles.

regular attendance. Boiler operator must inspect the boiler for proper operation and take any required readings once each hour. Boiler must be equipped with local operating and safety devices and should have local alarm lights and buzzers.

relief valve. Used to protect liquid systems from excessive pressure.

reset. Switch that must be reset manually after tripping.

retort. Space below the grates of an underfeed stoker.

Ringelmann. Chart used as a means of determining smoke density.

rivets. Fasteners used to connect steel plates.

rotometer. Variable-area flow meter that measures the flow of a fluid.

S

safety valve blowdown. Drop in pressure between popping pressure and reseating pressure (usually 2 to 8 psi below popping pressure).

safety valve capacity. Measured in pounds of steam per hour safety valves can discharge.

saturated steam. Steam at a temperature that corresponds with its pressure.

scale. Deposits caused by improper boiler water treatment.

scale-forming salts. Salts such as calcium carbonate and magnesium carbonate that when in solution tend to form a hard, brittle scale on hot surfaces.

scanner. Device that monitors the pilot and main flame of the furnace. The scanner is used to prove the pilot flame and the main flame.

school. Includes all public and private school systems, as well as public and private colleges, universities, and technical schools.

scotch marine boiler. A fire tube boiler with an internal furnace.

secondary air. Air needed to complete the combustion process.

sediment. Particles of foreign matter present in boiler water.

shear stress. Occurs when two forces of equal intensity act parallel to each other but in opposite directions.

sinuous header. Found on water tube boilers. Tubes are expanded, rolled and beaded into front and rear headers.

siphon. Protective device used between the steam and Bourdon tube in a steam pressure gauge.

slow-opening valve. Valve that requires five full turns of its handwheel to be fully open or closed.

sludge. Accumulation residue produced from impurities in water.

smoke density. Varies from clear to dark. Determined by the amount of light that passes through the smoke as it leaves the boiler.

smoke indicator. An indicating or recording device that shows the density of the smoke leaving the chimney.

solenoid valve. An electromagnetic valve positioned open or closed.

solid state. An electronic system using transistors in place of electronic tubes.

soot. Carbon deposits resulting from incomplete combustion.

soot blowers. Used to remove soot from around tubes to increase boiler efficiency. Mostly found on water tube boilers.

spalling. Hairline cracks in boiler brickwork (refractory) due to changes in furnace temperature.

spontaneous combustion. Occurs when combustible materials self-ignite.

“State Special”. A boiler or fired/unfired pressure vessel of any type or size, which carries neither the ASME symbol nor the National Board stamping, and which has been accepted by the Boiler Division and assigned an Arkansas state number.

staybolts. Bolts used in boilers to reinforce flat surfaces to prevent bulging.

steam and water drum. The pressure vessel in a steam boiler that contains both steam and water.

steam boiler. A closed pressure vessel in which water is converted to steam by the application of heat.

steambound. Condition that occurs when the temperature in the open feedwater heater gets too high and the feedwater pump cannot deliver water to the boiler.

steam separator. Device used to increase the quality of steam. Found in the steam and water drum.

steam space. The space above the water line in the steam and water drum.

steam strainer. Used before steam traps and turbine throttle valves to remove solid impurities.

steam trap. An automatic device that removes gases and condensate from steam lines and heat exchangers without the loss of steam.

steam turbine. Used to drive boiler auxiliaries or generators in large plants.

stopcock. A quick-opening or closing valve usually found on gas lines.

strip chart. Recording chart that records temperatures and pressures in the system.

suction pressure. Pressure on the liquid at the suction side of a pump.

sulfur. A combustible element found in coal and fuel oil.

superheated steam. Steam at a temperature above its corresponding pressure.

superheater. Used to increase the amount of heat in the steam.

superheater drain. Valve found on the superheater header outlet. Used to maintain flow throughout the superheater during start-up and shutdown.

super-jet safety valve. Valve set to open at a predetermined pressure.

surface blowdown valve. Used to remove impurities from the surface of the water in a steam and water drum.

surface condenser. A shell-and-tube vessel used to reduce the exhaust pressure on the outlet end of turbines or engines.

surface tension. Caused by impurities on the top of the water in the steam and water drum.

suspension sling. Used to support the drum of the HRT boiler.

synchronize. To balance out combustion controls before switching to automatic.

T

tensile stress. Occurs when two forces of equal intensity act on an object, pulling in opposite directions. Affects boiler plates and staybolts.

therm. Unit used to measure BTU content of natural gas. A therm has 100,000 BTU.

thermal efficiency. The ratio of the heat absorbed by the boiler to the heat available in the fuel per unit of time.

thermocouple. Used to measure temperatures in the system and send them back to a recording chart.

thermometer. Instrument used to measure temperature (degree of heat). Calibrated in degrees Celsius or degrees Fahrenheit.

through stays. Found on fire tube boilers (HRT and scotch marine) to keep front and rear tube sheets from bulging.

total force. Total pressure that is acting on an area, determined by diameter and pressure.

totalizer. Dial that determines hourly or daily flow rates.

try cocks. Secondary way of determining the water level.

tube brushes. Used in fire tube boilers to remove soot from inside of tubes.

tube sheet. Tubes are rolled, expanded and beaded into front and rear tube sheets of HRT and scotch marine boilers and upper and lower tube sheets of vertical fire tube boilers.

tubular gauge glass. Round gauge glass used for pressures up to and including 250 psi.

turbine stages. That part of the turbine where steam gives up its energy to the turbine blades. As the steam pressure drops, the stages (blades) become larger.

turbulence. Movement of water in the steam and water drum.

U

ultimate analysis. Used to determine the elements present in a coal sample.

ultraviolet. A form of light that is produced during combustion.

underfeed stoker. A coal-firing system that introduces the coal under the fire.

U-tube manometer. When filled with mercury, used to measure vacuum. U-tube manometers are calibrated in inches.

V

vacuum. A pressure below atmospheric pressure.

vacuum gauge. Pressure gauge used to measure pressure below the atmosphere that is calibrated in inches of mercury.

valve flow meter. Measures flow of a substance by the movement of a piston in a valve caused by resistance to flow of the substance.

vaporstat. Control with a large diaphragm that makes it highly sensitive to low pressure.

variable-area flow meter. Measures the flow of a substance by how much resistance is created by a float or piston which changes the area (size) of the flow path.

variance. A petition presented in writing to the Chief Inspector of the Boiler Inspection Division for consideration of a non-code boiler or pressure vessel to be installed and used within the State of Arkansas.

vent condenser. Removes oxygen and other noncondensable gases in a deaerating feedwater heater.

venturi. A constricting device used in pipelines to measure flow.

vertical fire tube boiler. One-pass boiler that has fire tubes in a vertical position. Vertical fire tube

boilers are classified as wet-top or dry-top.

W

warping. Bending or distortion of boiler or superheater tubes, usually caused by overheating.

water column. Reduces fluctuations of boiler water to obtain a better reading of the water level in the boiler gauge glass. Located at the NOWL.

Water column blowdown valve. Valve on the bottom of the water column used to remove sludge and sediment that might collect at the bottom of the water column.

water hammer. A banging condition that is caused by steam and water mixing in a steam line.

water softening. The removal of scale-forming salts from water.

water tube boiler. Boiler that has water in the tubes with heat and gases of combustion around the tubes.

waterwall. Vertical or horizontal tubes found in the furnace area of water tube boilers that lengthen the life of the refractory.

waterwall blowdown valve. Approved valve used to remove sludge and sediment from waterwalls and waterwall headers.

weight-type alarm whistle. Alarm whistle which signals high or low water by the gain or loss of buoyancy of weights in water within the water column.

windbox (plenum chamber). Pressurized air chamber that supplies air to a furnace.

X

There are no definitions for this category.

Y

There are no definitions for this category.

Z

zeolite. A resin material that is used in the process of softening water.

010.01-027 Repealer and Effective Date

A. All previous rules and regulations of the Boiler Safety Advisory Board and the Boiler Safety Division of the Arkansas Department of Labor are hereby repealed.

B. The effective date of these rules and regulations is the 1st day of July, 2006.