

State of Wisconsin
Department of Safety & Professional Services



Boiler Industry Days
Appleton, WI
April 24th and 25th



Boilers and Pressure Vessels

Rick Merkle
Bureau Section Chief
262-521-5065

Have you hugged your boiler today !

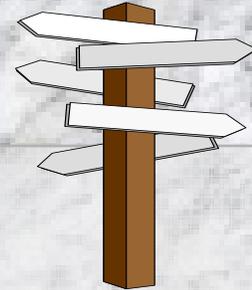


www.StrangeTravel.com

4/26/2013

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Agenda for the Day



- Boiler Safety Introduction
- Hot Water Heating Boiler Inspection and CSD-1 Requirements and Why ?
- SPS 341, Basic Boiler Requirements
- Understanding Hot Water Heating Systems
- Boiler Fittings and Appurtenances
- Inspection Aids-Checklist & Contractor Forms
- Wood Burners Quick Highlight
- Question & Answer ????



Department of Safety & Professional Services

Division of Industry Services

- Boiler Safety Section ... Responsibilities
- SPS 340, Gas Systems - LPG, LNG, CNG, H₂
- SPS 341, Boiler and Pressure Vessels
- SPS 343, Anhydrous Ammonia Storage - NH₃,
- SPS 345, Refrigeration-AC
- Structural Steel Welding - Comm Bldg
- Brochures for program areas on Website

Visit WEBSITE @ dsps.wi.gov

Boiler Inspection in Wisconsin ?

- Is Opportunity to Share Knowledge - Safety Tips
- Mutually Educates Owner, Operator & Inspector
- Code Assures Consistency for Safe Operation
- Maintains Compliance w/ Boiler Code, SPS 341, ASME codes and CSD-1
- Gets Owner / User the Required Permit to Operate
..... “PTO” for Commercial installations
 - PTO is Posted or made available on request
 - PTO Verifies Inspection to Bldg & local Fire Officials

Periodic Inspection Notification

- DSPS- Boiler Safety provides a reminder
- Computerized **Notice of Periodic Inspections Due !**
 - Notice requests owner to contact Inspector/Agency
 - Owner/Inspector arrange convenient date / time
- Required Permit to operate “PTO” is an Owner’s Responsibility
- Repair Firms may be contracted for job preparation
- In-house Maintenance may prepare boiler
- Operators / owners / contractors / **inspectors** may access, review & verify website records anytime



Wisconsin Boiler Inspectors

Complete inspection in Wisconsin

- (4) State District Inspectors
- (3) City of Milwaukee Inspectors
- (1) State contractor
- (~ 20) Insurance Inspection agencies

Total (155) Boiler Inspectors per records April 2013

Commercial Boiler Inspections

Reference codes

- **SPS 364.1001 Boilers, water heaters and pressure vessels.** Substitute the following wording for the requirements and exceptions in IMC chapter 10:
- **(1)** The provisions of ch. SPS 341 shall govern the installation, alteration and repair of boilers and pressure vessels. The provisions of chs. SPS 381 to 386 shall govern the installation, alteration and repair of water heaters.
- **SPS 364.1101 Refrigeration.** Substitute the following wording for the requirements and exceptions in IMC chapter 11: Mechanical refrigerating systems installed in public buildings and places of employment shall comply with ch. SPS 345.

Bldg Code refers one to SPS 341 or 345



Wisconsin Boiler Code

**WISCONSIN
ADMINISTRATIVE CODE**

**DEPARTMENT OF
SAFETY and PROFESSIONAL SERVICES**

Chapter SPS 341

BOILERS & PRESSURE VESSELS

**DEPARTMENT OF COMMERCE
201 W WASHINGTON AVENUE
MADISON WI 53703
608-266-3151
www.commerce.wi.gov**

SPS Chapter 341

Effective date

June 1, 2012

Includes **NEW** language for
**Inspection standards to
NBIC and CSD-1**

Types of Boiler Inspections

Internal – External - Hydrostatic Test

- **Internal Inspection** – equipment is shut-down and opened up, inspect both fire and water sides
- **External Inspection** - “equipment in operation”
- **Hydrostatic Tests** – scrape, clean fire /water sides of boiler, fill with water, pressurize and check for leaks

Note: Hot Water Heating boilers “HWH” generally receive an External Inspection



SPS 341, Boiler & PV Code

- **SPS 341.04 Definitions**
- (7) “Certified inspector” means a person who holds a valid credential issued by the department under ch. SPS 305 as a certified boiler-pressure vessel inspector or a certified in-service field inspector.
- (11) “External inspection” means an inspection made while the boiler or pressure vessel is in operation.



SPS 341, Boiler & PV Code

- **SPS 341.04 Definitions**
- **(15)** “Hot water heating boiler” means a boiler in which no steam is generated, from which hot water is circulated for heating or process purposes and then returned to the boiler, and which operates at a pressure not exceeding **160 psig** or a temperature of **250 F** at or near the boiler outlet.



SPS 341, Boiler & PV Code

- **SPS 341.04 Definitions**
- **(18)** “Internal inspection” means an inspection made when the boiler or pressure vessel is shut down and hand-holes and manholes or other inspection openings are opened or removed for inspection of the interior as required by the inspector.
- **(24)** “Owner or user” means any person, firm or corporation legally responsible for the safe operation of a boiler or pressure vessel, power piping or a solid-fuel-fired water-heating appliance.



SPS 341, Boiler & PV Code

- **SPS 341.04 Definitions**
- **(37)** “Solid fuel-fired water-heating appliance” means atmospherically vented equipment used to heat water by burning solid fuels for the purpose of providing space or process heat.

Note: UDC 323.04(4) references SPS 341.49



SPS 341, Boiler & PV Code

SPS 341.10 (2) Adoption of standards. The following standards are hereby incorporated by reference into this chapter:

- 2(a) American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, 2010 edition
- 2(e) Controls and Safety Devices for Automatically Fired Boilers, ASME CSD-1 2009 edition.
- (3) The National Board Inspection Code NBIC-ANSI/NB-23, 2011 Edition



SPS 341, Boiler & PV Code

■ SPS 341.15 General inspection requirements.

■ (1) All inspections. Certified inspectors, upon presenting appropriate credentials to the owner or user, may do any of the following:

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

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



SPS 341, Boiler & PV Code

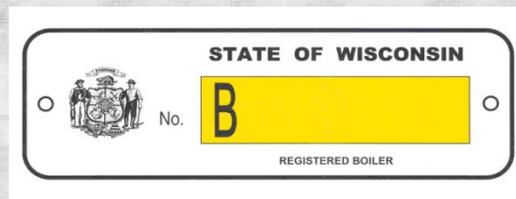
- **SPS 341.16 (1) Initial Boiler & Pressure vessel inspections.**
- (a) Except as provided in par. (b), boilers and pressure vessels shall be inspected by a certified inspector before they are placed in operation.

certified “Boiler” inspector



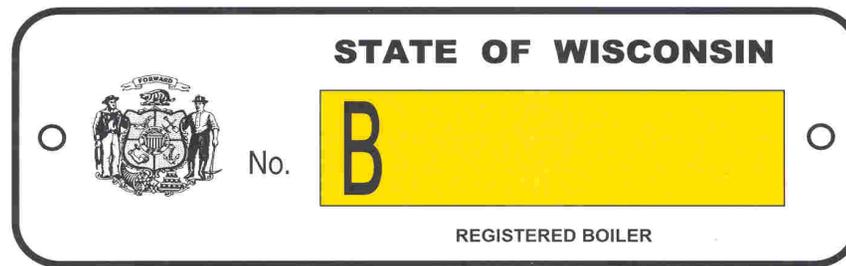
SPS 341, Boiler & PV Code

- **SPS 341.16 (1)** Initial Boiler & Pressure vessel inspections. Cont. (d) the certified inspector shall file an inspection report with the department and shall affix the Wisconsin registration number as required in s. SPS 341.36.



Wisconsin Registration Tags

- Boiler



- Unfired Pressure Vessel - UPV



“R” = Similar Tag for AC-Refrigeration

So ... How often are boilers & UPVs inspected ?



Inspection Frequency ...every 3 Years

- Hot Water Heating– HWH
 - MAWP 0-160 PSI, Max Temp 250 F
 - Requires at least **External** Inspection
- Low Pressure – Steam Heating
 - MAWP at or below 15 PSI
 - Requires at least **External** Inspection
- Pressure Vessels
 - Require at least **External** Inspection

Every 3 years / 36 months



Comm 41, Boiler & PV Code

- **SPS 341.17 (3)** Inspection of low pressure steam and **hot water heating boilers**. Except as provided in s. SPS 341.18, low pressure steam boilers and hot water heating boilers shall be subjected to a regular internal or external inspection at least once every 36 months by a certified inspector.



SPS 341, Boiler & PV Code

- **SPS 341.24 (1) Permit to operate Responsibility**
- (a) The owner or user of the boiler or pressure vessel shall be responsible for obtaining and maintaining a valid permit to operate.
- (b) The permit to operate shall be posted near the boiler or pressure vessel by the owner or user of the boiler or pressure vessel.

Next slide: Permit to Operate = “PTO ”



SPS 341, Boiler & PV Code

■ Permit to operate

STATE OF WISCONSIN DEPARTMENT OF COMMERCE		PERMIT TO OPERATE
Inspection Service Agent: Inspection Agency Name Telephone	Permit For: Boilers, 3 Year Pto Cycle - 2 Regulated Object ID No: 600141 Tag No.: B0000495 15 Psig Max Allow Working Pressure EXPIRES: 08/04/2007	
<i>This permit is to certify that the regulated object (equipment/installation) described herein meets the applicable standards of installation/operation of the Wisconsin Administrative Code, Ch. Comm 41. This may be rescinded for failure to maintain compliance with applicable codes and Statutes or failure to renew permit. Post as established by Wisconsin Administrative Rule.</i>		
ISSUED TO (owner/owner's agent) Owner name Address City WI 00000	CUST ID: 347784 FACILITY ID: 600104 Facility: Address: SITE ID: Site: Address: Location on Property: Boiler Room	Company name Address City

Building & Fire Inspectors request /check boiler.

SPS 341, Boiler & PV Code

- **SPS 341.28(3) Installation Location.**
- **(b)** Clearances shall be maintained around boilers, generators, heaters, tanks and related equipment and appliances to permit inspection, servicing, repair, replacement and visibility of all gages. When boilers are installed or replaced, clearance shall be provided to allow access for inspection, maintenance and repair. Passageways around all sides of boilers shall have an unobstructed width of not less than 18 inches unless otherwise approved by the department or authorized agent.



SPS 341, Boiler & PV Code

- SPS 341.29 Safety Controls
- Two Temperature controls required for hot water boilers
 - (1) high limit
 - (1) operating limit



Temperature Well



Room Thermostat is not considered boiler control !

SPS 341, Boiler & PV Code

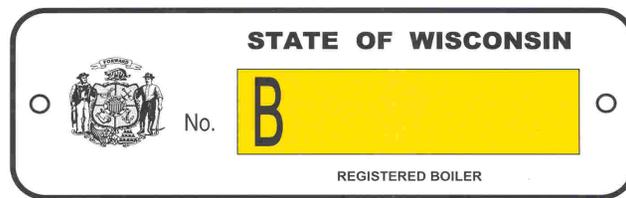
■ **SPS 341.30** every automatically fired low-pressure steam boiler shall be equipped with an automatic low-water fuel cutoff or other device which will perform a similar function, so located as to automatically cut off the fuel supply when the surface of the water falls to the lowest safe water line.

■ **ASME Section IV, HG-614 LOW-WATER FUEL CUTOFF** (a) Each automatically fired hot water boiler with heat **input greater than 400,000 Btu/hr** (117 kW) shall have an automatic low-water fuel cutoff that has been designed for hot water service, and it shall automatically cut off the fuel supply when the surface of the water falls to the level established in (b) below (see Fig. HG-703.2).



SPS 341, Boiler & PV Code

- **SPS 341.36 Identification of boilers and pressure vessels.**
- Boilers and pressure vessels subject to periodic inspections shall be identified by a registration number supplied by the department. The registration number shall be affixed to the vessel by a certified inspector at a location which is easily viewed.



SPS 341, Boiler & PV Code

- State inspectors attach the “sticker” below.
- Inspection Agencies provide their own stickers.

This label and signature certify that this object has been inspected in accordance with Ch. Comm. 40, 41, 43 and 45 as applicable.

**Department of Commerce
Division of Safety and Buildings**



Date of Inspection _____

Inspector Signature & Credential #_ Duane Leetch # 100004



SPS 341, Boiler & PV Code

..... New Installations

- **SPS 341.41(1)** The installation of any boiler or pressure vessel shall be registered with the department by the installer before the operation of the boiler or pressure vessel. Registration shall be on form **SBD-6314**.



Boiler & Vessel Registration

Installers must properly distribute form copies

Available
on Website
“Forms”



Boiler & PV
Registration
Form

SBD-6314



 <p>commerce.wi.gov Wisconsin Department of Commerce Safety and Buildings Division</p>		<p>Boiler and Unfired Pressure Vessel (UPV) Installation Registration</p>	
<p>Installing contractors shall prepare this form in triplicate for each boiler or pressure vessel installed:</p> <ol style="list-style-type: none"> Original to: Department of Commerce Safety and Buildings Division PO Box 7302 Madison, WI 53707-7302 Copy for owner Copy for installer 		<p>Boiler and UPV Information</p> <p><u>BOILER TYPE: (fired pressure vessel)</u> <input type="checkbox"/> POWER <input type="checkbox"/> HEATING <input type="checkbox"/> MINIATURE <input type="checkbox"/> UNFIRED PRESSURE VESSEL</p> <p><input type="checkbox"/> NEW <input type="checkbox"/> Replacing a boiler or unfired pressure Vessel? <input type="checkbox"/> USED If yes, please provide "OLD" tag number _____</p>	
<p><small>Personal information you provide may be used for secondary purposes (Privacy Laws 15.04(1) (m)).</small></p> <p>NAME OF USER:</p>		<p>LOCATION OF INSTALLATION:</p> <p>IN BUILDING: _____ COUNTY: _____</p>	
STREET ADDRESS:	PHONE NUMBER:	WI. REGISTRATION TAG NO.:	NATIONAL BOARD NO.:
CITY:	STATE: ZIP:	Inspector Entry	
		MANUFACTURER:	MFR. SERIAL NO.:
NAME OF INSTALLING CONTRACTOR:	HVAC Contractors Credential #'s (Number) (Expiration Date) ★	STREET ADDRESS:	
CITY:	STATE: ZIP:	SIGNATURE OF INSTALLER:	DATE:

SBD-6314-E (R04/04) - (End Date 03/07)

HVAC Contractor registration required for heating boiler installs !

Comm 5.70, HVAC Contractor

.....a Business Registration



- **SPS 305.70 HVAC contractors. (1) (a)** no person, entity or business may engage or offer to engage in the following activities, unless the person, entity or business holds a registration issued by the department as a registered HVAC contractor, except as provided in par. (b):
 - 1. Installing or servicing heating, ventilating or air conditioning equipment.
 - 2. Installing or servicing refrigeration or air conditioning equipment that would release or may release ozone-depleting refrigerant.
 - 3. Selling for reuse used ozone-depleting refrigerant from refrigeration or air conditioning equipment.

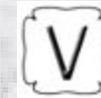
SPS 341, Boiler & PV Code

- SPS 341.42 (1) Boilers and pressure vessels shall be constructed and installed in accordance with the ASME code.

Boiler - Vessel Stamp

Pressure Relief Stamp

- Power HP Boilers



- Pressure Vessels



- Heating Boilers



CSD-1 Requirements 2009 Edition

- 341.11(2) Modifications of ASME CSD-1.
 - (a) *Sections CG-120 and CG-140.* ASME CSD-1 does not apply to boilers and burner assemblies with fuel input ratings of 400,000 Btu per hour or less.
 - (b) *Shutdown switch.* The requirement in ASME CSD-1 section CE-110 (a) to locate a shutdown switch or circuit breaker just outside the boiler room door is changed to include an alternative of locating the switch or breaker just inside the principal entrance into the room, where approved by the department or authorized agent.

CSD-1 Requirements 2009 Edition

- Our Jobs is to *verify* the installing contractors have complied with CSD-1 for the testing requirements, by checking that they have completed the following form
- 1. Certification and reporting (CG-500) for Controls and Safety Devices
- 2. The forms are part Appendix C, they can use other forms provided, the required information is available.

CSD-1 Requirements 2009 Edition

ASME CSD-1-2009

NONMANDATORY APPENDIX C MANUFACTURER'S/INSTALLING CONTRACTOR'S REPORT FOR ASME CSD-1

09)

Certification and Reporting (CG-500) for Controls and Safety Devices
(This form is a guideline and not part of ASME CSD-1-2009.)

Unit Manufacturer

Name _____
Address _____ Zip _____
Telephone _____ Fax _____

Unit Identification (Boiler)

Manufacturer's Model # _____ Year Built _____
ASME Section I _____ Section IV _____ Nat. Bd. # _____
UL # _____ CSA # _____
Jurisdiction: _____

Steam	Hot Water
Maximum W.P. _____ psig	Maximum W.P. _____ psig
Minimum Safety Valve Cap. _____ PPH	Maximum Temp. _____ °F
	Minimum Safety Relief Valve Cap. _____ PPH or Btu

Boiler Unit Description (type) _____
If Modular (no. of modules) _____
Boiler Unit Capacity (output) _____

Burner

Manufacturer _____ Model _____
UL or CSA # _____ Serial # _____

Fuels (as shipped) _____

Indicate Units (where not applicable, indicate "N/A")

Gas Manifold Pressure	_____
Oil Nozzle/Delivery Pressure (at maximum input)	_____
High Gas Pressure Switch Setting	_____
Low Oil Pressure Switch Setting	_____

Installation Location (if known)

Customer Name _____
Address _____
City _____ State _____ Zip _____
Telephone _____ Fax _____

CSD-1 Requirements 2009 Edition

ASME CSD-1-2009

Certification and Reporting (CG-500) for Controls and Safety Devices (Cont'd) (This Form is a guideline and not part of ASME CSD-1-2009.)

Control/Device	Manufacturer	Model #	Operational Test Performed, Date
Operating Controls			
Low-Water Fuel Cutoff CW-120(a), CW-140			
Forced Circulation CW-210(a)			
Steam Pressure CW-310(b)			
Water Temperature CW-410(b)			
Safety Controls			
Low-Water Fuel Cutoff CW-120(a), CW-120(b) CW-130, CW-140			
Forced Circulation CW-210(b)			
High Steam Pressure Limit CW-310(c)			
High Water Temperature Limit CW-410(b)			
Fuel Safety Shutoff Valve, Main CF-180(b)(2), CF-180(b)(3)			
Pilot Safety Shutoff Valve CF-180(c)			
Atomizing Medium Switch CF-450(b)			
Combustion Air Switch CF-220			
High Gas Pressure CF-162			
Low Gas Pressure CF-162			
Low Oil Pressure CF-450(a)			
High Oil Temperature CF-450(c)			
Low Oil Temperature CF-450(d)			
Purge Air Flow CF-210			
Flame Safeguard (Primary) CF-310, CF-320			
Flame Detector CF-310, CF-320			
Low Fire Start Low-Fire Start Switch CF-610			
Safety or Safety Relief Valve(s) CW-510, CW-520			

CSD-1 Requirements 2009 Edition

ASME CSD-1-2009

Certification and Reporting (CG-500) for Controls and Safety Devices (Cont'd)
(This Form is a guideline and not part of ASME CSD-1-2009.)

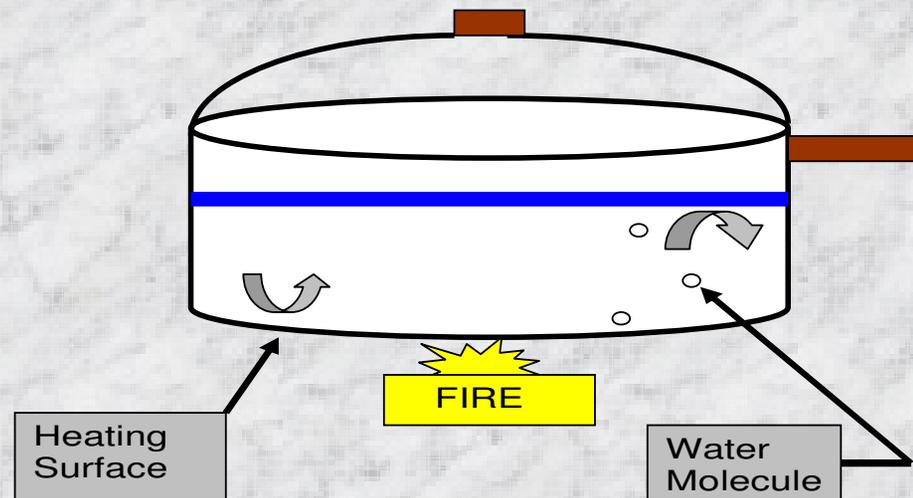
Manufacturer _____ Operational Test Performed, Date _____ / _____ / _____
Model _____
Size _____
Capacity _____ PPH/Blu/hr

Representing Equipment Manufacturer, Name _____
Signature _____ Date _____

Representing Installing Contractor, Name _____
Signature _____ Date _____

Understanding Hot Water Heating Systems

Heat Transfers and Natural Circulation occurs



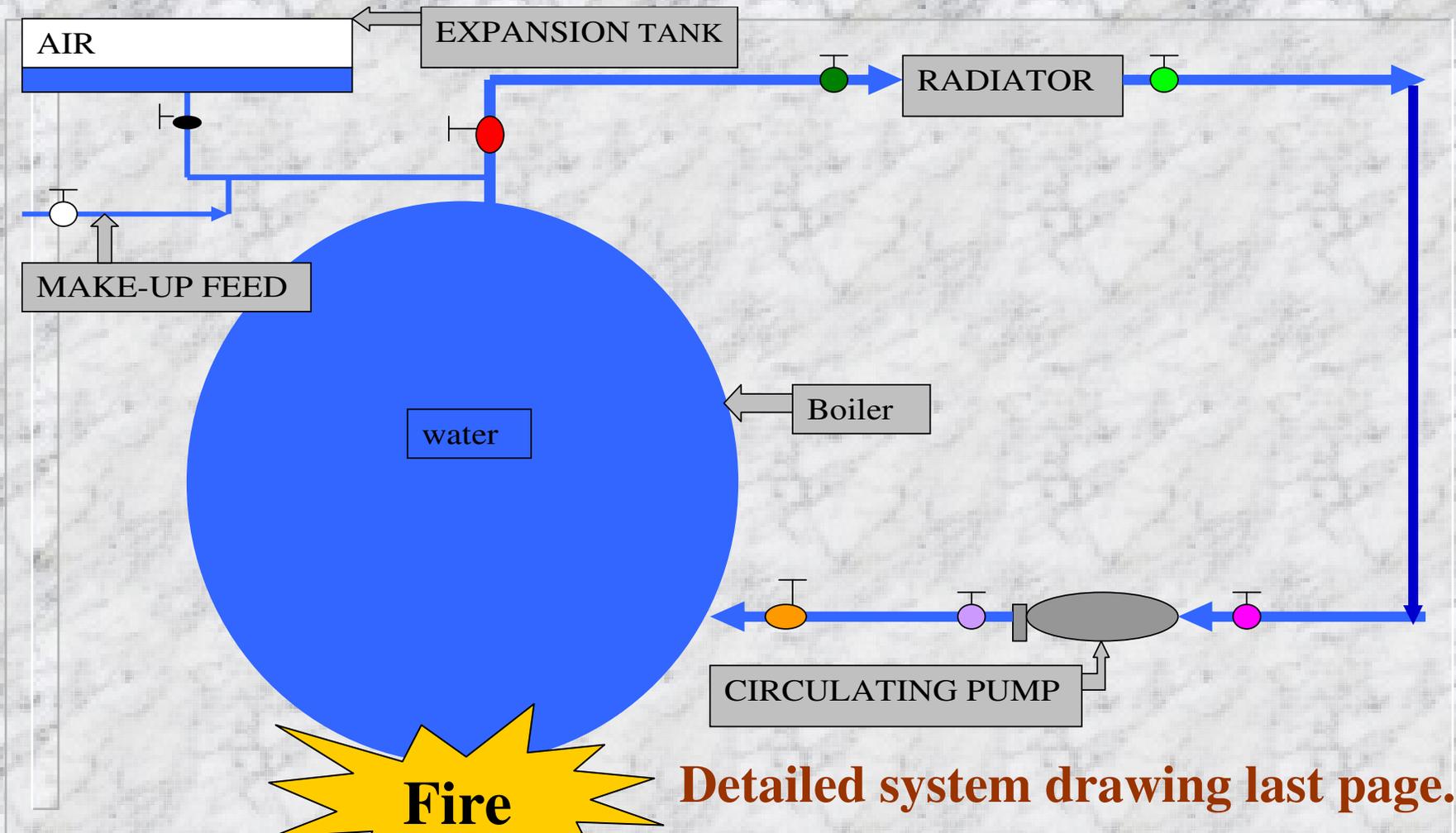
Definitions:

1. **Boiler**a closed vessel containing water that is heated
2. **Heating surface**that surface which has water on one side and heat or hot gases on the other
3. **BTU**amount of heat required to change the temperature of 1# of water one degree fahrenheit
4. **Boiling point of water** 212 degrees F or 100 degrees C at atmospheric pressure **Freezing point**.....32 degrees F or 0 degrees C at atmospheric pressure
5. **Atmospheric pressure**14.7 PSI

A boiler or burner operator could be anyone?

Understanding Hot Water Heating Systems

Hot Water Heating Boiler Systems



Detailed system drawing last page.

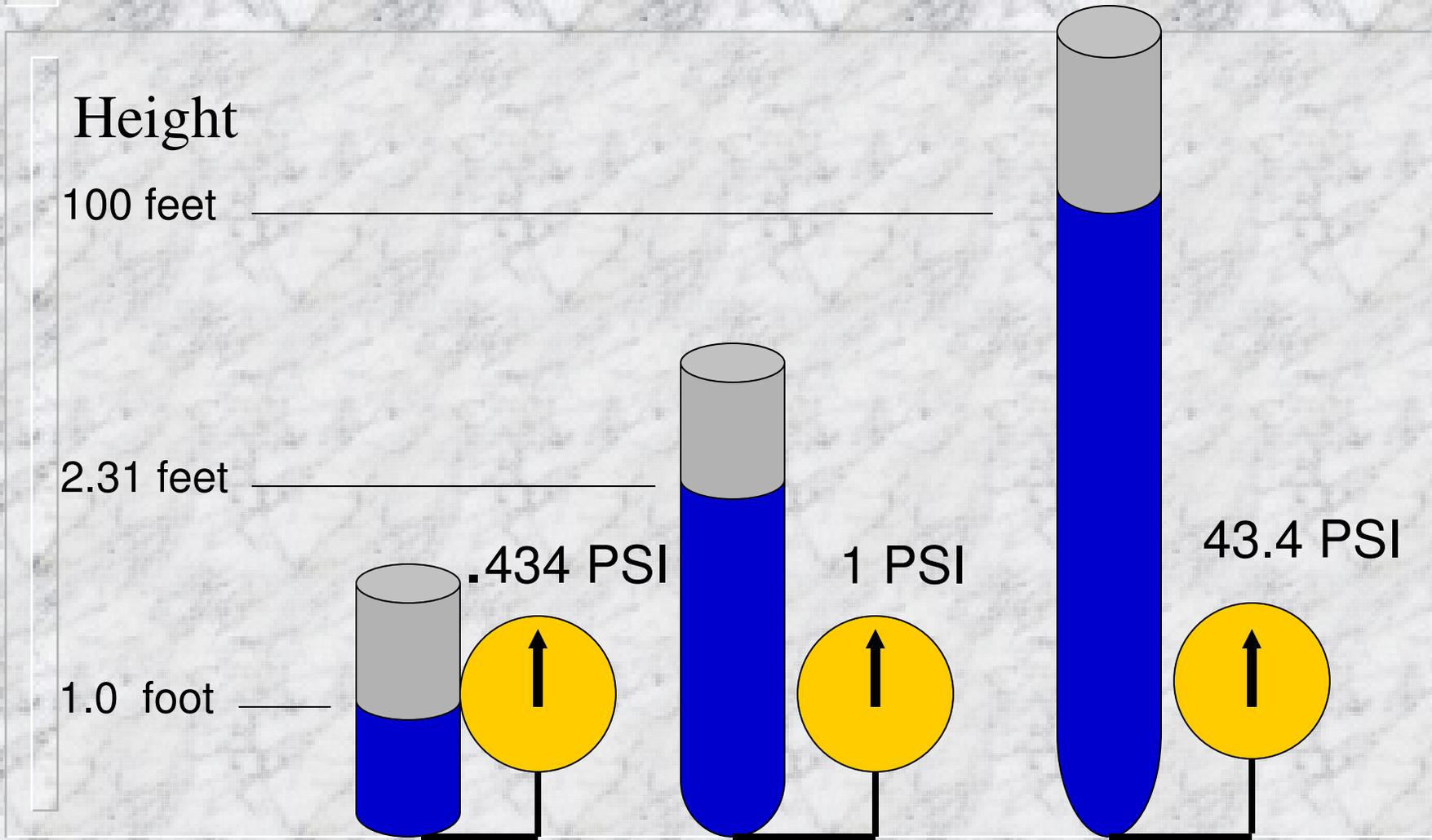
Understanding Hot Water Heating Systems

Why might HWH Pressure be 160 PSI ?

- HWH ...not to exceed 160 PSI or 250 degrees F
- Boilers installed in Basement of 10-20 story buildings
- .434 PSI per 1-ft
- 10 story ~ 100 ft system needs 43.4 PSI @ Boiler
- 20 story ~ 200 ft system height requires 86.4 PSI
- Reduce higher water system boiler pressure by installing boiler @ roof-top in Penthouse
- Next slides explain

Understanding Hot Water Heating Systems

Water Pressure vs Water column Height



Understanding Hot Water Heating Systems

Water column Height vs System Water Pressure

■ Conversion factors:

- 1 foot water column ~ .434 PSI
- 2.31 feet water column = 1 PSI
- 10 feet water column = 4.34 PSI
- 100 feet water column = 43.4 PSI
- 200 feet water column = 86.8 PSI
- 300 feet water column = 130.2 PSI



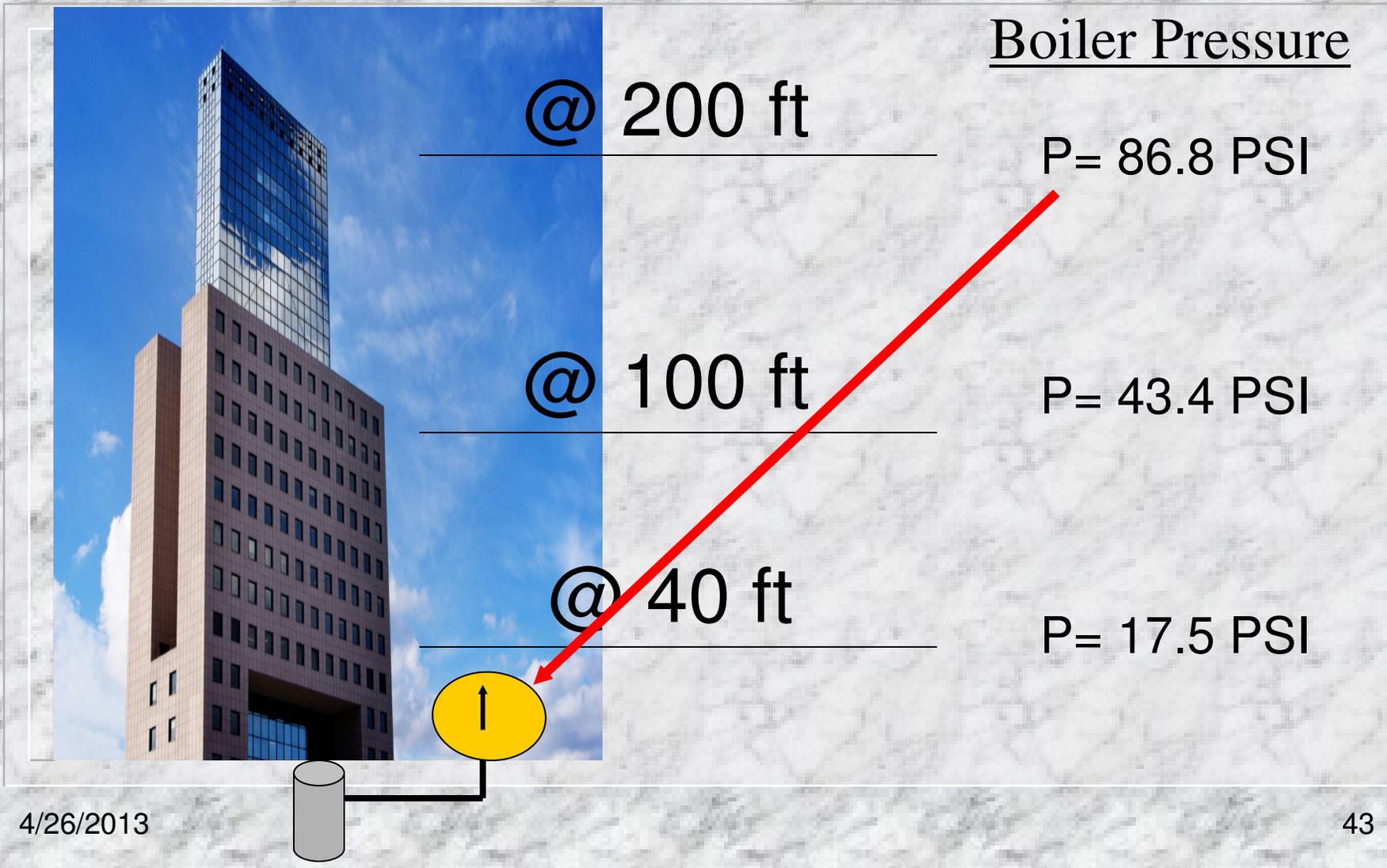
1,250 feet

Empire State

What's tallest building in Milwaukee ?

Understanding Hot Water Heating Systems

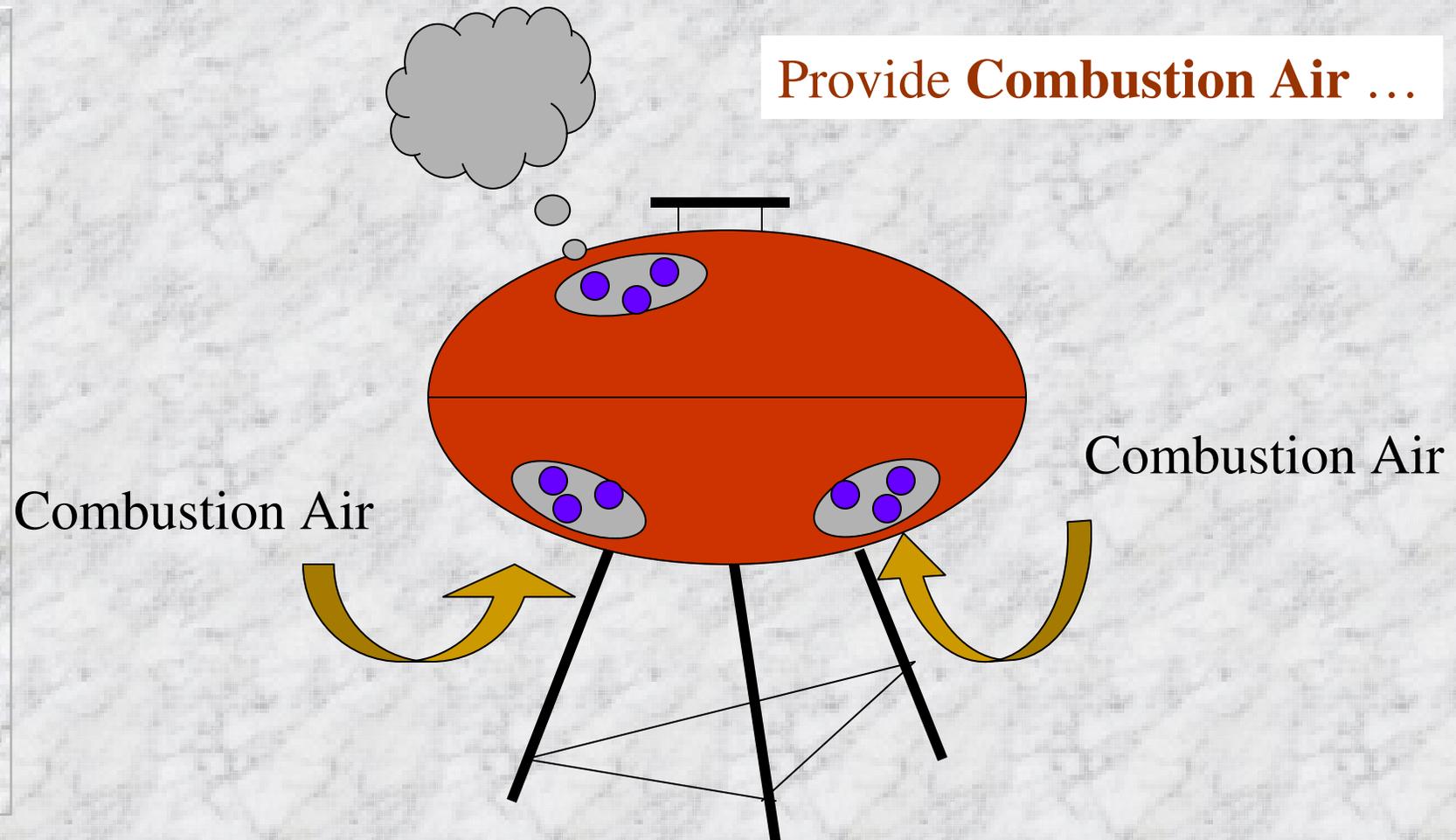
“NO heat complaint” upper floors ?



Understanding Hot Water Heating Systems

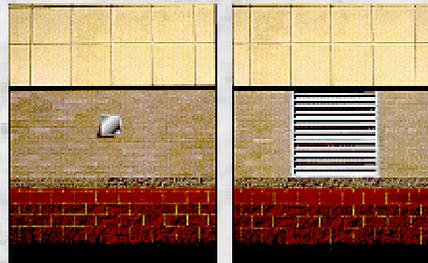
The Draft System Purpose ?

Provide Combustion Air ...



Boiler Draft – Combustion Air

- **Combustion air** louvers or power vents
- Engineered for location & equipment installed

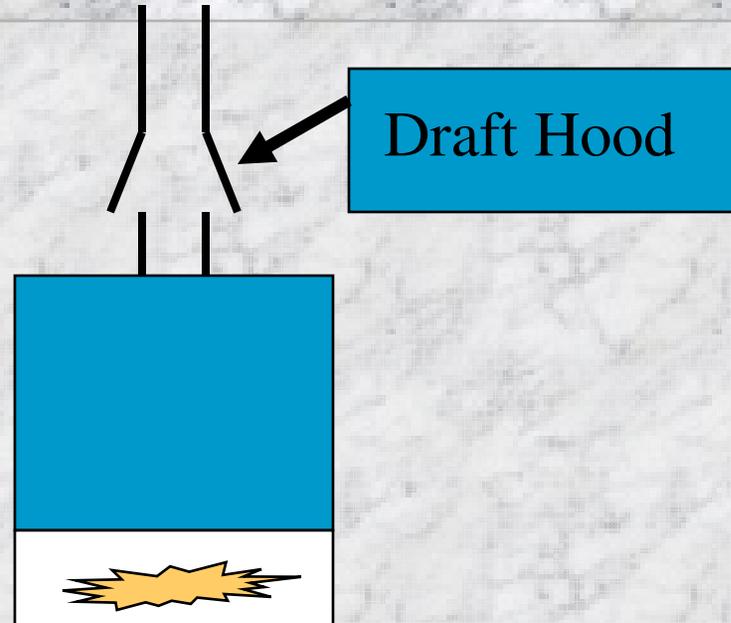


Rule of Thumb: Free combustion air opening 1 sq in per 2000 BTU/ hr (input) per NBIC, Part 1, 2.5.4 & 3.5.4

Also see the Commercial Bldg Code SPS 360-66

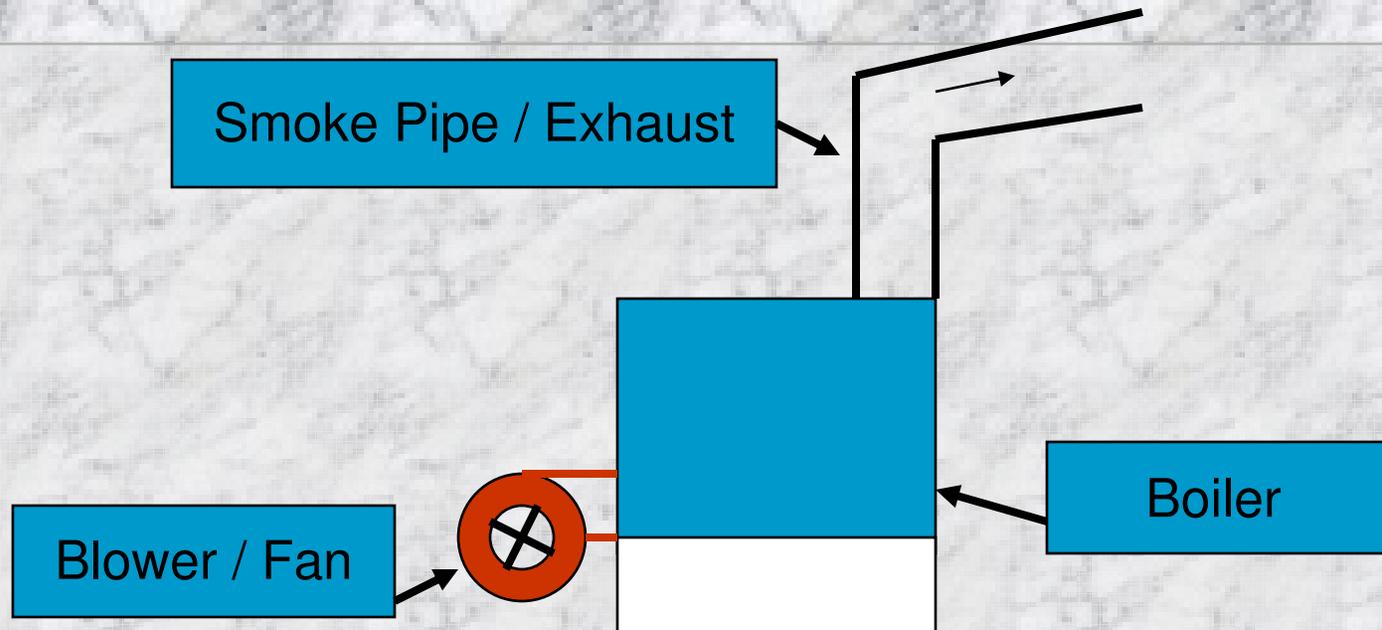


Natural Draft System ... Misc



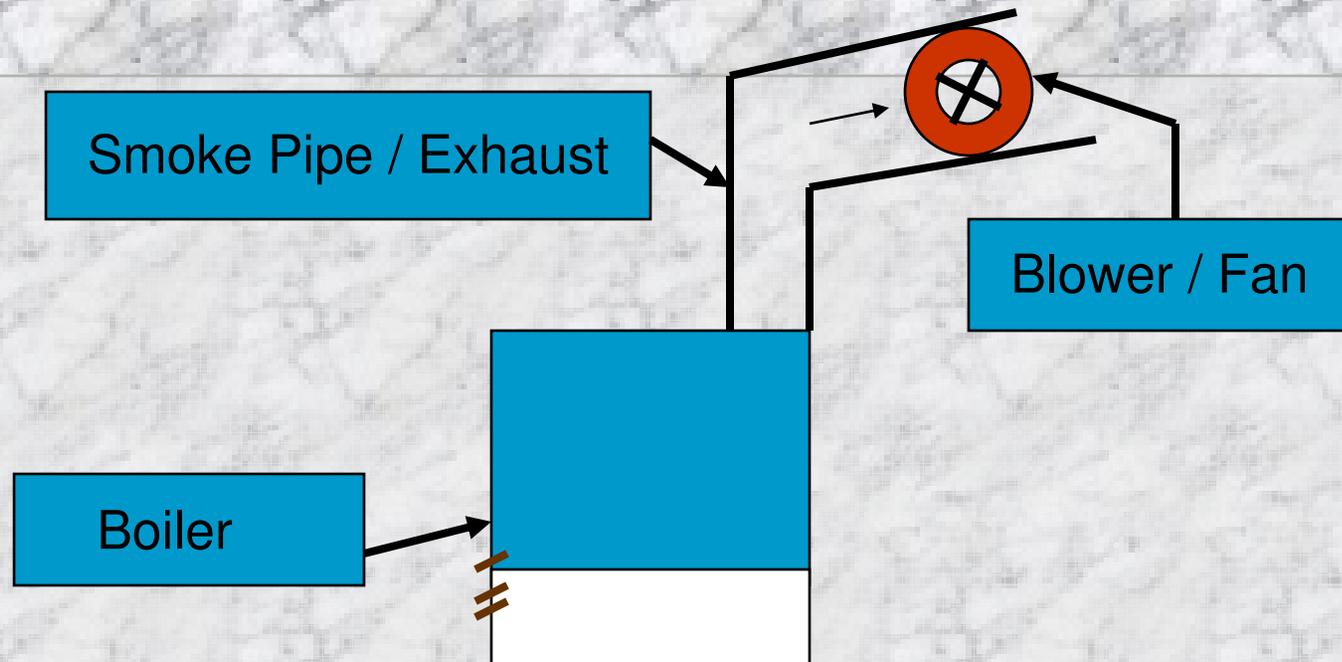
- Proper Hood installation / Balances draft
- Vent Properly sized per manufacturer
- Adequate distance from top of boiler

Forced Draft System



Forced Mechanical Draft

Induced Draft System

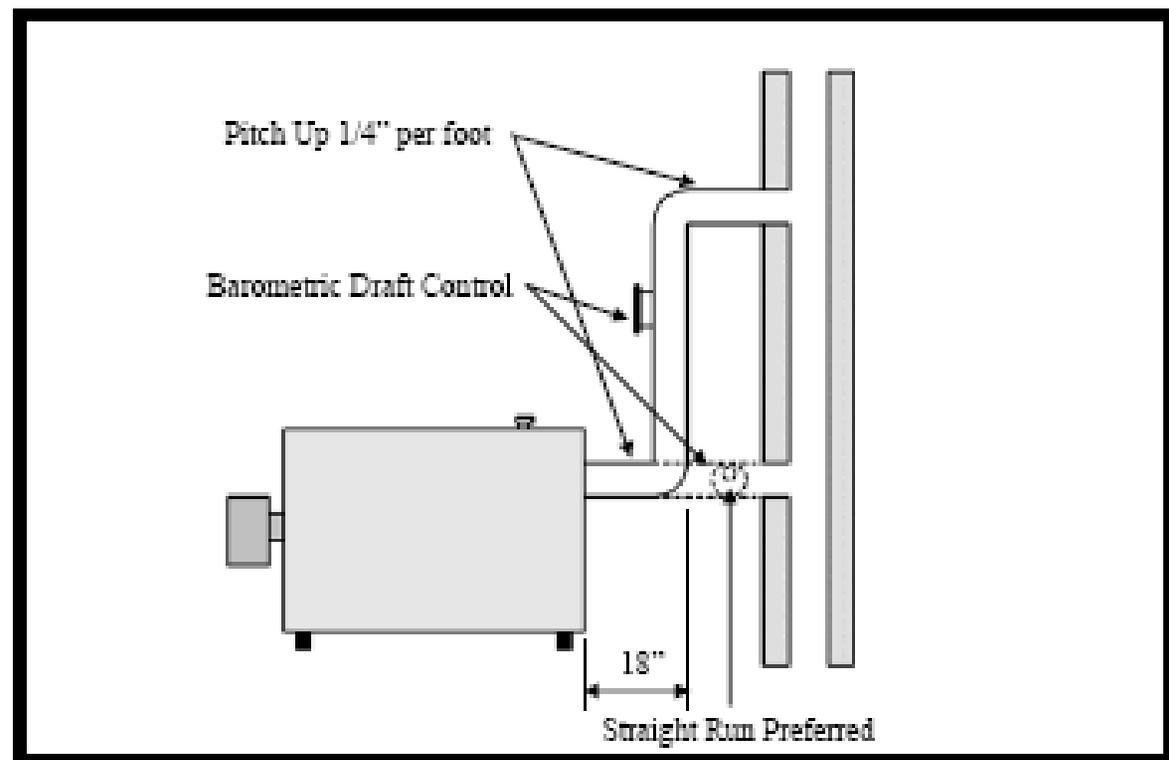


Induced Mechanical Draft

Note: Boilers may be combination forced & induced draft

Draft System Maintenance

- Check
- Breeching
- Venting
- Chimney
- Clean-outs



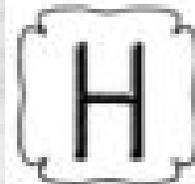
Understanding Hot Water Heating Systems

- Terminology
- Hot Water Heating “HWH”
- Hydronic Boiler System
- Hot Water Circulating System
- Limitations:
 - Pressure Limitation....**0 to 160 PSI**
 - Temperature max.....**250 degrees F**

Boiler Terms, Fittings & Trim

Boiler Design **ASME Stamp Required**

- Stamped/Constructed ASME
Section Section IV, Heating Boilers
- Hot Water Boiler (0-160 PSI, 250 F)
- Materials - P / T rated
 - Carbon Steel, welded or riveted
 - Cast Iron, CI sectionals
 - Copper tube, coils



Boiler Design Types

- Fire-tube

- Fire in the tube & water surrounds

Superior FT Boiler



- Water-tube

- Water in the tube & fire surrounds

Bryan WT Boiler



- Cast Iron Sectional

- Cast sections bolt together
- Water inside CI section

Smith Cast Iron



Note: Hot water boilers have both a waterside and fireside.

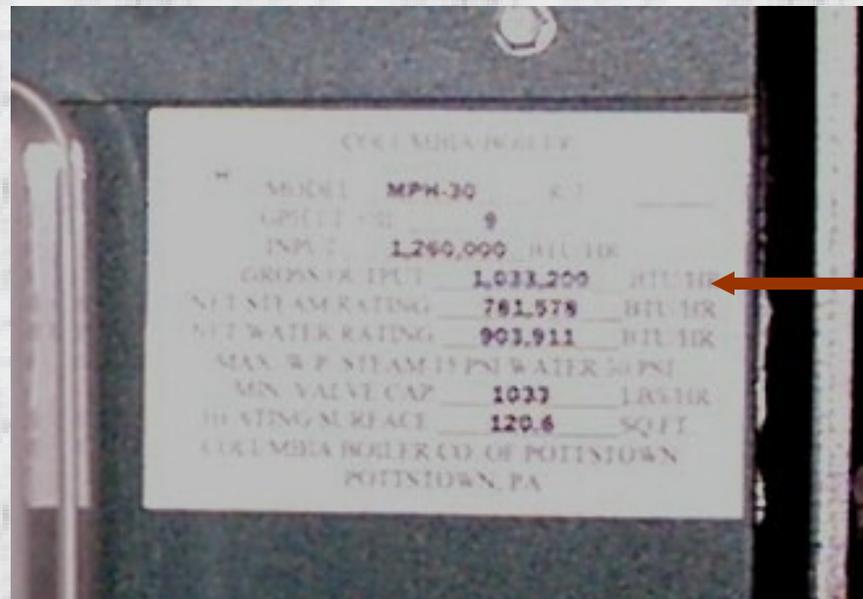
Boiler Terms, Fittings & Trim

- Nameplate - ASME stamping 
- Max Allowable Working Pressure - MAWP
- Relief valve (set pressure & capacity)
- BTU input / output Note: (MBH = 1000)
- Boiler Horse Power (1 BHP = 33,478 BTU/HR)

Example: Verify Pressure Relief Device Data

Boiler Nameplate and Sticker Information

- ASME stamp 
- NB # 146496
- MAWP 15 / **30**
- MSVR 1,033,200
BTU/hr



Pressure Protection Devices

..... important safety appurtenance

■ Safety Valves

- Spring loaded quick opening / pop-type action
- Vertically installed on “steam” boilers

■ Relief Valves

- Spring Loaded, slow opening action
- Vertically installed on “hot water” boilers

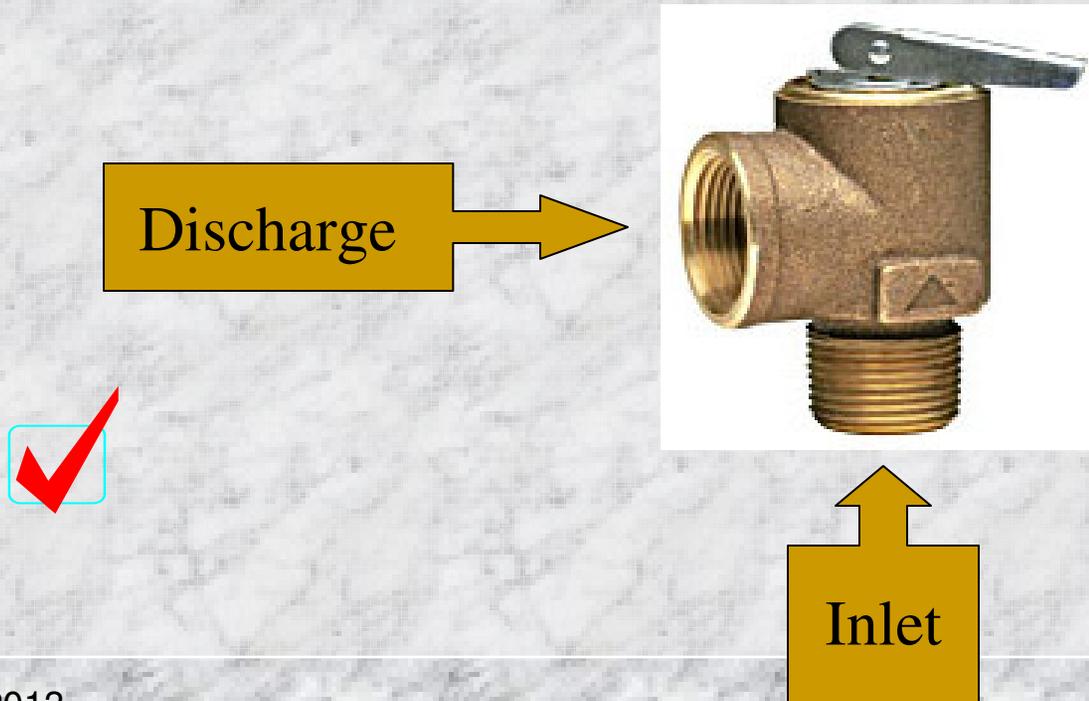
■ Pressure/Temperature Relief valve

- Spring loaded, P/T actuated
- Installed domestic “potable water heaters”



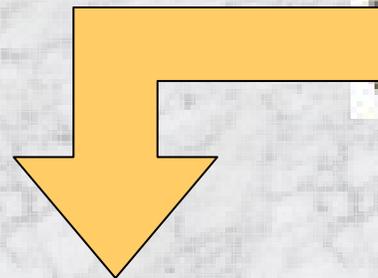
Boiler Terms, Fittings & Trim

- Relief upright, spindle vertically mounted
- Openings to relief valve cannot be reduced



Boiler Terms, Fittings & Trim

- Discharge Piping to safe location
- Discharge piping full size, short & direct
- Properly supported
- No stress on valve



Boiler Terms, Fittings & Trim

- Pressure & Temp Gauge
- Temperature Controls (Operator + high limit)
- Low Water Cut-off, HWH over 400MBH input
- Pressure Reducing Valve
- Supply - return Stop Valve & Drain Valve
- Circulating Pump
- Expansion Tank (ASME / Pre-pressurized)
- Back-flow Preventer Plumbing reqrmt

Boiler Fittings & Trim

- Pressure & Temperature Gauge
- Readily visible to operator
- Graduation of Pressure gauge
 - 1 1/2 to 2 x MAWP
- Calibrated for accuracy



Note: Siphon or pigtail not needed on HWH boilers

Boiler Fittings & Trim

Two Temperature Controls

- Two controls required for hot water boilers
 - (1) high limit - max @ 250° F
 - (1) operating limit

Temperature
sensing Bulb



Temperature Well fitting



Boiler Fittings & Trim

Low Water Cut-off "LWCO"

■ Probe Types

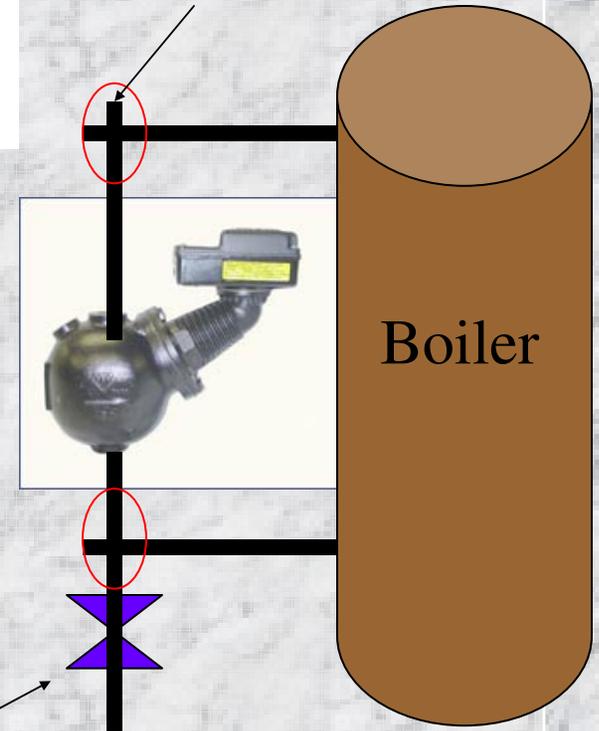


TC-4 Test and Check valve

■ Bowl / Float type

HWH over 400,000 BTU input

LWCO Drain valve



Boiler Fittings & Trim

- Low Water Cut-off
 - Bowl float type
- Inspect device for leaks
- Tight Pipe connections
- Drain, flush
- Properly test while burner in operation
- Manual reset ?



Boiler Fittings & Trim

Low water cut-off

- Low Water Cut-off
 - Probe type
- Check probe periodically
 - Do Maintenance
 - Test per Manufacturer recommendations

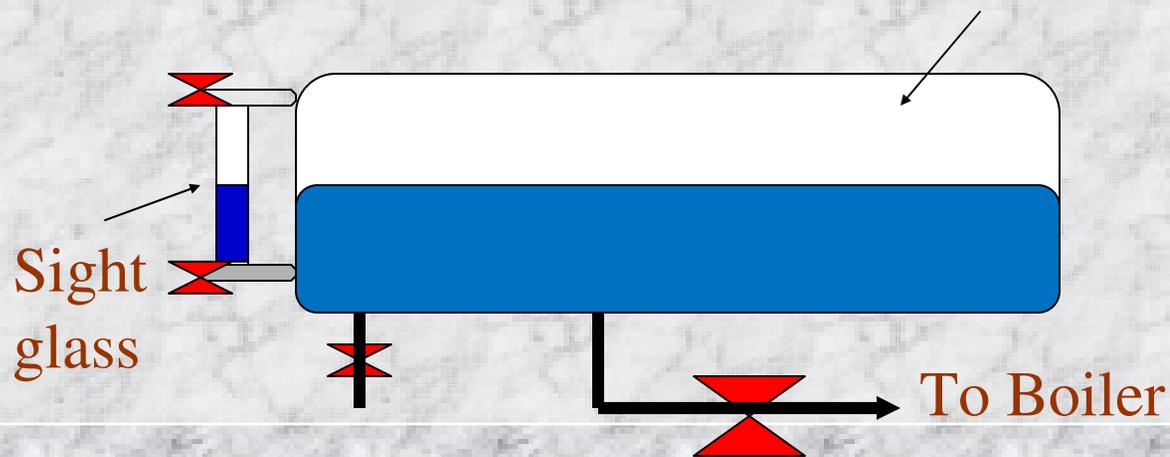


Boiler Fittings & Trim

Expansion tanks



- Over 30 PSI systems require ASME stamp tank
- 30 PSI and less, Pre-pressurized expansion tanks are acceptable
- Allows for expansion contraction
- Tank half filled water w/ Air cushion



Boiler Fittings & Trim

Back - flow preventer

- **BACKFLOW PREVENTERS**

- Protects our drinking water

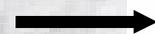
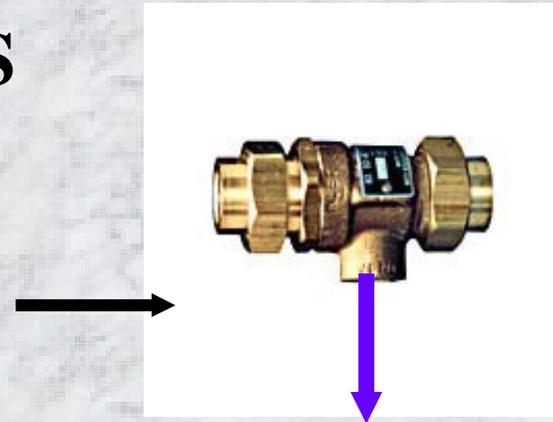
- 9 D Watts Backflow preventer

- For \leq 30 PSI Boilers

- Larger Watts (719, 919 .. etc)

- For over 30 PSI - Boilers

- Annually inspected



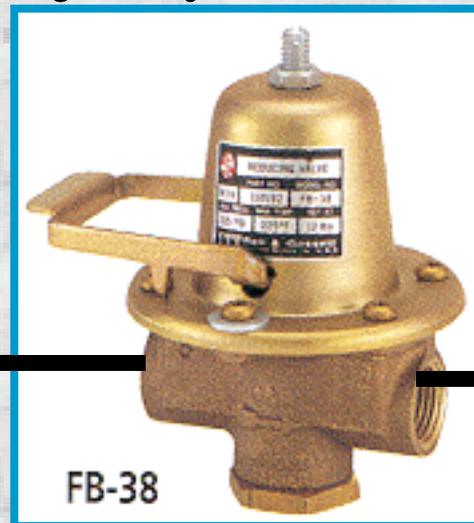
Plumbing Code Comm chapters 82.41

Boiler Fittings & Trim

Water supply-Pressure Reducing Valve

- Water supplied
- Backflow preventer protects drinking water
- PRV pressure Reducer -Reduces city water pressure
- 45 PSI to 12 PSI ... majority of boilers

Water
supply



To boiler

PRV

Boiler Inspection reminder

- **Globe Valves** – designed to throttle flow
- System pressure & temperature rated
- Arrow on valve body indicates flow direction

Flow directed
under the disk



Boiler Inspection reminder

- Check Valves
 - Swing check
 - Lift check
 - Ball check
- P/T rated / system
- Allows flow in one direction only
- Arrow on valve body indicates direction
- Properly install per Manufacturer



Boiler Fittings & Trim

Blow-down or Drain Valve

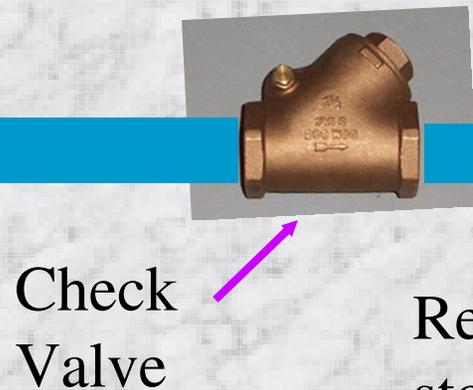
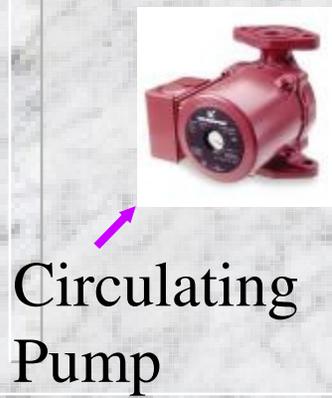
- Drain valve
- HWH boilers require (1)
- Pressure/temperature rated
- Properly sized 3/4" minimum
- Discharge to safe location



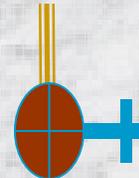
Boiler Fittings & Trim

Supply - Return Stop Valves

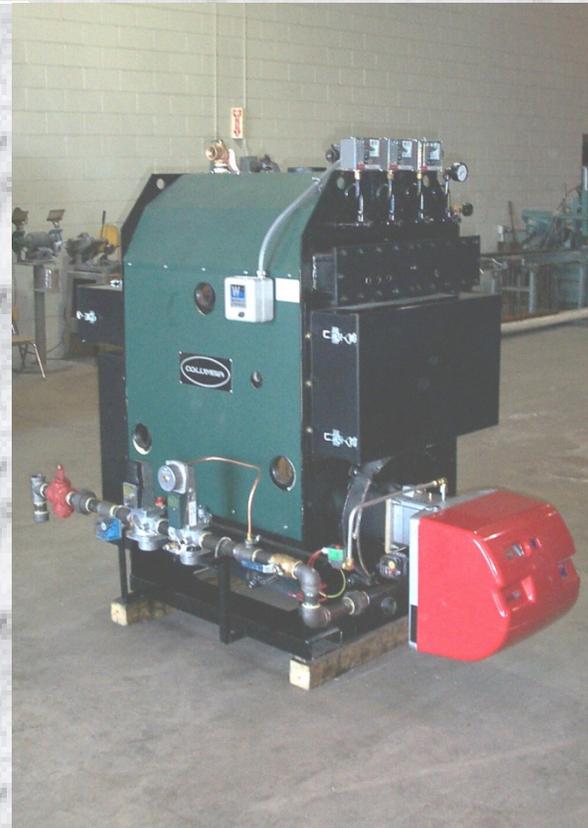
- Supply & Return stop valves
- System pressure temp rated
- Piping free of leaks
- Piping properly supported
- Allow expansion-contraction



Supply stop valve



Boiler Inspection Misc



- Foundation
- Anchor per manufacturer
- Allow Expansion/Contraction
 - expansion bends
 - expansion joints



Boiler Fittings & Trim

Chemical Pump / Chemical Pot

- Water Treatment System
- Slug feeders / Proportioning pumps
- Water Treatment person ?
- Maintain pH, chemical concentrations
- Prevent oxygen corrosion- pitting
- Scale similar to soot, inhibits heat transfer & acts as an insulator
- Prevent/remove scale build-up

Sample pot
install next slide

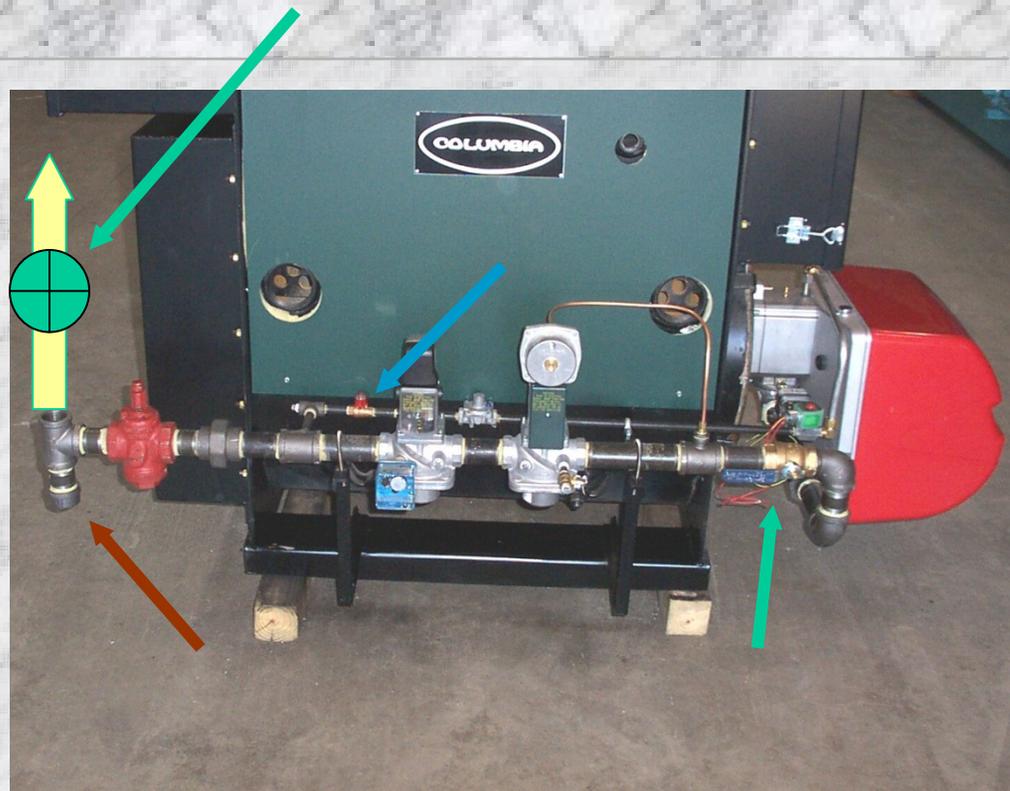
Chemical Pot Feeder



“Slug Feeder”

HWH Boiler Fuel System

- Fuel System
- Piping Supports
- Pilot valve
- Gas Shut-off valve
- Vent gas to atmosphere
- Drip 



Gas Piping per Building Code, SPS 365, NFPA-54



Boiler Inspection

.... Satisfactory & Complete



4/26/2013

75

Boiler & Vessel Registration

If Installers properly distributed form copies

Available
on Website
“Forms”

Boiler & PV
Registration
Form

SBD-6314



4/26/2013

 <p>commerce.wi.gov Wisconsin Department of Commerce Safety and Buildings Division</p>		<p>Boiler and Unfired Pressure Vessel (UPV) Installation Registration</p>	
<p>Installing contractors shall prepare this form in triplicate for each boiler or pressure vessel installed:</p> <ol style="list-style-type: none"> Original to: Department of Commerce Safety and Buildings Division PO Box 7302 Madison, WI 53707-7302 Copy for owner Copy for installer 		<p>Boiler and UPV Information</p> <p><u>BOILER TYPE: (fired pressure vessel)</u> <input type="checkbox"/> POWER <input type="checkbox"/> HEATING <input type="checkbox"/> MINIATURE <input type="checkbox"/> UNFIRED PRESSURE VESSEL</p> <p><input type="checkbox"/> NEW <input type="checkbox"/> Replacing a boiler or unfired pressure Vessel? <input type="checkbox"/> USED If yes, please provide "OLD" tag number _____</p>	
<p><small>Personal information you provide may be used for secondary purposes (Privacy Laws 15.04(1) (m)).</small></p> <p>NAME OF USER:</p>		<p>LOCATION OF INSTALLATION:</p> <p>IN BUILDING: _____ COUNTY: _____</p>	
STREET ADDRESS:	PHONE NUMBER:	WI. REGISTRATION TAG NO.:	NATIONAL BOARD NO.:
CITY:	STATE: ZIP:	Inspector Entry	
		MANUFACTURER:	MFR. SERIAL NO.:
NAME OF INSTALLING CONTRACTOR:	HVAC Contractors Credential #'s _____ (Number) ★ _____ (Expiration Date)	STREET ADDRESS:	
CITY:	STATE: ZIP:	SIGNATURE OF INSTALLER:	DATE:

SBD-6314-E (R04/04) - (End Date 03/07)

New installs Ask or look for the registration !

Comm 41, Boiler & PV Code

■ Permit to operate

STATE OF WISCONSIN DEPARTMENT OF COMMERCE		PERMIT TO OPERATE
Inspection Service Agent:	Permit For: Boilers, 3 Year Pto Cycle - 2	
Inspection	Regulated Object ID No: 600141	
Agency Name	Tag No.: B0000495	
Telephone	15 Psig Max Allow Working Pressure	
EXPIRES: 08/04/2007		
<p><i>This permit is to certify that the regulated object (equipment/installation) described herein meets the applicable standards of installation/operation of the Wisconsin Administrative Code, Ch. Comm 41. This may be rescinded for failure to maintain compliance with applicable codes and Statutes or failure to renew permit. Post as established by Wisconsin Administrative Rule.</i></p>		
ISSUED TO (owner/owner's agent)	CUST ID: 347784	
Owner name	FACILITY ID: 600104	
Address	Facility:	Company name
City WI 00000	Address:	Address City
	SITE ID:	WI 00000
	Site:	
	Address:	
	Location on Property:	Boiler Room
		SDB-252 (R 9/99)

Request to see the PTO or look up website Record !

Solid Fuel FiredWhat-cha-call- it !

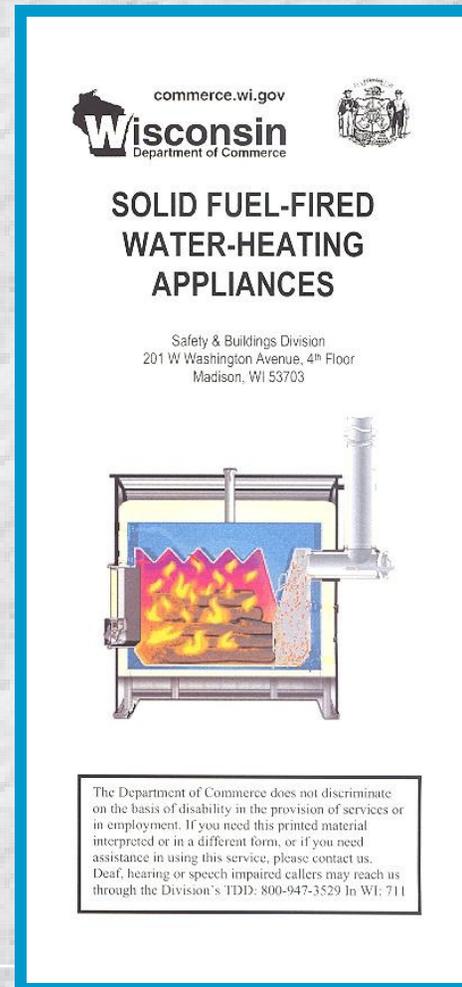
A “Boiler, Furnace or Stove ” ?

- A New Brochure will help answer questions !
- Acceptable or Not Acceptable for Install ?
- Comply with code State or Local ?
- Installed Inside or outside of Building ?
- What fuel is acceptable ?
 - Corn, coal, wood, pellets, tires, garbage ?

New Brochure

Solid Fuel-fired Water-heating Appliance

- **Commercial:**
- Reference Boiler Section
 - **Comm 41.49**
 - **By Boiler Inspector**
- **Residential:**
- Reference UDC Section
 - **Comm 23.04(4)**
 - **By UDC Inspector**



SPS 341.49 (Condensed version)

Solid fuel–fired water–heating* appliances

- (1) GENERAL. This section applies to solid fuel–fired water–heating appliances that are not constructed and installed in accordance with the ASME code.
- (2) DESIGN.
 - (a) * appliance shall be constructed with self–contained weather proofing or other weather protection acceptable to the department.
 - (b) A * appliance shall be listed by a nationally recognized testing laboratory acceptable to the department.
 - (c) A * appliance shall be designed and constructed for operation at atmospheric pressure and be properly vented to prevent a positive pressure condition.

SPS 341.49 (Condensed version continued)

* **Solid fuel-fired water-heating appliances**

- (3) **INSTALLATION.** (a) A * appliance shall be located away from other normally occupied structures per manufacturer's recommendation. If provided, a canopy shall be open on all sides, constructed of substantially nonflammable materials and shall not fully cover the unit.
- (b) A * appliance shall be enclosed by fencing to prevent tampering by unauthorized persons.
- (c) Automatically * appliance shall use a fuel feed system designed or approved by the unit manufacturer.
- (d) The installation of a * appliance shall be provided with means to prevent freezing.
- (4) **REPAIRS.** Repairs to the boiler shall be made in accordance with the manufacturer's recommendation.

Register November 2008 No 635, eff. 12-1-08.

UDC ... SPS 323.04

Types and location of equipment.

- **SPS 323.04 (3) BOILERS.** Boilers and solid fuel-fired water-heating appliances that serve a one or 2-family dwelling, whether located inside or outside the dwelling, shall comply with ch. Comm 41, Boilers and Pressure Vessels.

Register November 2008 No 635, eff. 12-1-08

Commercial Boiler Inspections

Reference codes

- **SPS 364.1001 Boilers, water heaters and pressure vessels.** Substitute the following wording for the requirements and exceptions in IMC chapter 10: (1) The provisions of ch. **SPS 341** shall govern the installation, alteration and repair of boilers and pressure vessels.
- **SPS 364.1101 Refrigeration.** Substitute the following wording for the requirements and exceptions in IMC chapter 11: Mech refrigerating systems installed in public buildings and places of employment shall comply with ch. **SPS 345**.

Bldg Code refers one to SPS 341 or 345



1. Boiler
2. Temperature gauge
3. Backflow preventer
4. Make-up water
5. Drain valve
6. Pressure regulator
7. Expansion tank
8. Air separator or purger
9. High temp. supply line
10. Return line
11. Primary circulator
12. Secondary circulator

13. Fan forced unit heater
14. Pipe radiators (under air inlets)
15. Low temp floor heat
16. Injection valve
17. Balancing valve (globe type)
18. Zone valve (if required)
19. Floor sensors (group of 4)
20. Room air sensors
21. "Smart" control panel
22. Flue and draft hood

— High temp. line
 - - - Low temp. line

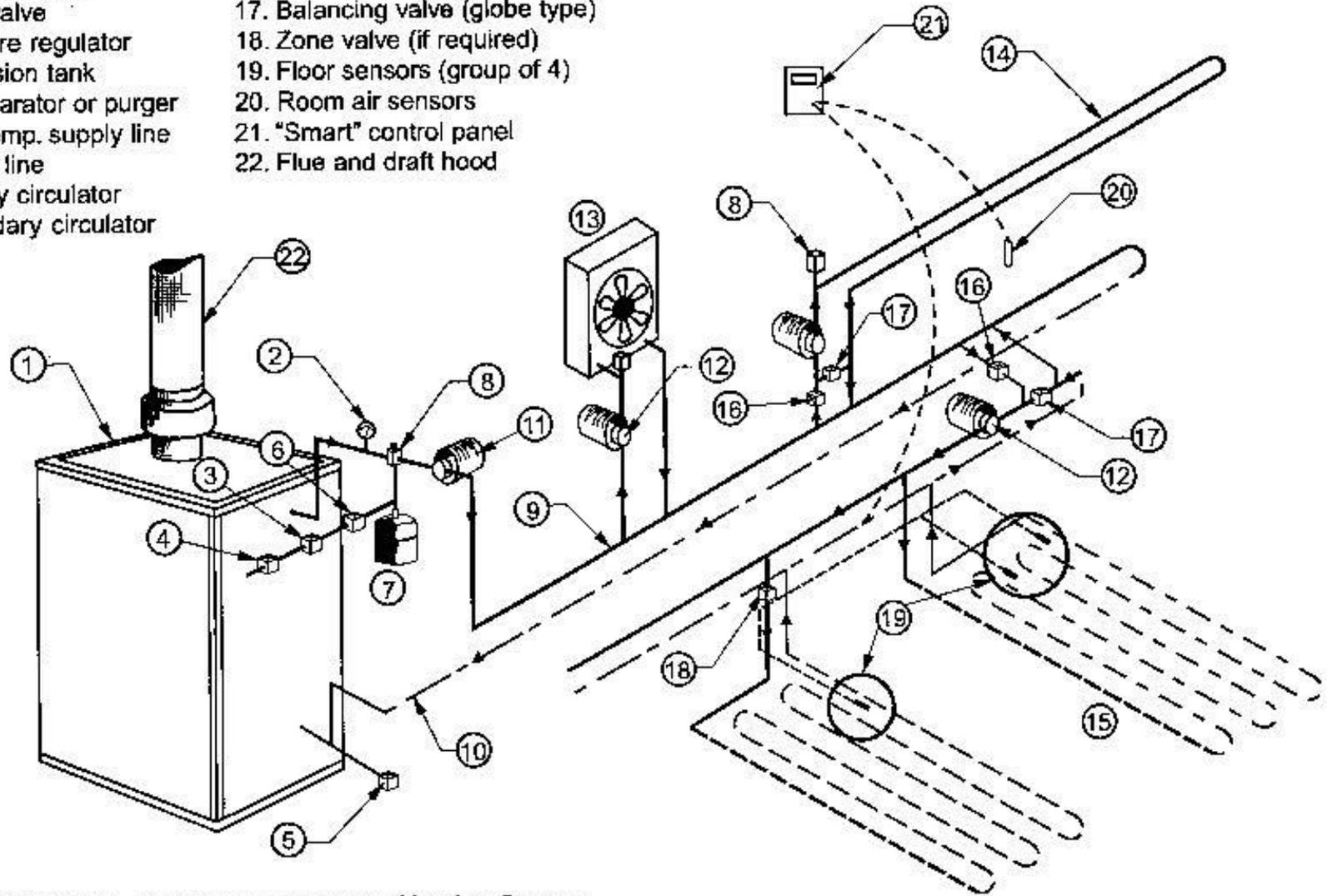


Figure 1: Schematic of a Typical Hot Water Heating System

THANK YOU



BOILER SAFETY

Department of Safety and Professional
Services,
Division of Industry Services,
Bureau of Field Services



Rick Merkle
141 NW Barstow St, 4th Floor
Waukesha WI 53188
262-521-5065

Hot Water Heating Boiler Basics

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FB-38



Bell & Gossett Three Piece Oil-Lubricated Boosters

Cast Iron Series 100 NFI Pump 1/12 HP Single Phase three piece design oilable, repairable pump - sleeve bearing design, flexible spring design coupler, mechanical seal.

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