
ASME CSD-1

2009

**CF - Combustion Side Control
Equipment**



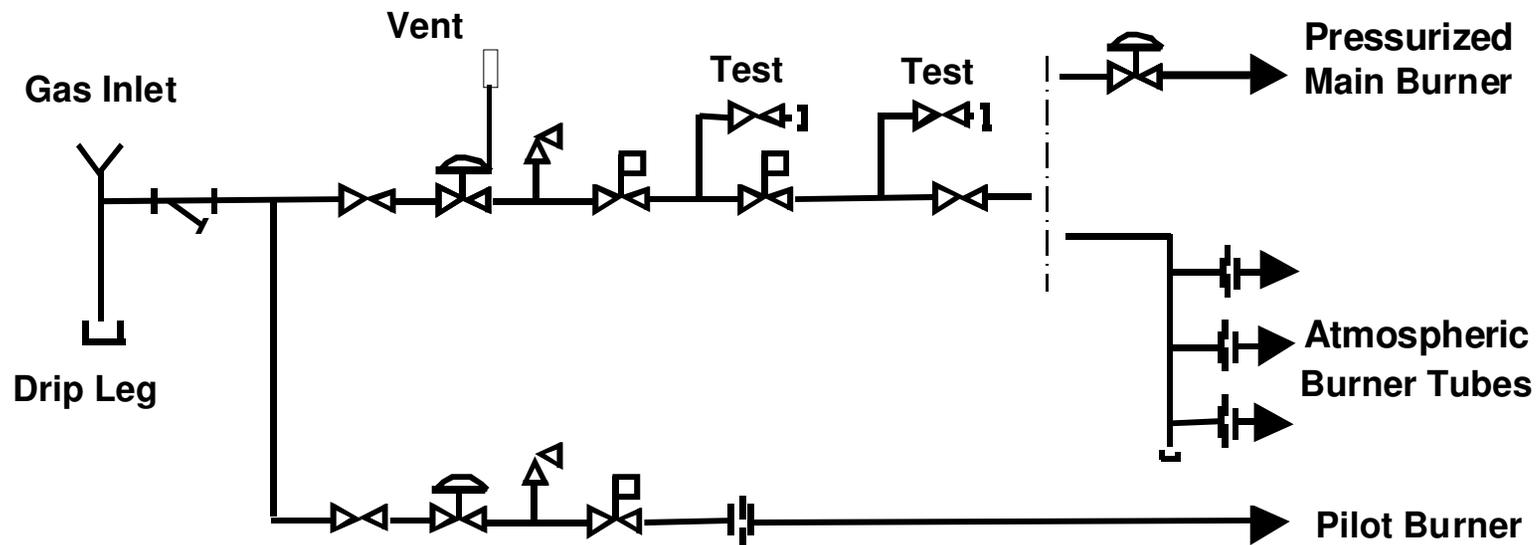
Part CF - Combustion Side Control Equipment

- All controls and safety devices covered by CSD-1 must be accepted and listed for the intended service by a nationally recognized testing agency.
- Examples
 - UL - Underwriters Laboratory
 - FM - Factory Mutual
 - AGA - American Gas Association



Part CF - Combustion Side Control Equipment

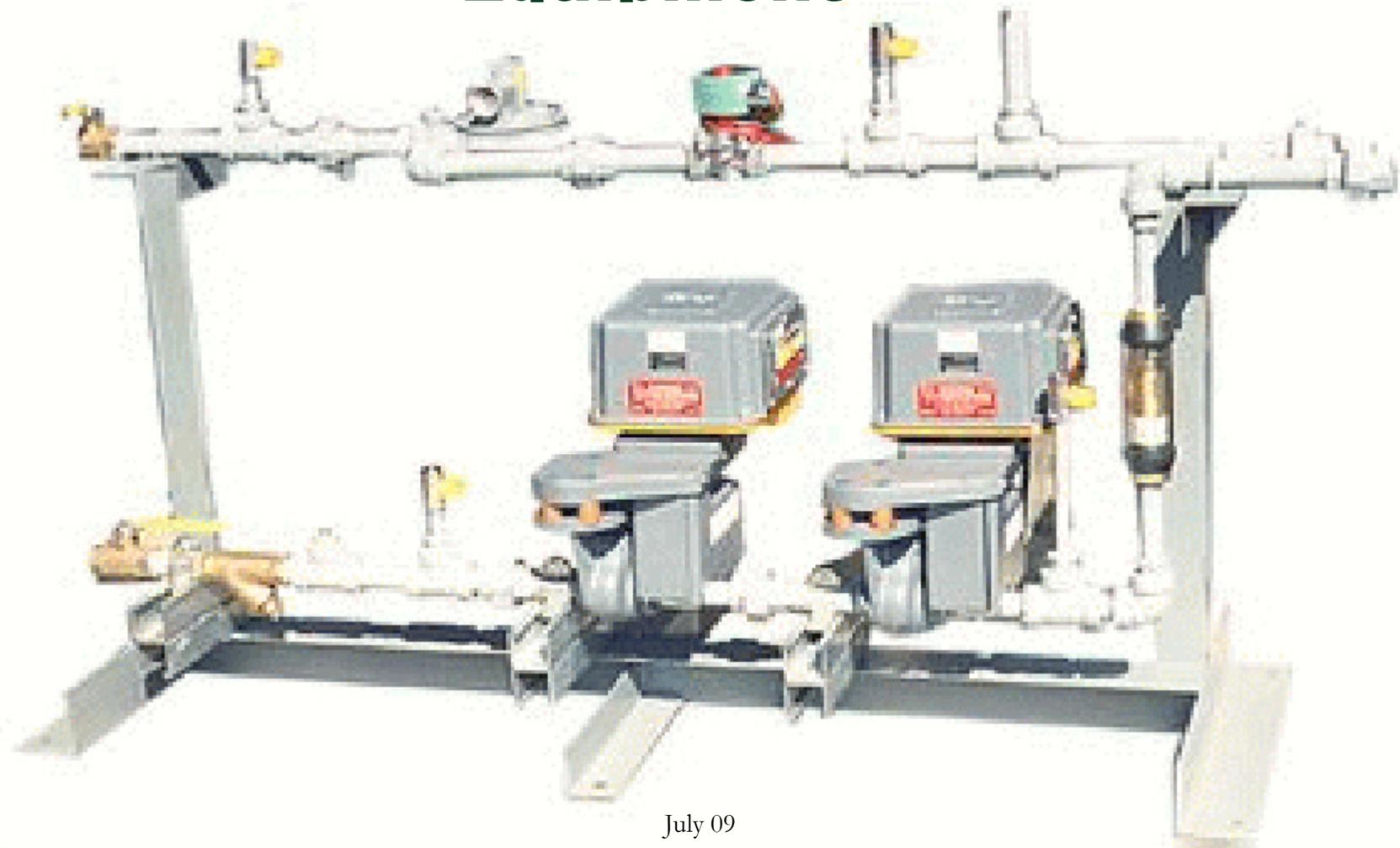
- Typical 400,000 Btu/hr to 2,500,000 Btu/hr
- Automatically Gas-Fired Boiler Units



 Typical Arrangement

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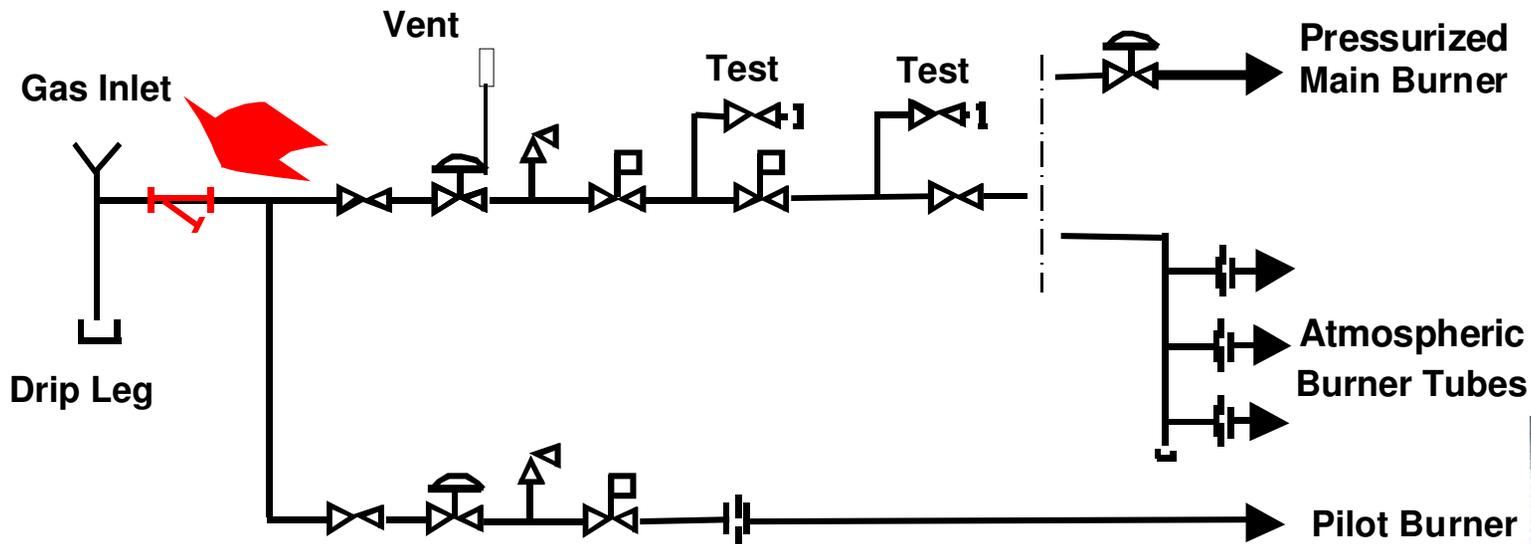
Part CF - Combustion Side Control Equipment



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CF- 130 - Filters or Strainers

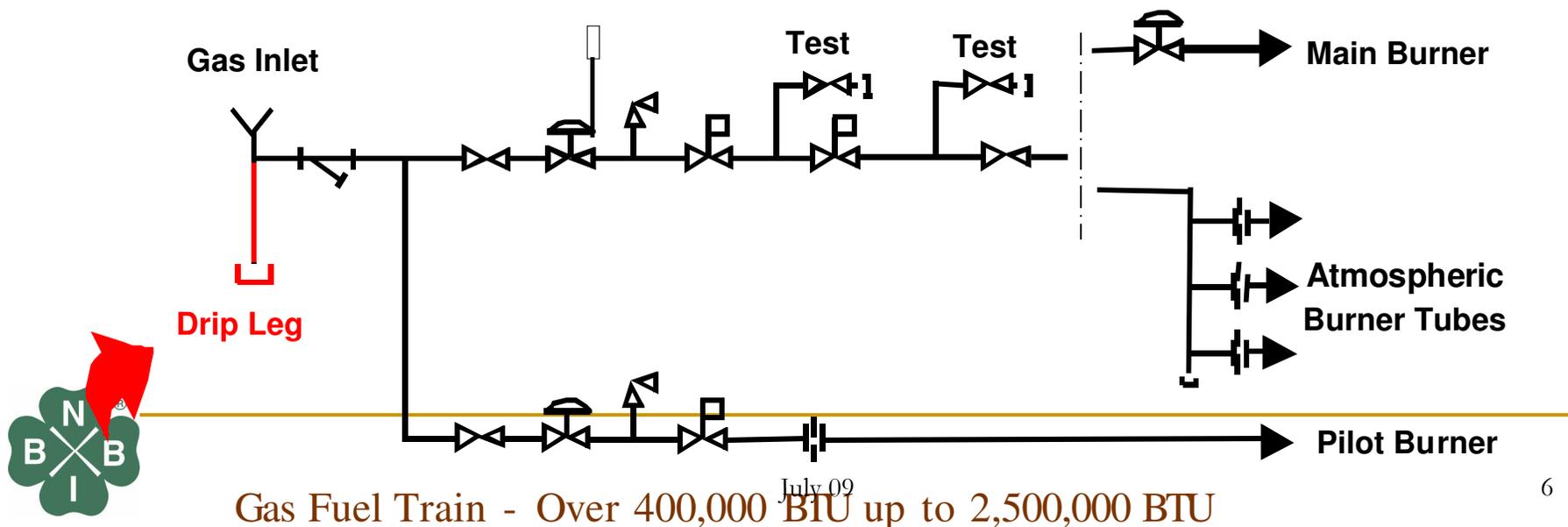
- Filters or strainers are recommended



Gas Fuel Train - Over 400,000 BTU up to 2,500,000 BTU July 09

CF-140 - Sediment Traps and Drips

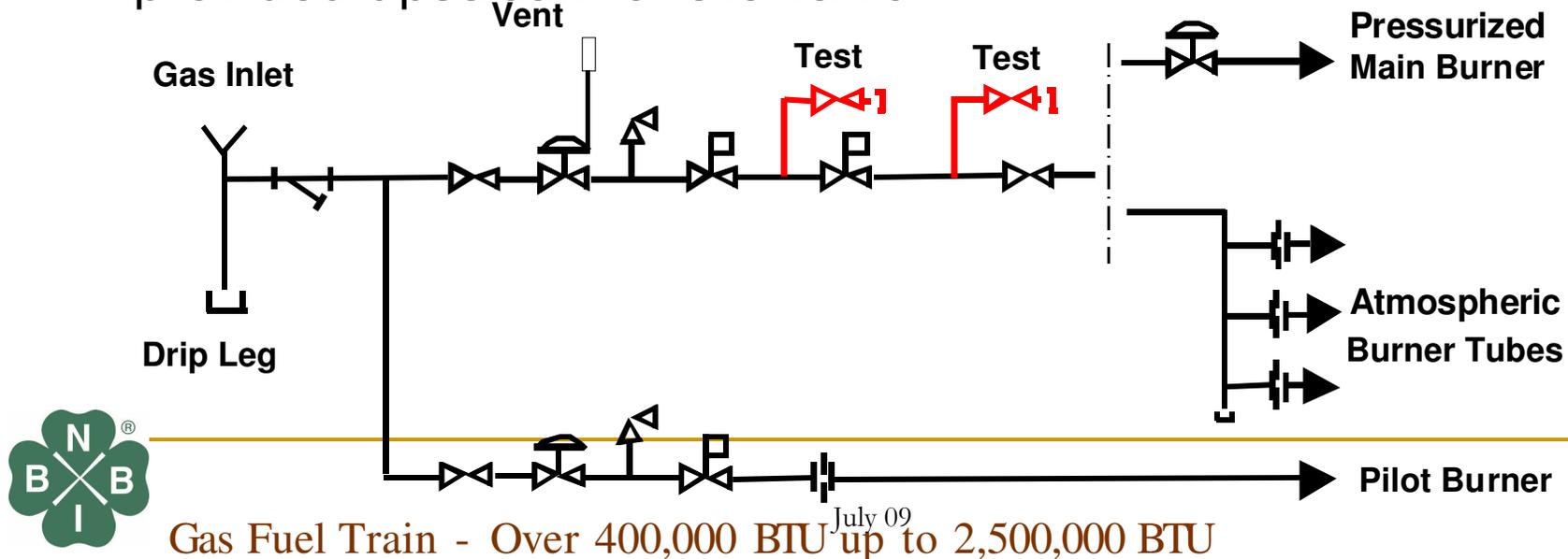
- A trap (Drip leg) shall be provided at the gas inlet connection to the boiler. The manufacturer shall either provide the trap or provide instructions to the installer.



Gas Fuel Train - Over 400,000 BTU up to 2,500,000 BTU

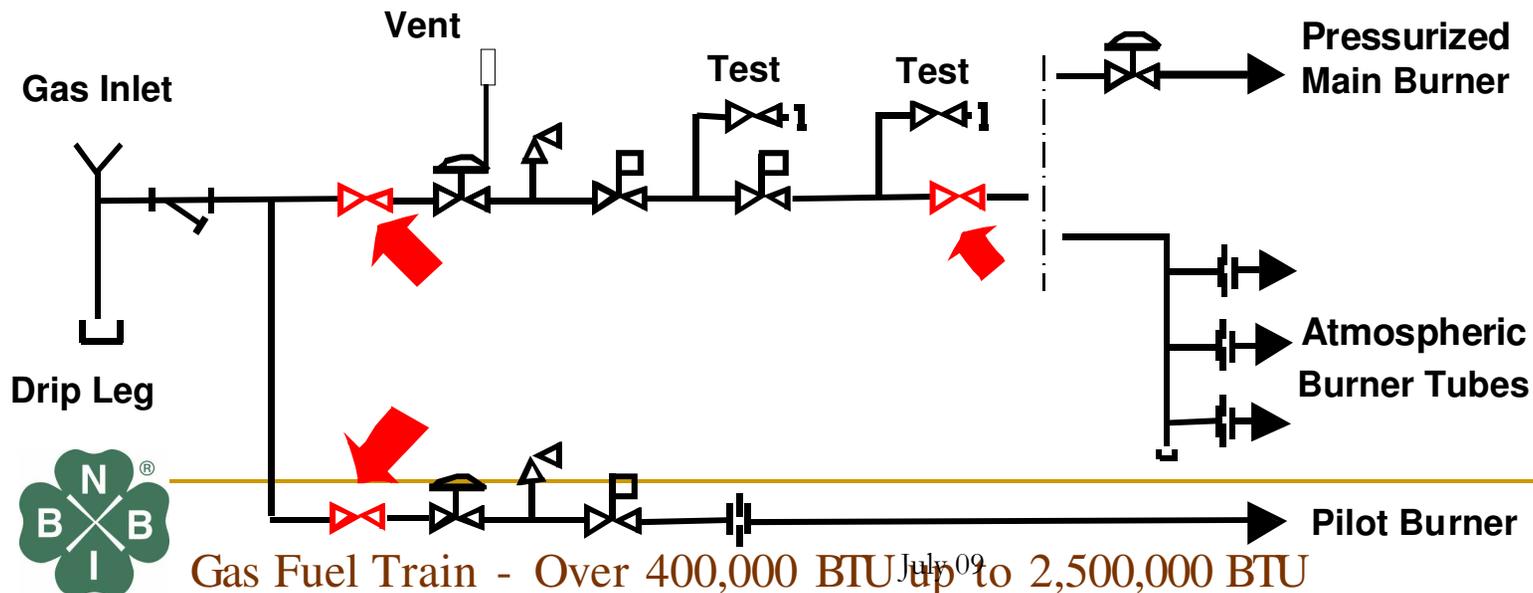
CF-150(d) - Manually Operated Leak Test Valve

- A manually operate leak test valve, NPS 1/8 minimum shall be provided, the outlet of which shall be plugged or capped. One shall be provided after the downstream safety shutoff valve. When two safety shutoff valves are provided, a leak test valve shall be provided upstream of the valve



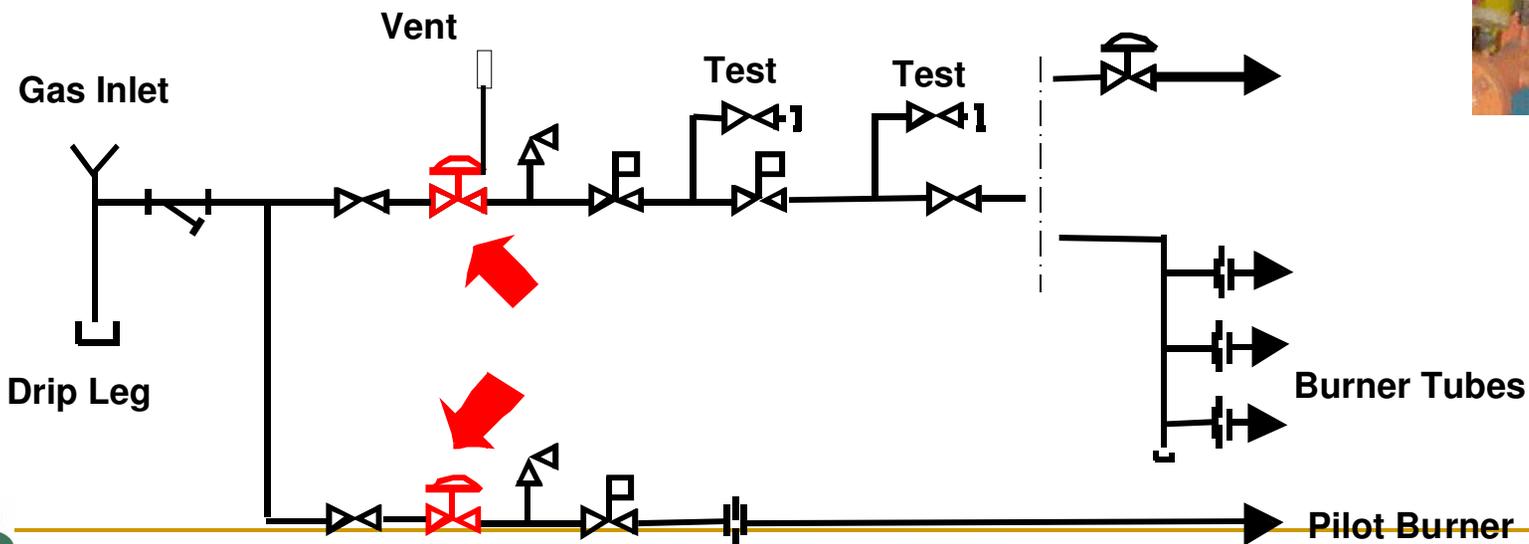
CF-150 - Manually Shutoff Valves

- Manually operated shutoff valves shall be provided upstream from all other main gas line controls
- Pilot gas supply shall be located upstream from the valve
- Valves shall be accessible (6 feet), indicate open/closed position, of ball or lubricated plug type and have handles permanently attached



CF-160 - Gas Pressure Regulators

- Both the main and pilot gas shall have a gas pressure regulator.
- The pressure at the outlet of the regulator shall be within 10% of the set point at all firing ranges.



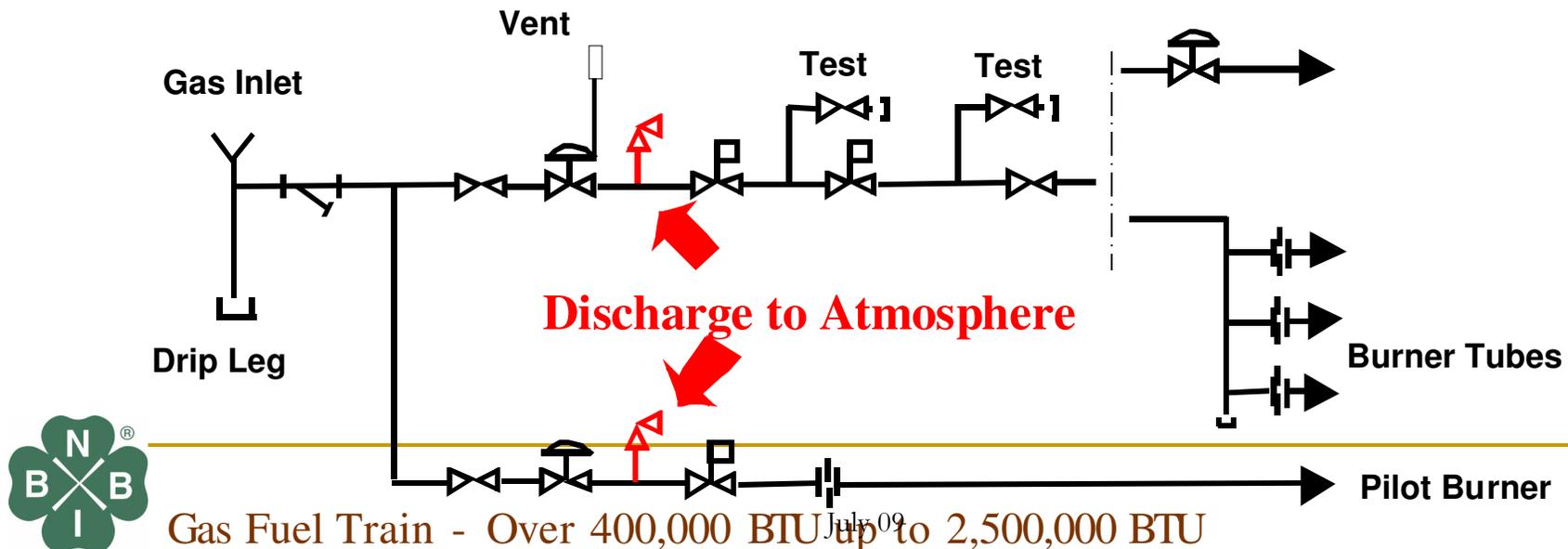
Gas Fuel Train - Over 400,000 BTU up to 2,500,000 BTU

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CF-161 - Overprotection Protection



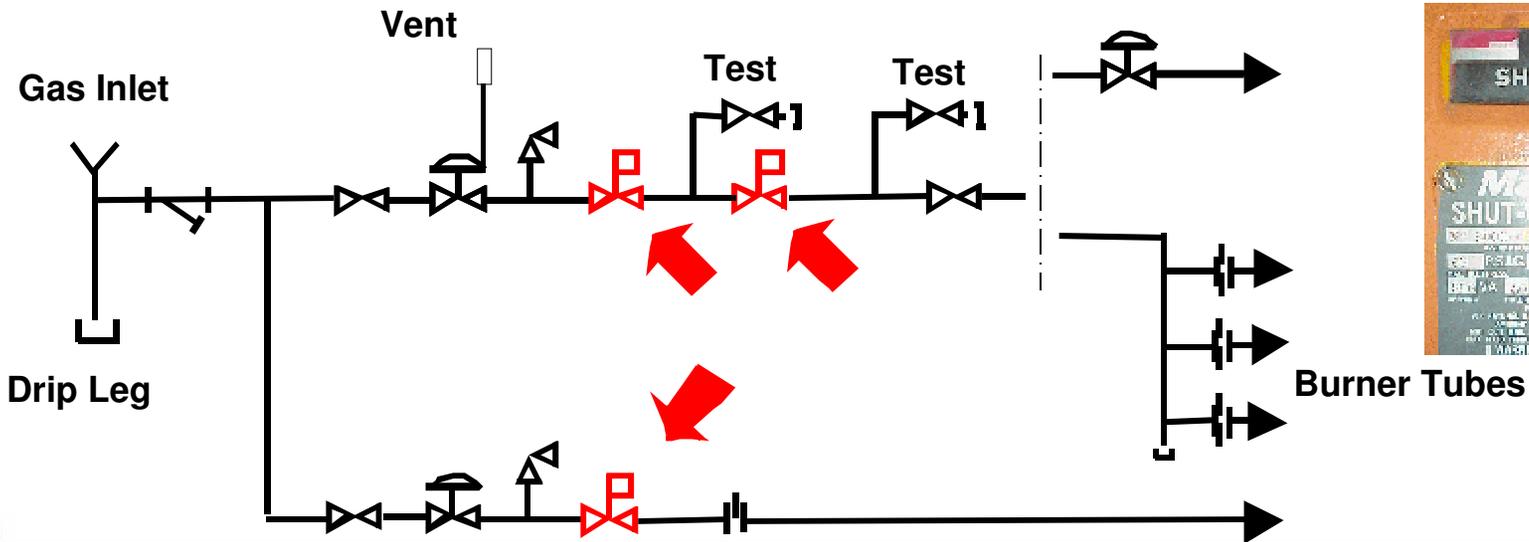
- When the rating pressure of any component is less than the gas pressure entering the building, gas pressure relief valves shall be provided, located upstream of all controls and downstream of the gas pressure regulator on both the main and pilot gas lines.



CF-180 - Safety Shutoff Valves



- Shall be either ANSI Z21.21 or UL 429 Rated
- Main burner - two required in series, one of which shall have proof of closure interlock function. May be in a common body; however, each shall have an independent operating shaft
- Pilot burner - one valve required.



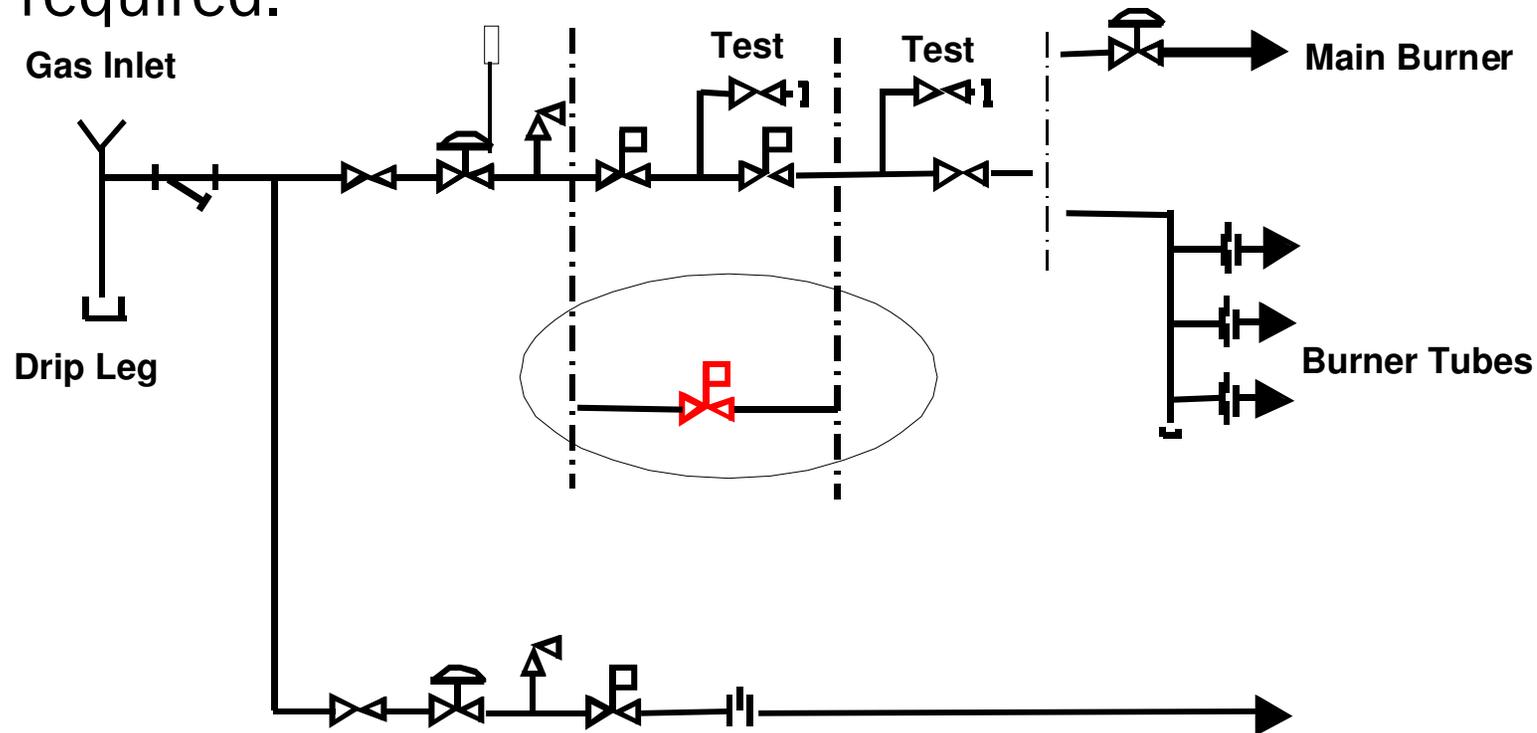
Gas Fuel Train - Over 400,000 BTU up to 2,500,000 BTU

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Alternate Arrangement 1



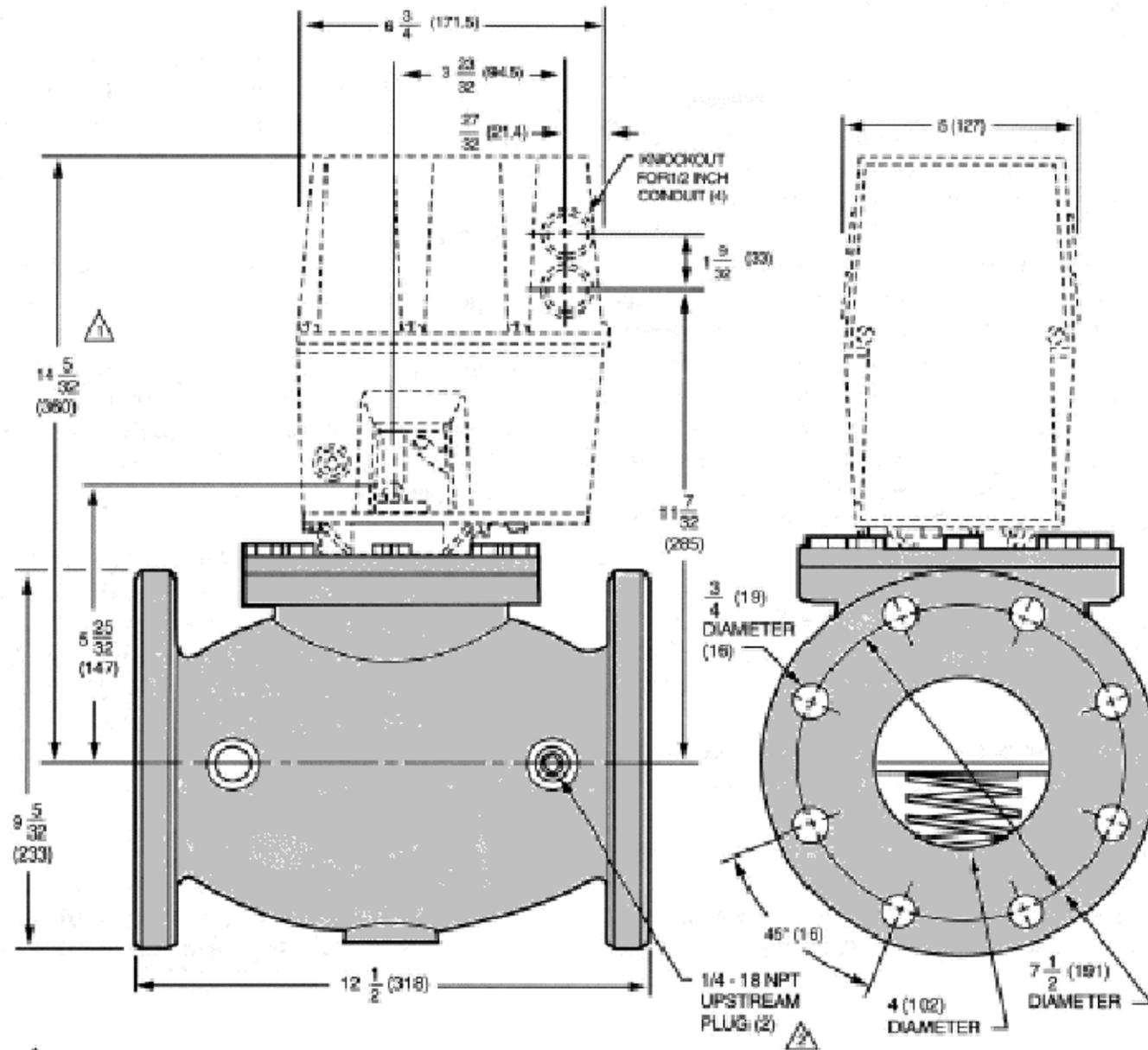
- One safety shutoff valve with proof of closure may be used in place of two safety shutoff valves.
- With this option, only one leak test provision required.



Gas Fuel Train - Over 400,000 BTU up to 2,500,000 BTU

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Fig. 3—Approximate dimensions of the 4 in. V5055 Valves with valve actuator in in. (mm).



△ ALLOW 2 IN. (51 mm) CLEARANCE ABOVE V4055 SO IT MAY BE REMOVED FROM VALVE.

△ DIMENSIONS ON DIN-APPROVED VALVES: 1/4 - 18 BSP PL UPSTREAM PLUG (2), .71 IN (18 mm) DIAMETER BOLT HOLE (16), 7.087 IN (180 mm) DIAMETER BOLT CIRCLE.

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Fig. 8—Proper positions of valve and bonnet seals in 3/4 through 3 in. valves.

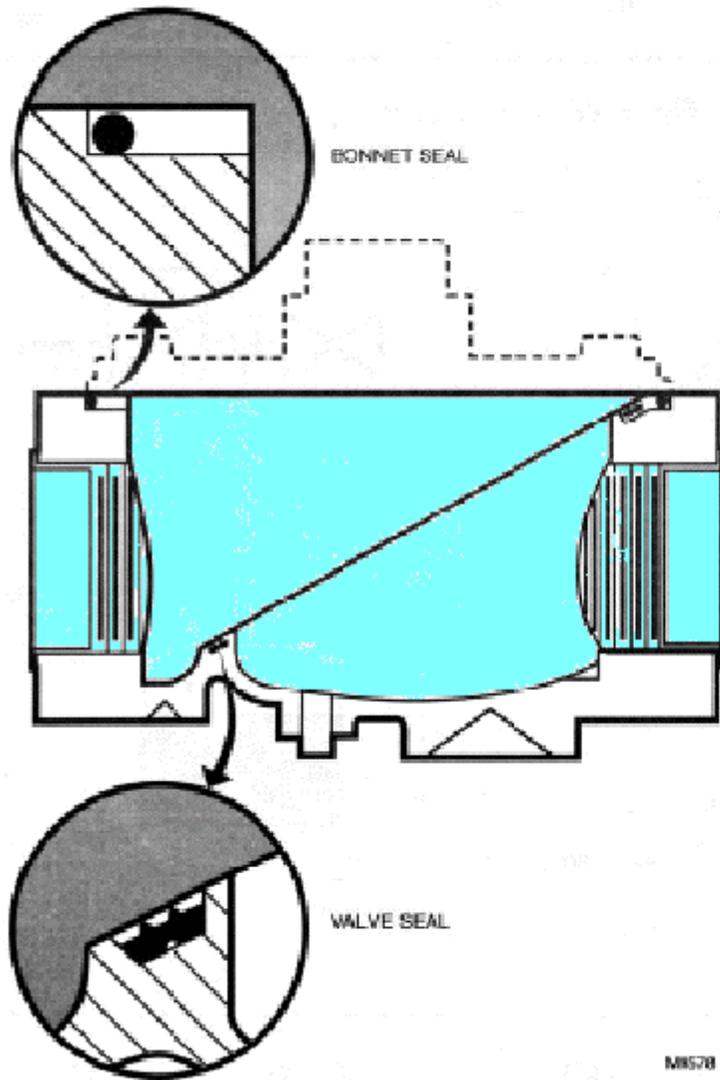
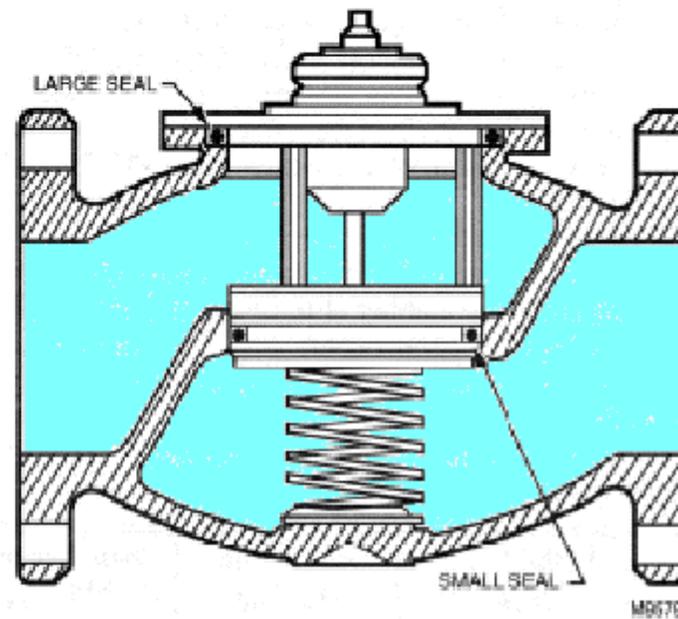
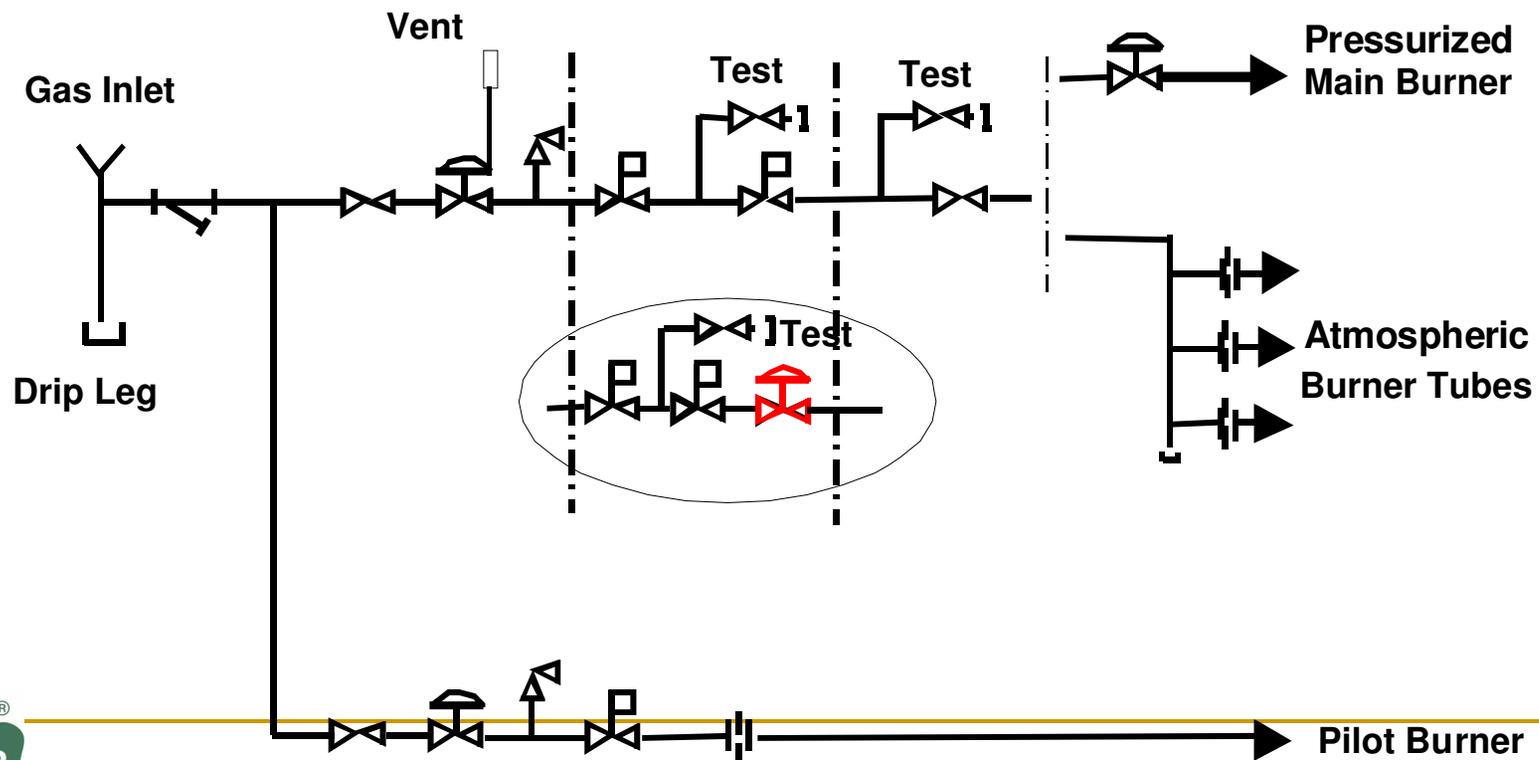


Fig. 9—Proper positions of valve and bonnet seals in 4 in. valve.



Alternate Arrangement 3

- One main gas pressure regulator may be located downstream of the safety shutoff valves.

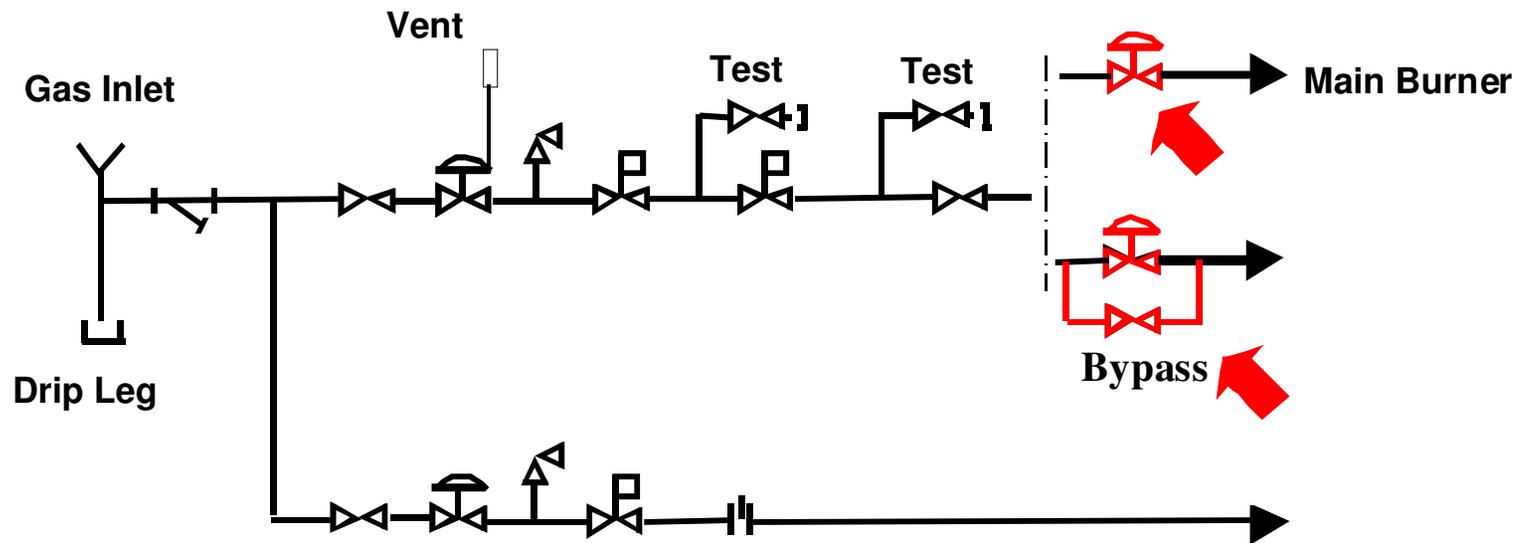


Gas Fuel Train - Over 400,000 BTU up to 2,500,000 BTU

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CF-170 - Control Valves

- An automatic input, completely closed, control valve may be combined with a safety shutoff valve.
- A bypass for a minimum flame may be provided around the control valve only.

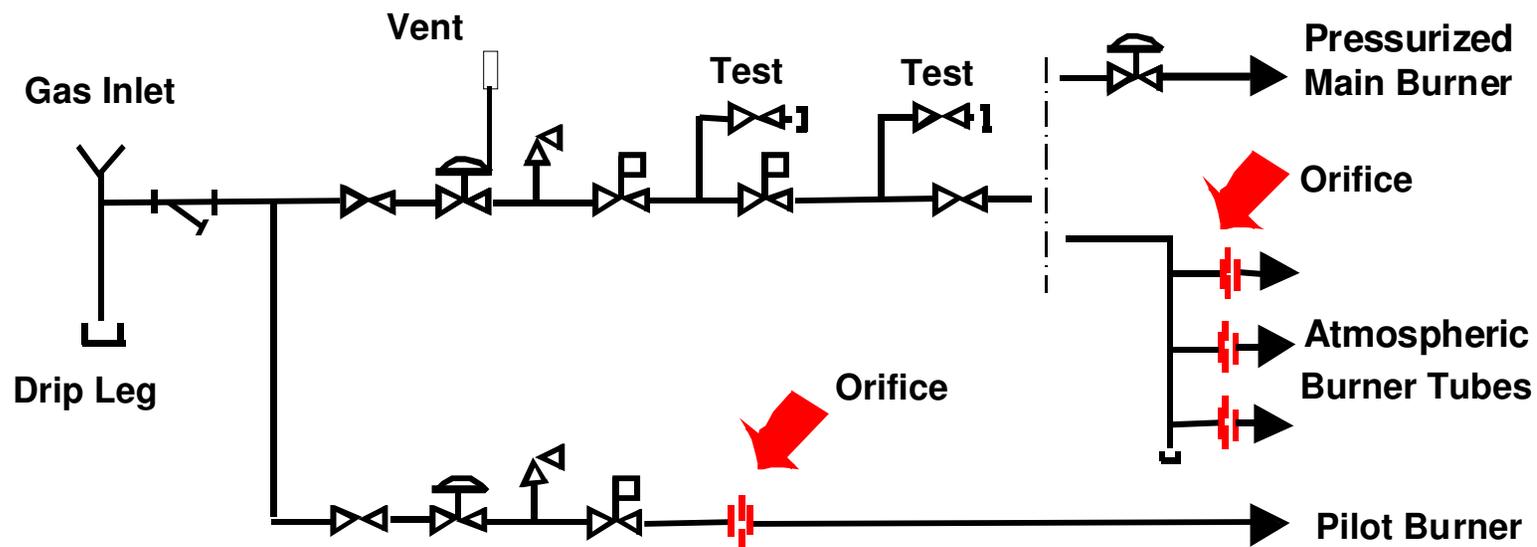


Gas Fuel Train - Over 400,000 BTU up to 2,500,000 BTU

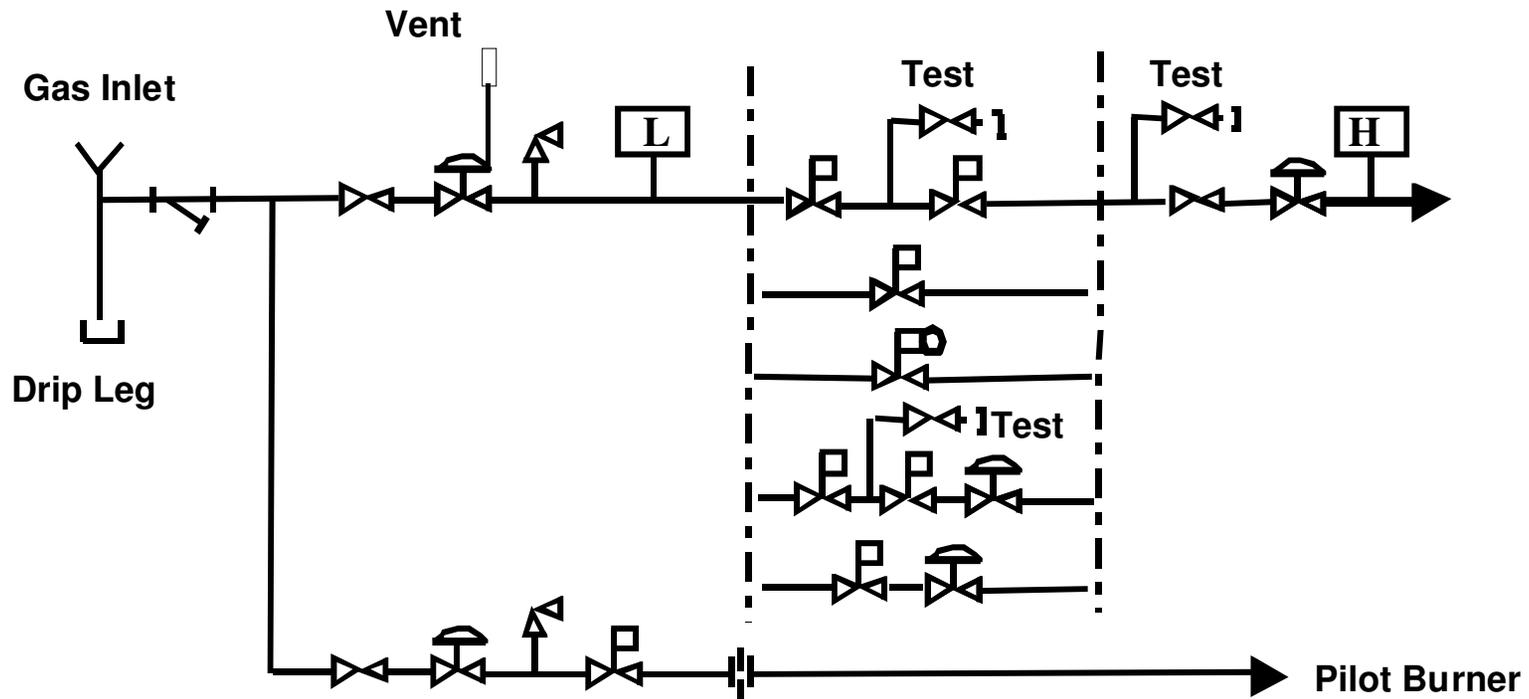


Orifice(s) - Illustrated in Figure B-1

- Not addressed within text



Automatically Gas-Fired Boiler Units

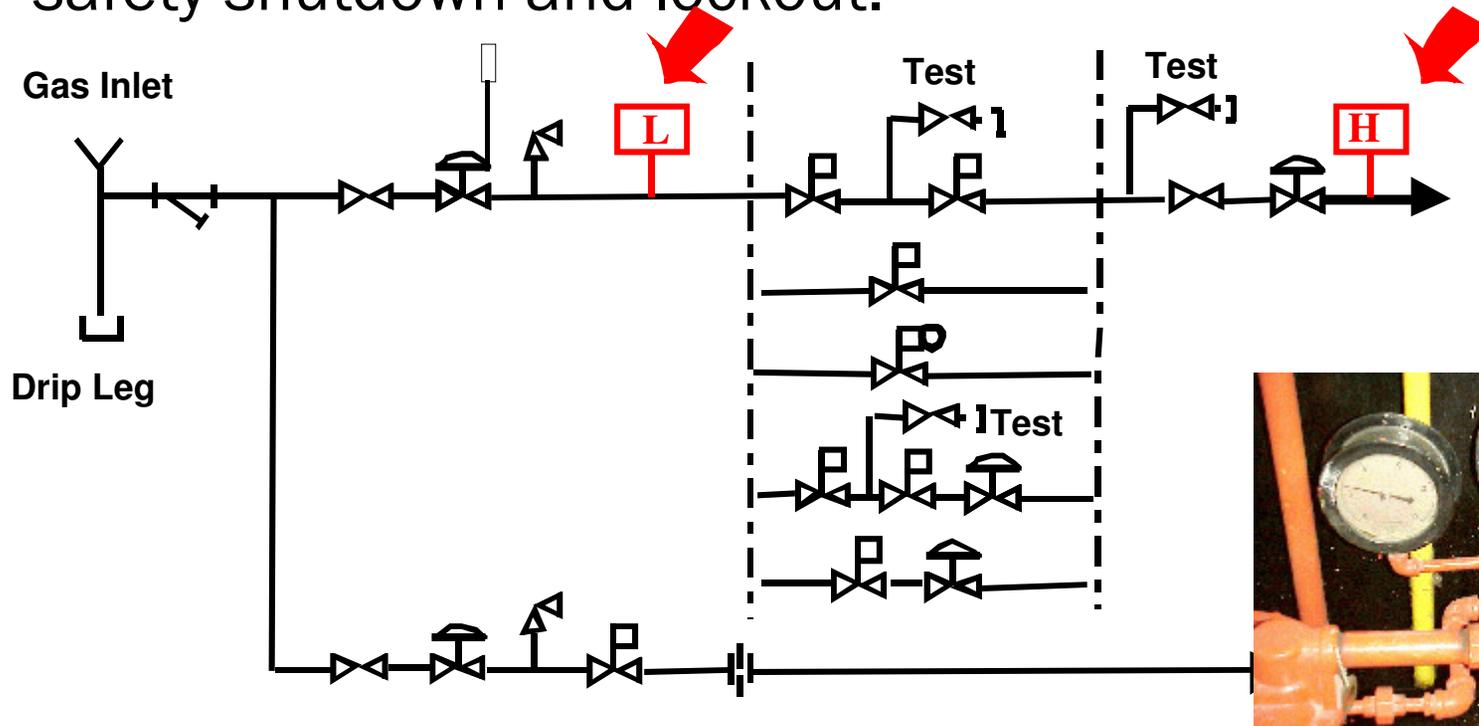
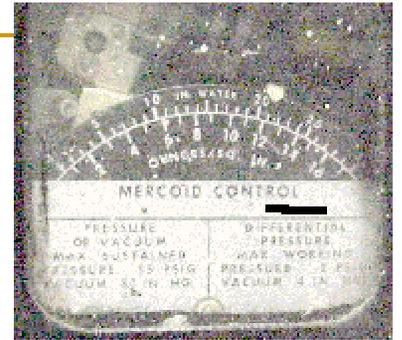


Gas Fuel Train - Over 2,500,000 BTU up to 5,000,000 BTU



CF-162 - & Table CF-2

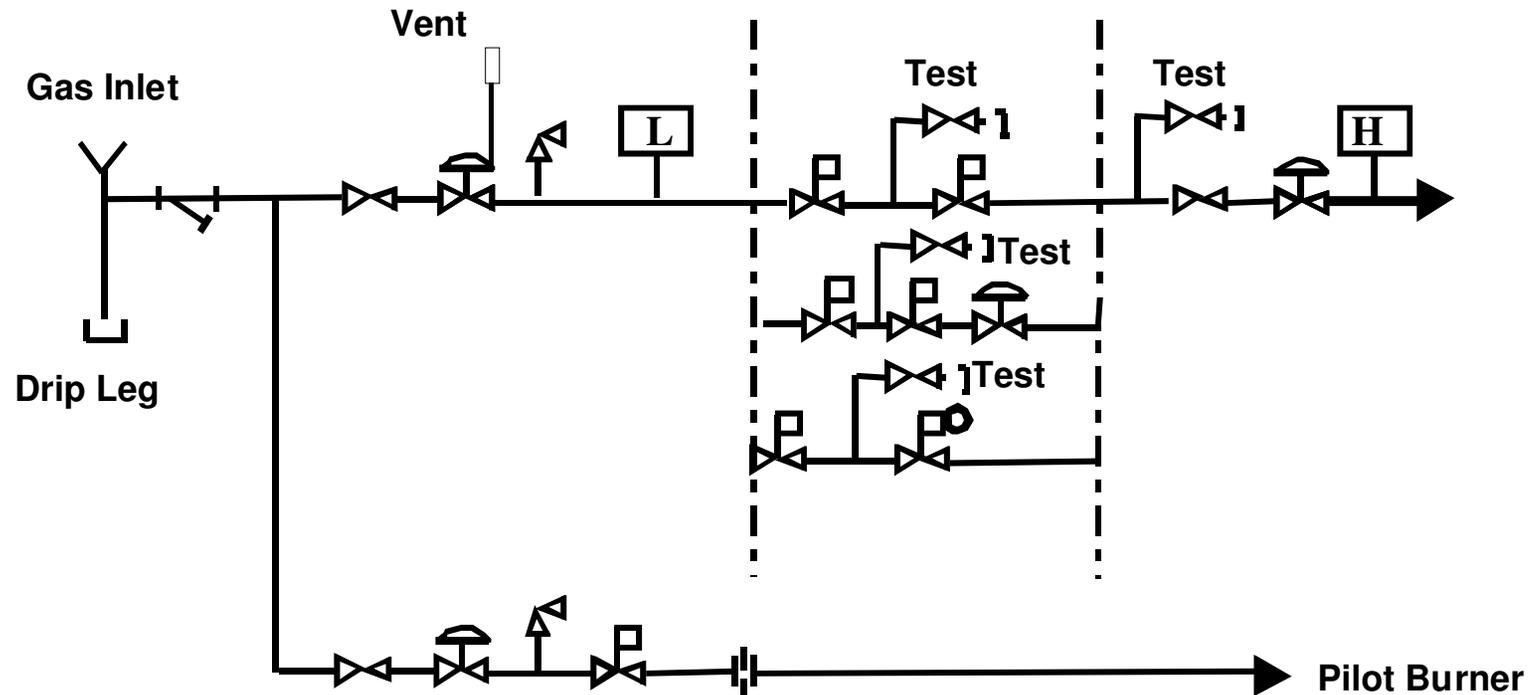
- High and low gas pressure switches are required and shall be arranged to cause a safety shutdown and lockout.



Gas Fuel Train - Over 2,500,000 BTU up to 5,000,000 BTU



Automatically Gas-Fired Boiler Units

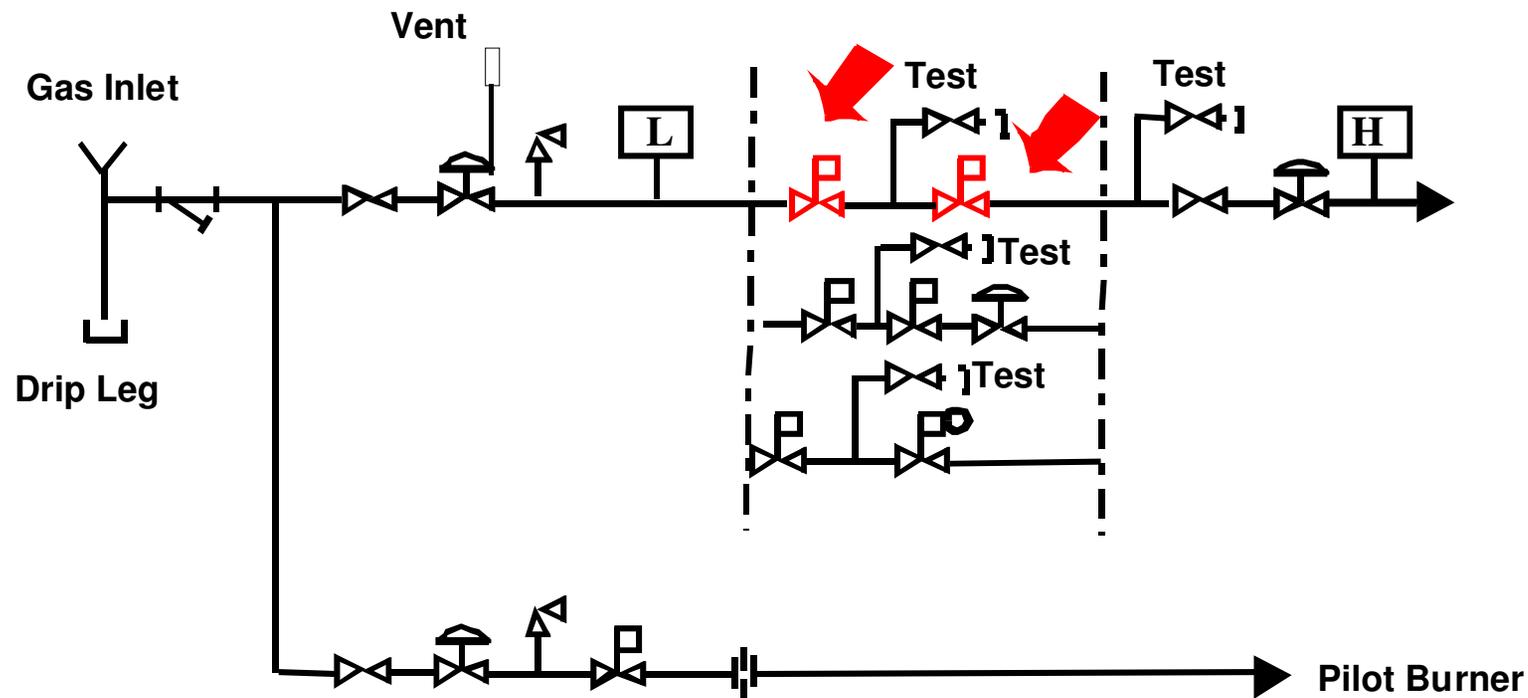


Gas Fuel Train - Over 5,000,000 BTU up to 12,500,000 BTU/hr



CF-180 - Safety Shutoff Valves

- Shall be either ANSI Z21.21 or UL 429 Rated
- Main burner - requires a safety shutoff valve and a second safety shutoff valve with proof of closure mounted in series.

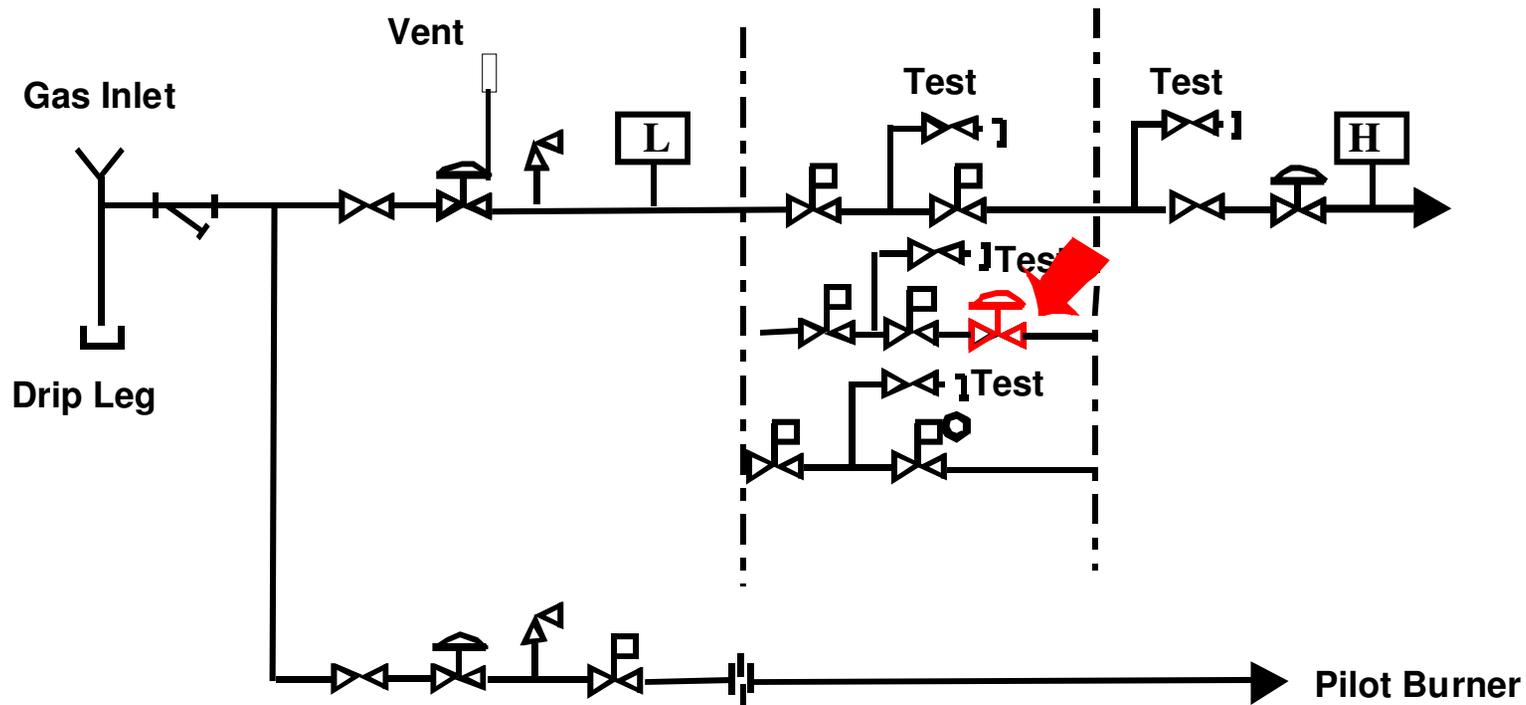


Gas Fuel Train - Over 5,000,000 BTU up to 12,500,000 BTU/hr



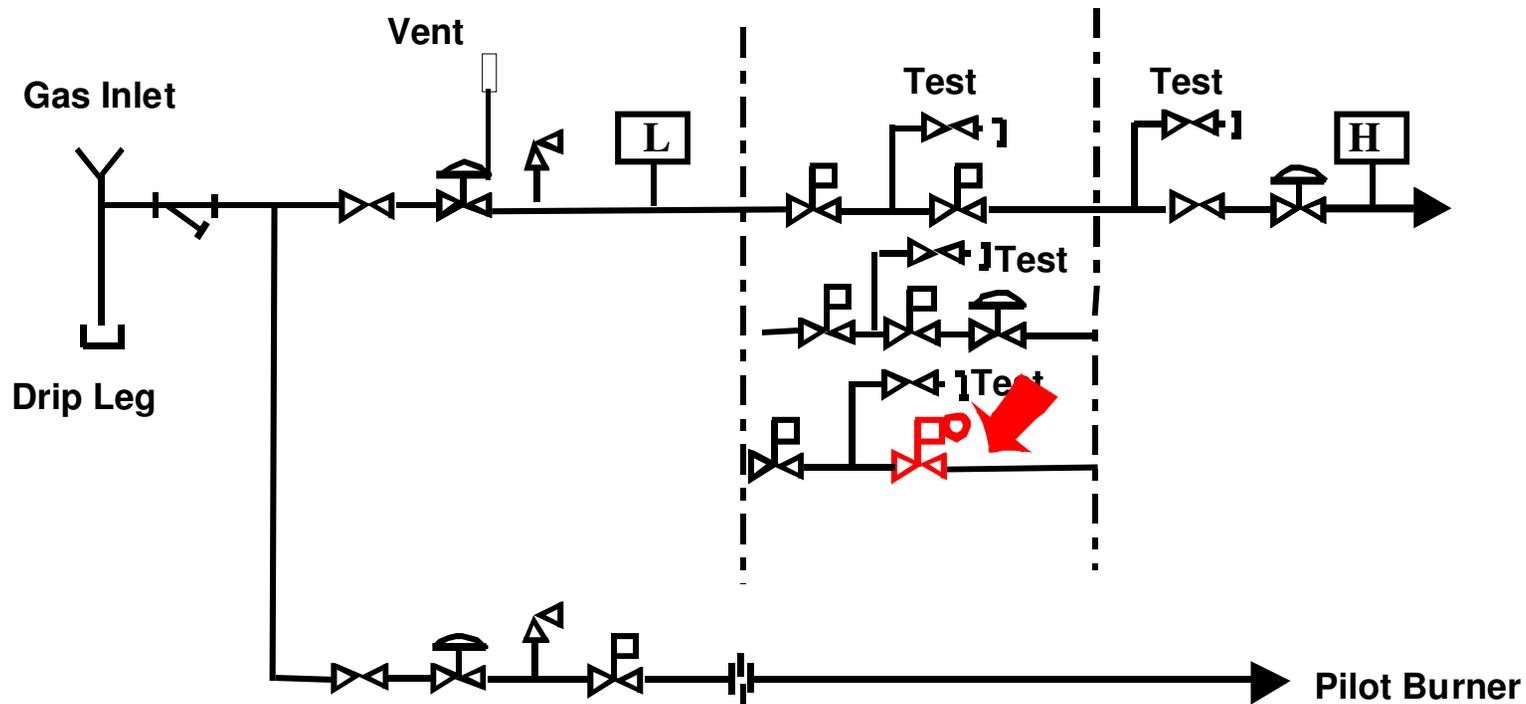
Alternate Arrangement 1

- A main gas pressure regulator may be located downstream of the shutoff valves



Alternate Arrangement 2

- A main gas pressure regulator/safety shutoff combination valve with proof of closure is permitted.



CF-110(b)

- Boilers having inputs less than 400,000 BTU/hr shall comply with ANSI Z21.13
- Shall comply with the provision for purging safety control timing action of flame failure loss of combustion air proving fuel supervision
- Listed in Tables CF-4 and CF-5



CF-210

■ Preignition Purging

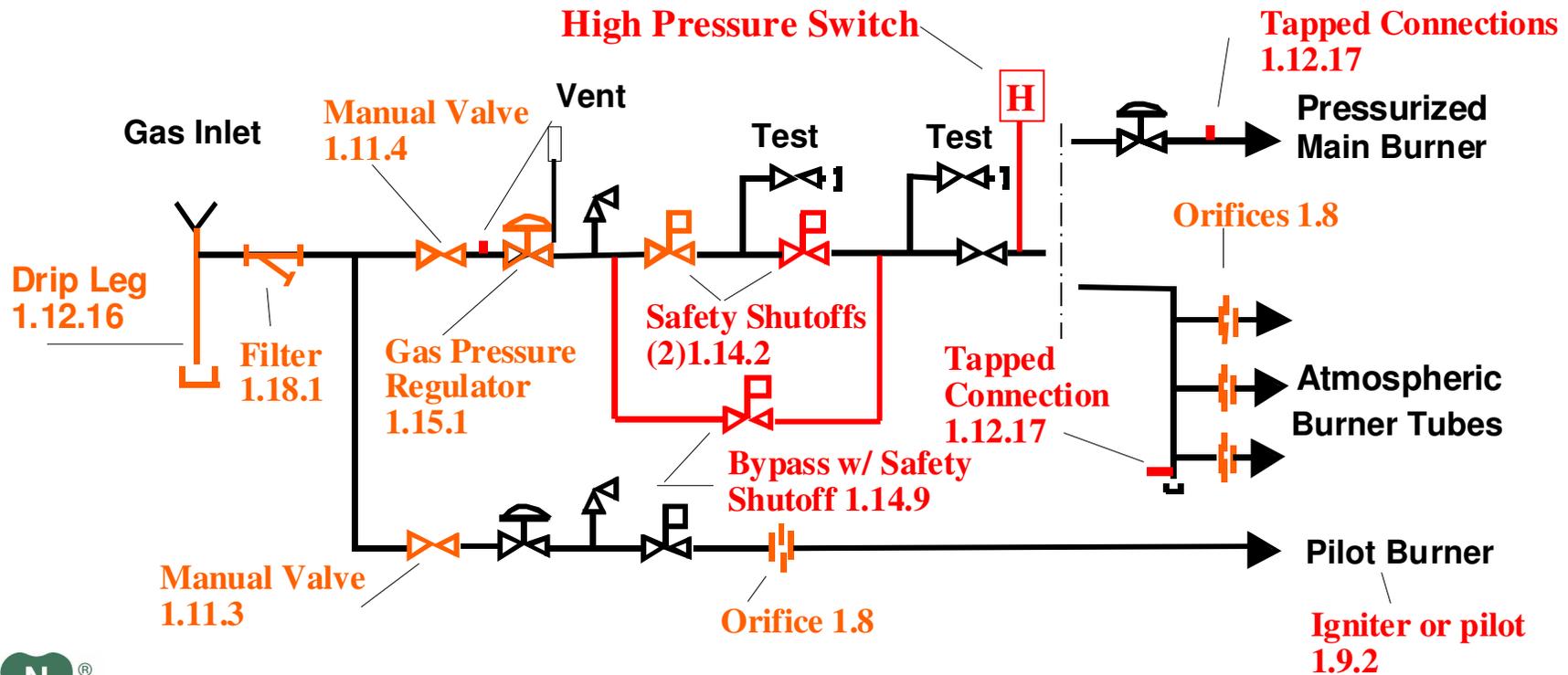
- ❑ Four air changes, with in 90 seconds (based on fire side volume) for forced draft/power burners
- ❑ Four air changes not less than 60% open damper and proven air (with an air switch, flow or pressure)
- ❑ For manually lit constant pilots 5 minutes minimum time specified by manufacturer . (Natural draft units)
- ❑ For natural draft using an auto damper/ shutter, it must be proven open for 90 seconds or meet Z21.13



Typical Arrangement Z21.13 up to 400,000 BTU/hr

- Additional:

- 1.12.1 requires piping to be steel
- 1.19.5 requires a temperature limiting device
- Note: Paragraph numbers shown above refer to Z-21.13 1991 Edition



Z21.13 and CSD-1

- Both Z21.13 and CSD-1 attempt to compare their rules for differences
 - Z21.13 states the differences to be as follows:
 - Fuel Train - Z21.13 does not provide a specific design for the fuel train; however, it does address a number of items which must be provided.
 - Low Gas Pressure switch - not required by Z21.13
 - Continuous pilots and intermittent ignition system - permitted on all boilers, evaluated by laboratory test for safe lighting
 - Ignition timings - evaluated by laboratory tests
 - Interlocking control for low fire starts - not required



Z21.13 and CSD-1

- CSD-1 makes its comparison and identifies the following differences:
 - Z21.13 is a performance based standard that requires testing and design certification of boiler burner units by an approved testing laboratory.
 - Ignition timing - CSD-1 establishes time by rule
 - All controls and safety devices covered by CSD-1 must be accepted and listed for the intended service by a nationally recognized testing agency.



Z21.13 and CSD-1

- Our review of both documents reveals a greater number of differences, mostly in the required hardware required as follows:
 - ❑ Z21.13 requires tapped connections be provided to permit installation of pressure gages so that the gas pressure can be observed at both ends of the gas train
 - ❑ Z21.13 requires two safety shutoff valves in series
 - ❑ Z21.13 permits a bypass around the safety shutoff valves, but requires that the valve be a safety shutoff valve
 - ❑ Z21.13 requires the piping to be steel
 - ❑ Z21.13 requires a temperature cutoff device

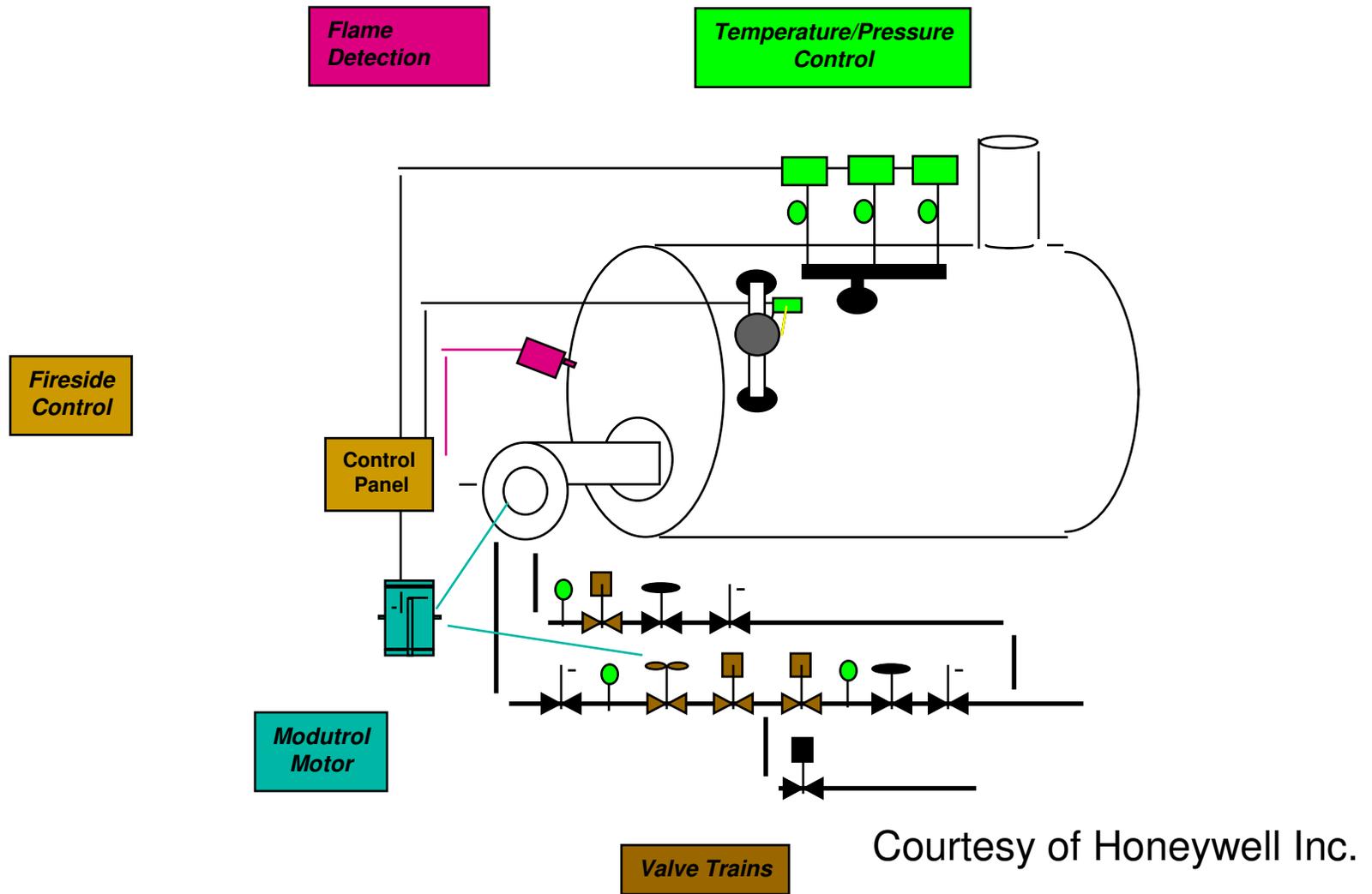


CF-300 Gas-Fired Boiler Units, Safety Controls

- CF-310 Primary Safety Control (Flame Safe Guard)
 - ❑ Will operate to timings listed in Tables CF-1 through CF-4
 - ❑ Listed or labeled
 - ❑ Require manual resets

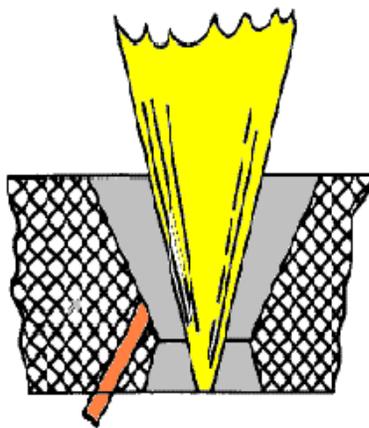


Diagram of Typical FSG System



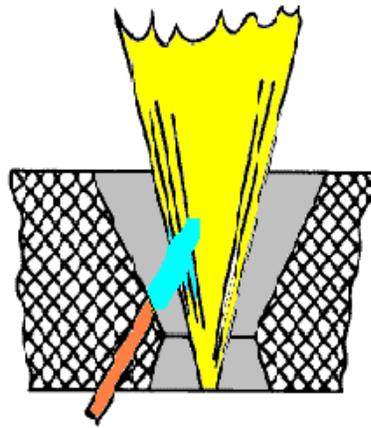
CF-330 - Action on Flame Failure (Gas Burners)

- < 2,500,000 BTU input can recycle one time before lockout, provided preignition purge in accordance with CF-210 OR
- Natural draft with 5 minute delay timer before restart
- > 2,500,000 BTU input locks out on flame failure



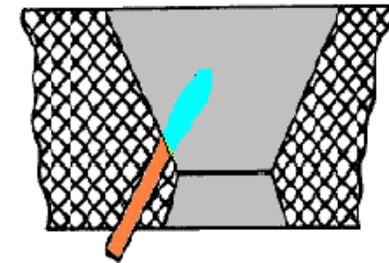
INTERRUPTED PILOT

Pilot employed for seconds only. Burner fires after ignition without pilot.



INTERMITTENT PILOT

Pilot ignites fuel and continues to burn during firing cycle. Burner and pilot off simultaneously.



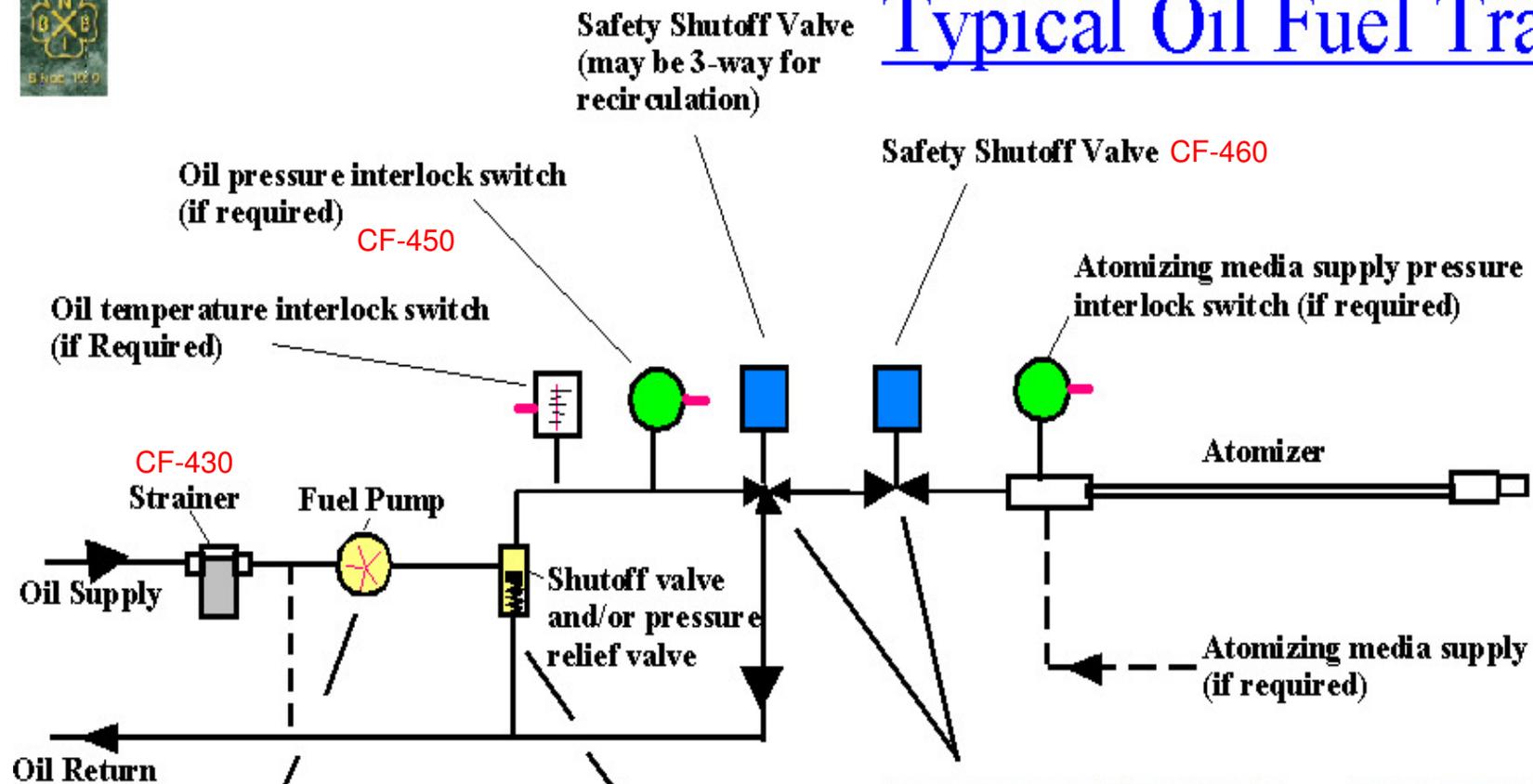
CONTINUOUS PILOT

One ignited pilot burns continuously whether burner is firing or off thus providing protection against unburned gases entering furnace.





Typical Oil Fuel Train



Typical Oil Fuel Train

- Oil pressure interlock switch - CF-450(a)
- Atomizing media supply pressure interlock switch - CF-450(b)
- Oil temperature interlock switch - CF-450(c)



Added to CF in 09

- CF-610 Low fire start
 - > 2,500,000 BTU or 20 gph input requires low fire start unless listed/labeled (Proven otherwise)
- CF-710 Burner Assemblies
 - >400,000 BTU or 3 gph shall meet CSD-1 and shall be listed/labeled
- CF-910 Gas Modular Boilers (CG-140 a)
- CF-920 Oil Modular Boilers (CG-140 b)
- CF-930 Electric Modular Boilers (CG-140 c)



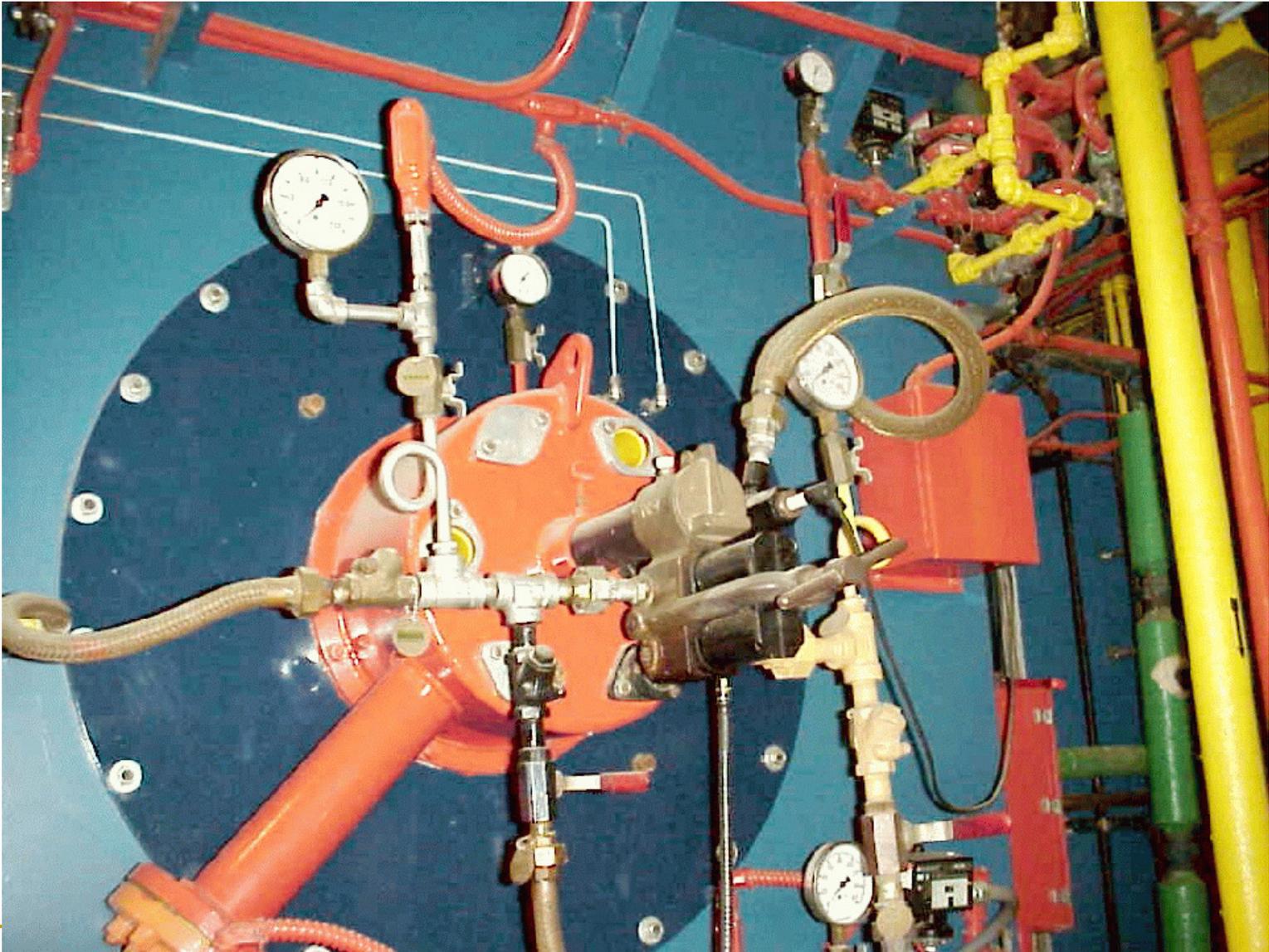
Atomizing Media

Steam

Plant Air

Compressor





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Questions

