

SAFETY SHUTOFF VALVES FOR FUEL-FIRED HEATING EQUIPMENT

ALLIANZ RISK CONSULTING



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INTRODUCTION

Explosion and fire are inherent hazards associated with fuel-fired heating equipment, such as boilers, ovens, dryers, and furnaces, especially during startup and shutdown. The leading causes of fires and explosions are lack of proper controls and safety devices, lack of adequate maintenance, improperly trained operators, failure to test controls and safety devices, and complacency on the part of the operator due to long periods of trouble-free operation.

While there are many safety devices required by codes and standards to ensure the safe operation of fuel-fired heating equipment, the safety shutoff valve (SSOV) serves as a key safety control device to prevent the flow of gas or oil into the combustion chamber when the equipment is shutdown or an abnormal condition occurs.

The SSOV may be operated hydraulically, pneumatically or by a solenoid valve. Some valves are available with a proof-of-closure interlock, which uses an overtravel switch to verify the valve is closed before the purge and ignition cycles can begin. Another means for verifying the valve is

closed is a valve proving system. This system utilizes a pump to pressurize the piping between two SSOVs and the pressurized gas is monitored for leakage. All SSOVs and valve proving systems should be listed or approved.

Allianz Risk Consulting recommends SSOVs for fuel-fired heating equipment be installed and maintained in accordance with applicable National Fire Protection Association (NFPA) and American Society of Mechanical Engineers (ASME) codes and standards. All local codes and standards should also be followed.

BOILERS

The requirements for automatically fired boilers with a fuel input rating less than 12.5 million Btu/hr (3.7 MW) are covered by ASME CSD-1, *Controls and Safety Devices for Automatically Fired Boilers*.

NFPA 85, *Boiler and Combustion Systems Hazards Code*, establishes the minimum requirements for boilers with a fuel input rating of 12.5 million Btu/hr (3.7 MW) or greater.

The tables below indicate the SSOV requirements for gas and oil-fired boilers based on the fuel input rating.

GAS-FIRED BOILERS:

Fuel Input Rating	SSOV Requirement
≤ 5,000,000 (1.5 MW)	Two SSOVs
> 5,000,000 (1.5 MW) to < 12,500,000 (3.7 MW)	Two SSOVs (one with proof-of-closure)
≥ 12,500,000 (3.7 MW)	Two SSOVs (both with proof-of-closure) with automatic vent valve* between two valves that terminates outdoors

* Automatic vent valve may be omitted when a listed automatic valve-proving system is used

OIL-FIRED BOILERS:

Fuel Input Rating	SSOV Requirement
< 12,500,000 Btu/hr (3.7 MW)	Two SSOVs or one SSOV and nozzle cutoff valve
≥ 12,500,000 Btu/hr (3.7 MW)	Two SSOVs (both with proof-of-closure)

OVENS, DRYERS & FURNACES

NFPA 86, *Standard for Ovens and Furnaces*, establishes the minimum SSOV requirements for ovens, dryers, and furnaces.

GAS-FIRED OVENS, DRYERS, & FURNACES:

Two SSOVs are required; however, only one SSOV is required for radiant tube-fired burner systems where either of the following conditions is satisfied:

- The system is open at one or both ends.
- The system is validated explosion resistant.

OIL-FIRED OVENS, DRYERS, & FURNACES:

One SSOV is required; however, two SSOVs are required where any one of the following conditions exists:

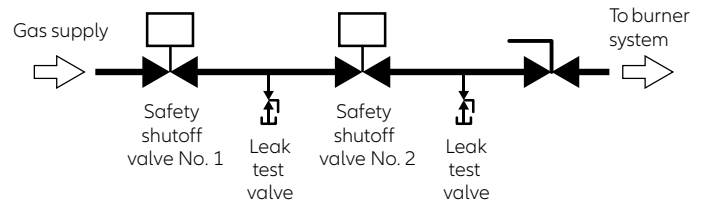
- The pressure is greater than 125 psi (862 kPa).
- The fuel oil pump operates without the main oil burner firing, regardless of the pressure.
- The fuel oil pump operates during the fuel gas burner operation of combination gas and oil burners.

If two SSOVs are required and the fuel input rating exceeds 400,000 Btu/hr (117 kW), at least one valve shall have proof-of-closure and be interlocked with the preignition purge interval.

LEAKAGE TESTING OF GAS SAFETY SHUTOFF VALVES

Since valve seats can deteriorate over time, they require periodic testing to ensure gas is not leaking through the valve. SSOV leakage testing, also known as bubble testing, is required at least annually by trained personnel in accordance with the manufacturer's instructions.

The figure below shows an example installation of leak test valves:



Source: NFPA 86, *Standard for Ovens and Furnaces*

Care should be exercised when performing leakage testing since flammable gases will be released into the local area.

In addition, all safety interlocks require functional testing at least annually.

REFERENCES

NFPA 85, *Boiler and Combustion Systems Hazards Code*

NFPA 86, *Standard for Ovens and Furnaces*

ASME CSD-1, *Controls and Safety Devices for Automatically Fired Boilers*

QUESTIONS OR COMMENTS?

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