
Boiler Room Natural Gas Leak Detection And Safety Protocol

1.0 Maintenance Objective & Frequency

The objective of this procedure is to verify the functionality and calibration of all fixed and portable natural gas detection systems in the boiler room, ensure emergency shutdown valves operate correctly, and confirm that no gas leaks exist at any pipe joints, valves, or burner components. This protocol prevents catastrophic explosions, protects personnel, and maintains compliance with CSA B149.1 and TSSA regulations.

Frequency: Monthly visual inspection and functional test of gas detectors; quarterly calibration of all gas sensors; annual full system test including emergency shutdown valve actuation and leak survey using a calibrated gas sniffer.

2.0 Lockout/Tagout (LOTO) & Safety

- **Electrical Isolation:** Disconnect main boiler control panel power and apply personal lock. Also isolate power to the gas detection panel if required for sensor replacement.
- **Gas Isolation:** Close the manual gas shut-off valve upstream of the boiler train. Install a lockable valve tag. Do not rely on automatic valves for isolation.
- **Pneumatic Isolation:** If the boiler uses pneumatic gas valve actuators, isolate and bleed the compressed air supply.
- **Mandatory PPE:** Safety glasses, flame-resistant coveralls, steel-toed boots, and nitrile gloves. Use a calibrated gas sniffer (0-100% LEL) continuously during the procedure.
- **Ventilation:** Ensure the boiler room ventilation system is operational. If any gas smell is detected, evacuate immediately and follow emergency procedures.

3.0 Required Tools, Parts & Lubricants

- Calibrated gas sniffer (0-100% LEL methane) with current calibration certificate
- Calibration gas cylinder (50% LEL methane in air) with regulator and tubing
- Digital multimeter (Fluke 87 or equivalent) for sensor output verification
- Adjustable wrench (10 inch) for gas valve fittings
- Soap-and-water solution in spray bottle for leak detection
- Replacement gas sensor cartridges (if sensor fails calibration)
- Lockout/tagout kit with padlocks, hasps, and tags
- ServiceGrid mobile device or tablet for digital PM logging

4.0 Step-by-Step Maintenance Procedure

1. Perform LOTO on the boiler control panel and close the manual gas shut-off valve. Verify zero gas flow using the gas sniffer at the downstream test port.
2. Inspect all gas detection sensors for physical damage, corrosion, or debris. Ensure sensor caps are clean and unobstructed. Replace any damaged sensors.

3. Using the gas sniffer, scan all gas pipe joints, valve stems, flanges, and burner components. Pay special attention to the gas train, including the safety shut-off valves and pressure regulators. Record any readings above 0% LEL.
4. If any leak is detected (reading >0% LEL), apply soap-and-water solution to pinpoint the source. Bubbles indicate a leak. Tighten fittings to 25 Nm (if accessible) or replace gaskets as needed. Re-test with gas sniffer.
5. Calibrate each fixed gas detector by applying calibration gas at 50% LEL to the sensor. Adjust the sensor span potentiometer (or digital calibration routine) until the display reads 50% LEL $\pm 2\%$. Document the pre- and post-calibration readings.
6. Test the alarm functionality of each detector: apply calibration gas until the alarm setpoint (typically 20% LEL) is reached. Verify that the local alarm horn and remote annunciator activate. Silence and reset per manufacturer instructions.
7. Test the emergency shutdown (ESD) system: simulate a gas alarm by applying calibration gas to a sensor. Verify that the automatic gas shut-off valve closes within 5 seconds and that the boiler control panel indicates a fault. Reset the ESD system.
8. Inspect the manual gas shut-off valve for smooth operation. Open and close the valve fully three times. Ensure the valve handle is in the open position after testing.
9. Check the boiler room ventilation system: verify that the exhaust fan operates and that the fresh air intake is unobstructed. Measure airflow at the exhaust grille (minimum 0.5 m/s).
10. Remove LOTO, restore power to the boiler control panel, and open the manual gas shut-off valve. Purge the gas line for 2 minutes to remove any air.
11. Perform a final gas sniffer scan of all joints and components with the system pressurized. Confirm zero detectable leaks.

5.0 Verification & Return to Service

1. Initiate a normal boiler start sequence. Verify that the burner ignites smoothly and that the flame signal is stable (minimum 2.5 VDC on UV scanner).
2. Monitor the gas pressure at the burner inlet during operation. Pressure should be within the manufacturer's specified range (typically 5-10 inches WC).
3. Verify that all gas detection sensors read 0% LEL during normal operation. Confirm that the alarm system is armed and functional.
4. Complete the PM work order in ServiceGrid, attaching calibration certificates and any sensor replacement records. Note any corrective actions taken.
5. Sign off on the work order and notify the shift supervisor that the boiler room is safe for operation.

Regulatory Disclaimer: This document is a generic maintenance template provided for educational and informational purposes only. It does not constitute professional engineering or reliability advice. The end-user assumes all liability for validating all step sequences, torque specs, and LOTO protocols against specific machinery OEM manuals before deployment to a live production floor.