

Make Up Air Unit (MUA) Gas Burner Inspection and Combustion Analysis

1.0 Maintenance Objective & Frequency

The objective of this procedure is to perform a thorough inspection and combustion analysis on the Make Up Air Unit (MUA) gas burner to ensure safe, efficient operation, prevent flame rollouts, reduce CO emissions, and maintain optimal combustion efficiency. This PM is critical for preventing nuisance shutdowns, gas valve failures, and heat exchanger damage.

Frequency: Annually (or per OEM recommendation) and after any major burner component replacement (e.g., gas valve, igniter, flame sensor). For units operating more than 6000 hours per year, consider semi-annual intervals.

2.0 Lockout/Tagout (LOTO) & Safety

- **Electrical Isolation:** Disconnect and lock out the main disconnect switch for the MUA unit. Verify zero voltage using a calibrated voltmeter.
- **Gas Isolation:** Close the manual gas shut-off valve upstream of the unit. Install a lockable gas valve tag and personal lock. Purge the gas line downstream of the valve by opening the bleed port (if equipped) until no gas odor is detected.
- **Mechanical Isolation:** Ensure the supply fan and exhaust fan (if applicable) are locked out and cannot be energized.
- **Mandatory PPE:** Safety glasses, flame-resistant coveralls, leather work gloves, and hearing protection. For combustion analysis, use a calibrated combustion analyzer with a CO sensor.
- **Confined Space:** If accessing the burner through a confined space entry, follow your facility's confined space entry permit procedure.

3.0 Required Tools, Parts & Lubricants

- Combustion analyzer (calibrated, with O₂, CO, CO₂, NO_x, and efficiency calculation capability)
- Manometer (0-20 inches w.c.) for gas pressure measurement
- Multimeter (True RMS, CAT III rated)
- Socket set (metric and imperial, 1/4 to 3/4 inch)
- Allen key set (metric, 2-10mm)
- Torque wrench (0-100 in-lbs and 0-50 ft-lbs)
- Wire brush (stainless steel, 1 inch wide)
- Fine grit sandpaper (220 grit)
- Replacement gaskets for burner access panels (if applicable)
- High-temperature anti-seize compound (e.g., Never-Seez)
- Gas leak detection solution (e.g., Snoop)
- Replacement flame sensor (if inspection shows wear or pitting)
- Replacement igniter (if spark gap is out of spec or ceramic cracked)

4.0 Step-by-Step Maintenance Procedure

1. Perform LOTO as per Section 2.0. Verify zero energy state on all isolation points.
2. Remove the burner access panels. Use a socket or Allen key as required. Set panels aside in a clean area.
3. Visually inspect the burner head, flame retention ring, and burner tiles (if applicable) for cracks, warping, or carbon buildup. Use a wire brush to remove any loose carbon deposits. Replace any cracked tiles.
4. Inspect the igniter: Check the spark gap (typically 3-4mm or per OEM spec). Clean the electrode with fine sandpaper. Replace if the ceramic is cracked or the electrode is eroded beyond 50% of original thickness.
5. Inspect the flame sensor: Remove the flame sensor. Clean the sensing rod with fine sandpaper until bright metal is visible. Check for pitting or corrosion. Replace if pitted or if the ceramic insulator is cracked.
6. Inspect the gas valve train: Check the manual shut-off valve, gas pressure regulator, and safety shut-off valves for leaks using gas leak detection solution. Verify that all valve actuators operate freely. Torque any loose fittings to OEM specifications (typically 25-35 ft-lbs for NPT connections).
7. Check the combustion air blower: Inspect the blower wheel for debris and balance. Clean with a brush if necessary. Verify that the blower motor bearings are free of play. Lubricate if equipped with grease fittings (use high-temperature grease).
8. Reinstall the burner access panels with new gaskets if required. Torque fasteners to OEM spec (typically 10-15 ft-lbs for sheet metal screws).
9. Remove LOTO and restore gas and power. Purge the gas line by opening the manual shut-off valve slowly. Check for gas leaks at all connections using leak detection solution.
10. Start the MUA unit in manual mode. Allow the burner to fire and stabilize for 5 minutes at high fire.
11. Perform combustion analysis: Insert the combustion analyzer probe into the flue gas sampling port (typically located in the exhaust stack). Record O₂, CO₂, CO, NO_x, and stack temperature. Adjust the gas pressure regulator and combustion air damper to achieve the following targets (typical for natural gas): O₂: 3-5%, CO: <100 ppm (air-free), CO₂: 8-10%, stack temperature: within OEM range (typically 150-250°C above ambient).
12. Verify flame signal strength: Using a multimeter, measure the flame sensor DC microamp signal. Typical range is 5-15 μ A for a rectification flame sensor. If below 3 μ A, clean or replace the flame sensor.

5.0 Verification & Return to Service

1. Cycle the MUA unit through three start/stop cycles to verify reliable ignition and flame stability. Ensure no flame rollout occurs.
2. Check the supply air temperature rise across the heat exchanger. Compare to OEM nameplate data (typically 30-60°F rise). If outside range, re-check combustion settings and air flow.
3. Verify that all safety limits (high temperature limit, air flow proving switch, gas pressure switches) are functioning by simulating a fault condition (e.g., blocking the air intake temporarily). The unit should shut down and lock out.
4. Record all combustion readings, flame signal, gas pressures, and temperature rise in the PM work order in ServiceGrid. Attach a photo of the combustion analyzer display.
5. Remove all tools and debris from the area. Close and secure all access panels. Return the unit to automatic mode.
6. Sign off on the PM work order in ServiceGrid, noting any corrective actions taken (e.g., replaced flame sensor, adjusted gas pressure).

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.