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Inspection and Technical Services

Gas Equipment Bulletin: Initial Start-Up Procedure for Input Exceeding 400,000 BTUhrs

ITS 21-015

Rationale: Recommended procedures for the safe start-up and commissioning of high-input gas fired equipment.

This guideline has been developed to help ensure safe start-ups of high input gas-fired equipment. Due to a large variation in the types of equipment and controls, some of the procedures as set out will not be applicable to certain burners. On some equipment, other safety checks that are not mentioned in this guideline may be required.

The commercial and industrial gas fitter ultimately responsible for the installation, and must be present during the initial start-up. This person should check to demonstrate that the installation meets all relevant codes, including the testing of piping, a check of safety controls electrical connections, safety interlocks and relief valve rating.

The gas fitter should ensure that all persons not directly involved in the start-up are cleared from the room, or the area of the equipment if outdoors, in which the equipment is located, before start-up is attempted.

A dry-run should be carried out with all manual valves closed to determine that all controls are in a safe operating condition before gas is supplied to the pilot or main burner. It is suggested that the dry run checks will take a minimum of four control cycles to perform and can be carried out as follows:

First Cycle:

1. Check and determine the movement of position of the air dampers during the pre-purge to ensure the air flow is not less than 60% of that required for the minimum input to the unit during this period.
2. Check the volume of pre-purge air to determine its conformance with applicable codes and standards (at least four air changes to the combustion chambers and flue passages).
3. At the end of the pre-purge cycle, check the modulating gas valve and the air damper to determine that they have returned to the low fire position.

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Second Cycle:

During pre-purge, simulate failure of the airflow or forced fan operation and ensure that ignition spark does not occur. Failure may be simulated by failing a motor, closing the damper, removing the belt, removing tubing connection from air providing device, or other acceptance means.

Third Cycle:

Connect a meter for the measurement of scanner or detector signal. Check this reading during the ignition period to ensure it reads zero. If there is a reading, the scanner or detector may be sensing a false signal due to a spark, etc.

NOTE: The meter should be connected according to the applicable specifications and the type and make of controls.

Fourth Cycle:

Subject the scanner or detector to a simulated flame, and check that:

1. The pilot is proved.
2. The main gas valve opens.
3. The pilot is interrupted (ignition spark ceases).
4. The trial for main flame is proven (the time between the opening of the main gas valve and the interruption of the spark).
5. The loss-of-flame signal is proven when the simulated is removed and the gas valve closes.
6. The manual reset valve, when used in conjunction with a firing valve that incorporates an end-switch interlock, cannot be opened with the firing valve in an open position (carried out by subjecting scanner or detector to a simulated flame).

Start-up of burner or burners:

1. Purging gas piping

a) Do not open the firing valve. This valve should remain closed until piping is purged of air.
b) Determine a safe location and method of dispersal of purged gas.
c) The purge connection should be made between the manual shut-off valve on the drop and the pilot connection or main input valve.
d) The purge connection should be large enough to ensure an adequate purge velocity to evacuate air.
e) Once the above conditions having been fulfilled, the piping can be purged. To ensure all air is evacuated, purging must continue until gas is detected at the purging tube by means of flaring or other positive method (not in the combustion chamber of the unit).
f) When purging is complete, the piping should be reassembled or purge connection closed off and all untested joints soap-tested under gas pressure.
g) During the above purge period the firing valve should be closed. After completion of (f) above, connect a manometer or pressure gauge between the main gas valve and the firing valve. The pressure reading on this instrument should be zero, as a pressure reading would indicate the main gas valve is leaking or open.

2. Light-up of burner

The following are supplementary to specific manufacturer's instruction. These should, however, be carried out in conjunction with manufacturer's instructions.

a) Pilot turn-on
   i. Ensure the main firing valve is closed. Check that the pilot burner is in the correct position to ignite the main burner.
   ii. Turn-on pilot the gas supply and establish the pilot.
   iii. Using a multi-meter, adjust pilot flame to attain a maximum and steady signal.
   iv. Terminate cycle during the 'Trial for Pilot'. Ensure lockout with appropriate time limit.
   v. De-energize the control system and adjust for a new cycle.

b) Gas manifold pressure check with firing valve closed.
   i. This check is only an indication that the regulator is working when gas pressure is to be reduced from pounds (5 PSI or higher) to inches of W.C. at the main burner. Do not adjust the regulator. The reading observed will be a lock-up pressure. This is carried out by putting the burner through a cycle and noting the reading on the manometer that was connected in 1 (g) above – purging gas piping.

c) Burner turn-on
   i. The main flame turn-on procedure will vary with the type of equipment. For some types of equipment it is preferable to use the firing valve to establish main flame. For other types it may be necessary to turn on the firing valve and permit the establishment of main flame through the automatic input valve.

      For example: a burner with an interrupted pilot has a period of 15 seconds to establish a main flame. It is therefore considered safe and practical to open the firing valve and establish main flame through the automatic valve.

      A unit equipped with an intermittent pilot however, has a constant open automatic valve after the pilot is proven, thus the main burner or initial start must be established using the firing valve.

   ii. When main flame is established, adjust air dampers to produce a stable, clean flame and make the following adjustments.

      a. Establish correct burner input by checking input on gas meter; manifold pressure.
      b. Set air adjustment for correct air/gas ratio over complete firing range; CO2 check; excess air check; CO check.
      c. Check (where applicable) function of:
         - Low – Gas pressure switches
         - Air flow proving devices
         - Low water cut-off

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- High limit control
- Operating limit control
- All other interlocks and limit devices

d. Perform a minimum pilot turn-down test. The minimum pilot is considered the input at which the pilot will ignite, be sensed with a minimum signal by the flame sensing device, and provide safe lighting of main flame.
e. Re-establish normal pilot adjustment.

Caution must be exercised when carrying out this test to observe the size of the minimum flame and its ability to safely light the main flame.

NOTE:
When starting up gas fired boilers, the gas fitter must ensure that any boiler with a rating greater than 3 Boiler Horsepower (as per the Steam and Pressure Plants Act) is not activated without prior notification and approval of the ITS Boiler Inspection Unit in other than one (1) or two (2) family dwellings.

For booking a boiler inspection, please email BPVIntake@gov.mb.ca

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