3. Purging a system

Overview

Purpose

A gas technician/fitter must know how to properly purge a gas piping system in accordance with applicable codes to prevent a buildup of combustible air/gas mixtures and ensure that the piping/tubing system delivers air-free gas to the appliances.

Objectives

At the end of this Chapter, you will be able to:

- refer to Code requirements related to purging;
- identify locations for purge points; and
- describe differences in purging natural gas and propane.

Terminology

Term	Abbreviation (symbol)	Definition
Branch line		Part of a piping or tubing system that conveys gas from the main piping or tubing or header to an appliance(s)
Purge		To replace the existing fluid (gaseous or liquid) in piping, tubing, equipment, a container, or an appliance with a desired fluid
Purge burner		Burner equipped with a constant ignition source and a flame arrestor intended to burn the escaping (discharged) gas during purging operations
Specific gravity		Ratio of the density of the gas to the density of the air at a specified temperature and pressure

Purging requirements and locations for purge points

After successfully completing pressure and leak tests, you must purge the gas system. Purging consists of forcing air out of the system with gas under pressure. It is important to begin and perform purging at the proper locations to ensure the complete system is purged.

Assignment Questions – Chapter 2

1) When during a piping installation should pressure testing be carried out?
   a) After all of the appliances have been installed and connected.
   b) Before any appliance is installed. A leak test is required after the appliance is installed.
   c) Before any appliances are installed.

2) What is the minimum diameter gauge that can be used for pressure testing?
   a) 3 inches (75 mm)
   b) 2 inches (50 mm)
   c) 4 inches (100 mm)

3) What two inert gases may be used to pressure-test gas piping systems?
   a) Nitrogen and Hydrogen
   b) Argon and Carbon dioxide
   c) Carbon dioxide and Nitrogen
   d) Hydrogen and Argon

4) What should be done immediately after opening the gas valve at the gas meter?
   a) Listen for the gas flow to stop and monitor the gas meter test dial.
   b) Test fire the gas appliance and check the input.
   c) Ventilate by opening a window allowing any gas to escape during the purging process.

5) How can a leak be located?
   a) By providing a lit taper at each joint and looking for a small flame.
   b) By watching the meter for movement.
   c) By wiping each joint in the system with a leak detecting solution (i.e., soap and water)

6) After installation, a propane system requires testing. Put the following steps in order for testing a system that does not have a gas meter:

a) Place a pressure gauge on the system.	1
b) Mark the pressure gauges and observe for leakage.	2
c) When the system is up to pressure, close the manual valves.	3
d) Do a main manual shut-off valve seepage test.	4
e) Pressurize the system by opening the manual valves on each stage.	5

7) What personal information must the gas technician/fitter place on the test tag after testing is complete?
   a) Name, certification number, and classification.
   b) Contractors registration and company name.
   c) Name, address and phone number of gas technician.

Clause 6 of CSA B149.1 covers purging requirements and procedures.

Incorrect purging methods and shortcuts have led to numerous leaks, fires, and even explosions. It is imperative that gas technicians/fitters maintain safe and approved purging methods on all work conducted.

Purge points and procedures

Purging should begin at the appliance farthest from the source of supply. Purging of branch lines then follows one by one at a location farthest from the point where the gas enters the individual branch line.

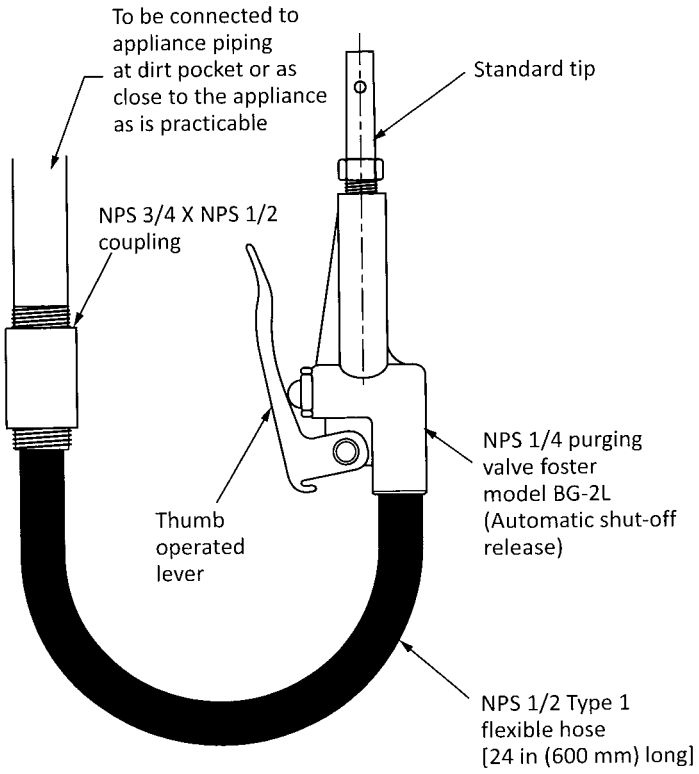
Clause 6.23 of CSA B149.1 lists a number of different options for purging natural gas and propane piping and tubing systems. You should review these options to ensure that you use the most suitable method for the type of installation at hand.

Incorrect purging procedures have led to gas leaks, fires, and in rare cases, explosions.

The following purging techniques represent acceptable Code-recognized purging methods:

Purging technique	Description
Use a hose to the outdoors	This involves a long tubing terminating outside away from air intakes and sources of ignition with a valve and a gas technician/fitter at the outside location.
Use a burner	You use a specially approved burner that connects to piping and has a propane-fired pilot light that flares off the gas/air mixture until a stable flame is established.
Use pilot tubing	On appliances equipped with a constant pilot, you can disconnect the tubing at the gas valve and purge it using the gas control valve knob. Appliances input must be less than 400 000 BTU.
Use a readily accessible burner	When an installation includes a gas range, you may purge the system piping at the top range burners with a match lit beside them until such time as a steady flame is established. Appliance input must be less than 400 000 BTU.
Use a purge tool	Annex H outlines the use of this approved assembly, which connects to the drip pocket and allows for purging indoors using the spring-loaded nozzle valve. See Figure 3-1.

Figure 3-1
Approved purge assembly



Clause 6.23 of CSA B149.1 titled *Purging of gas piping systems after leak testing*, which also references Annex H of the Code, *Purging of piping and tubing systems where a readily accessible burner is not available or where an appliance is not equipped with a continuous pilot*, lists purging requirements and procedures.

The gas technician/fitter should review and become familiar with these Code requirements.

Purging of piping greater than 4 in diameter

CSA B149.1 outlines how you must first purge piping of 4 in or greater, if the test gas was air, with nitrogen or carbon dioxide in order to neutralize the interior of the piping prior to the purging procedure.

This helps reduce the risk of a gas/air mixture existing inside the piping and finding a source of ignition that may flash back.

You should always purge piping of this diameter to the outdoors in order to minimize the amount of gas buildup inside the building.

Differences between purging natural gas and propane

With respect to purging, the main differences to be aware of between natural gas and propane are their upper and lower explosive limits and their specific gravities.

Upper and lower explosive limits

Both natural gas and propane will explode if mixed with a certain volume of air and then ignited.

Gas	Approximate explosive limits	Explosion risk
Natural gas	Range from 4% to 15% natural gas in air	Concentrations above or below these limits lessen the risk of explosion.
Propane	Range from 2% to 10% propane in air	

Specific gravity

Air has a specific gravity of 1.0. If a fuel's specific gravity:

- is lower than 1.0, the less dense or lighter the gas; and
- is higher than 1.0, the denser or heavier the gas.

Gas	Specific gravity	Implications
Natural gas	0.60	• Because its specific gravity is lower than that of air, natural gas is lighter than air and will rise above it in a confined space. • This quality of natural gas allows it to vent naturally to atmosphere when there is a path for it to do so.
Propane	1.5	• Because it is heavier than air, propane will collect in the lower areas of confined spaces. • This property of propane can create a dangerous explosion hazard if it occurs in an area where there is the possibility of the propane coming into contact with a source of ignition. • A heavier-than-air fuel, such as propane, pools and collects in low-lying areas and is more difficult to ventilate than natural gas. This creates the risk of a flammable mixture that is ready to ignite from any source of ignition. • It is always a safer procedure to utilize a purge hose to the outdoors in accordance with Code guidelines when purging propane gas piping systems.

Assignment Questions – Chapter 3

1) Which appliance piping should be purged first?
   a) The one with the largest input.
   b) The one farthest from the point of supply
   c) The one with the smallest input.

2) What type of gas cock must be placed within 5 ft of the purge point?
   a) One with ¼ turn lever handle
   b) One with a 'dead man' valve
   c) A lubricated 1/4 turn valve

3) What substance is used to purge the air out of a gas piping system that is 4 in diameter or larger?
   a) An inert gas (carbon dioxide or nitrogen)
   b) Compressed Air
   c) Gas (Propane or natural gas)

4) What is the maximum input of a propane appliance that may be purged at the pilot outlet of the appliance control valve?
   a) 125 000 Btu/h
   b) 45 000 Btu/h
   c) 400 000 Btu/h

5) What characteristics of propane differentiate propane purging from natural gas purging?
   a) Smell, calorific value
   b) Specific gravity, explosive limits

6) Complete the following statement:
   The approximate explosive range of natural gas is _____ _____ natural gas in air.
   a) 5% to 15%
   b) 10% to 20%
   c) 4% to 15%
   d) 15% to 20%