29) What is the maximum interval that propane tubing can be run inside a residential occupancy without identification?
   a) 6 ft
   b) 12 ft
   c) 3 ft
   d) 24 ft

30) Where must the shut-off valves be placed if propane piping or tubing is extended from one building to another?
   a) At the exit of the first building.
   b) At the point of entry to the second building.
   c) One at the exit of the first building and another at the point of entry to the second building.

31) What is the required test pressure of a propane piping system 50 ft long with a working pressure of 10 psig?
   a) 50 psig for 60 minutes
   b) 50 psig for 180 minutes
   c) 15 psig for 180 minutes

32) Is an individual shut-off valve required for all propane appliances on a recreational vehicle?
   a) Yes
   b) No

2. Code requirements for testing

Overview

Purpose

A gas technician/fitter must know how to interpret applicable codes in order to properly test gas piping systems and gas-fired appliances and equipment so that they operate in a safe and efficient manner.

Objectives

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

- interpret codes as they apply to testing piping systems; and
- describe how to document test results on test tag.

Terminology

Term	Abbreviation (symbol)	Definition
Pressure test tag		Tag attached to the system, in a prominent place, after testing that includes location, testing, and tester information

Codes as they apply to testing piping systems

Testing requirements for gas piping systems

After installing a gas piping system, you must pressure test it in accordance with the requirements of the applicable codes and regulations. Inspect and test all piping and components to be concealed before you conceal them. Perform testing at two specific times:

1) before installation of any appliances (CSA B149.1, Clause 6.22.2); and
2) after installation of appliances (CSA B149.1, Clause 6.22.3).

Pressure test device calibration requirements

For systems where the working pressure exceeds 0.5 psig (3.5 kPa) but does not exceed 5 psig (35 kPa), the pressure gauge or equivalent device shall undergo calibration to read in increments of not greater than 1 ounce of pressure (0.5 kPa).

For systems where the working pressure exceeds 5 psig (35 kPa), the pressure gauge or equivalent device shall undergo calibration to read in increments of not greater than either 2 psig (14 kPa) or 2% of the maximum dial reading of the gauge, whichever is less.

When you use a pressure gauge, it must be a minimum of 3 in (75 mm) diameter and the maximum range must exceed the test pressure by at least 15% but not more than 300%.

Visual inspection

During installation of piping and tubing and before pressure testing, visually inspect piping and tubing for cuts, abrasion, and any other defect that may cause leaking or failure of the system when it is under pressure.

Remember that you must inspect and test all piping and components to be concealed before you conceal them.

Testing before installation of appliances

Perform the first system test after the installation of the piping system and before the connection of any appliances to the system. Before testing, isolate or remove any components of the system that have a pressure rating below the test pressure to prevent any damage to these components. Follow these steps to perform the test:

1) Isolate the piping system that you will test by capping or plugging all open ends.

2) Insert a pressure gauge at one end of the system.
3) Pressurize the system with air or inert gas (nitrogen or carbon dioxide) to the specified test pressure.
   Figure 2-1, which is Table 6.3 of CSA B149.1, shows the pressure test requirements for gas piping and tubing systems.
4) Measure the pressure with a pressure gauge calibrated in 14 kPa (2 psig) increments or less, or 2% of the full-scale reading of the gauge, whichever is greater.

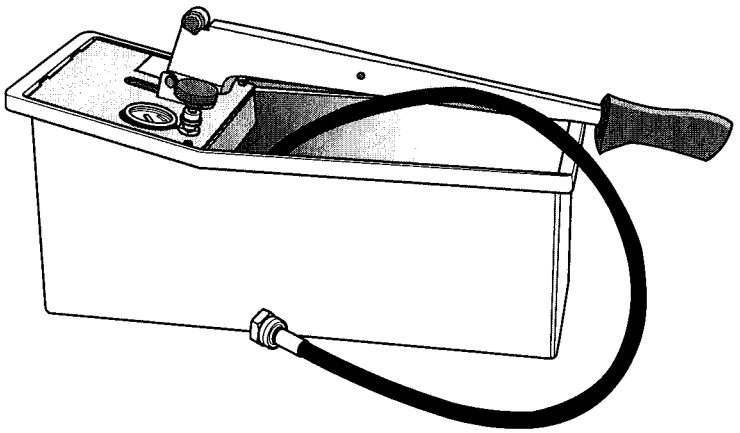
Figure 2-1
CSA B149.1 Table 6.3
Pressure test requirements
(See Clauses 6.22.1 and 6.22.2.)

Working pressure, psig (kPa)	Diameter of pipe or tubing	Length of pipe or tubing, ft (m)	Test pressure, psig (kPa)	Test duration, min
Up to and including 2 (14)	All sizes	200 (60) or less	15 (100)	15
Up to and including 2 (14)	All sizes	More than 200 (60)	15 (100)	60
Over 2 (14) but not more than 33 (230)	All sizes	200 (60) or less	50 (340)	60
Over 2 (14) but not more than 33 (230)	All sizes	More than 200 (60)	50 (340)	180
Over 33 (230)*	All sizes	All lengths	1.5 times the maximum operating pressure	180
All welded pipe	All sizes	All lengths	The greater of 50 psig (340 kPa) or 1.5 times the maximum operating pressure	180

**Propane maximum operating pressure is defined as*
(a) 250 psi (1725 kPa) for piping and tubing operating at container pressure;
(b) 350 psi (2400 kPa) when connected to the outlet of a pump or compressor; or
(c) 375 psi (2570 kPa) minimum or the setting of the hydrostatic relief valve in piping that can contain liquid propane, that can be isolated by valves, and that requires hydrostatic relief valves as specified in Clause 5.4.1 of this Code or Clause 5.6.1 of CSA B149.2.

Notes:
(1) *These test pressures and test durations are minimum requirements. Circumstances can require test pressures and test durations in excess of those shown in the Table.*
(2) *All wrapped and/or factory-coated piping and tubing systems (except for CSST and copper) of all sizes and lengths shall be tested at a minimum pressure of 100 psig (700 kPa) in accordance with the time duration in the Table.*

Figure 2-2
Pressure test pump



Leak detection

If a drop-in pressure in the system indicates a leak, you will need to do a "soap test" to locate the source of the leak:

1) Wipe each joint or fitting in the suspect portion of the system with the leak detector solution (soap and water).
2) A leak will cause the solution to form bubbles at its source.

Testing after installation of appliances

After the installation of appliances are installed, check the system visually to ensure there are no openings in the system from which gas could escape. You must calibrate the manometer or pressure gauge that you used for this test in 1 in w.c. (250 kPa) increments or less. Perform the pressure test as follows:

1) Shut off the appliances and install a manometer or pressure gauge at the gas meter outlet.
2) Introduce gas into the system, listen for the gas flow to stop, and monitor the gas meter test dial to ensure that no gas is escaping.
3) Turn off the meter valve. The system contains the gas under pressure.
4) Maintain the gas pressure indicated on the manometer or pressure test gauge for a minimum of 10 minutes. (If the manometer or pressure gauge indicates that there is a leak, refer to *Testing before installation of appliances* > *Leak detection* section.)
5) Upon successfully completing the test, perform a leak test on all untested control valves and appliance piping using soap solution under normal operating pressure to ensure they are gas tight.

Checking for shut-off valve seepage

Perform this test to ensure that gas seepage from the meter valve is not masking any undetected gas leaks. A gas meter valve may sometimes seep gas if its sealing grease becomes dry and hardened. If the valve passes gas in this way, the system test will not be accurate and results will

be invalid. For this reason, before performing the pressure test, check the gas meter valve for seepage in the following way:

1) When the system is brought to a static pressure condition, release a small amount of the contained gas pressure by quickly removing, then replacing, the manometer or pressure gauge tubing.
2) This action opens the service regulator, allowing the testing of the system back to the gas meter shut-off valve.
3) If, after this action, the gas pressure increases slowly to static pressure, the meter valve is seeping gas and should undergo servicing before testing proceeds.

Propane system testing

Propane system testing is also in two stages:

Before the installation of appliances

This is the same procedure as for natural gas.

Refer to *Testing before installation of appliances* section.

After installation of appliances

If a meter is installed on the propane system, this test follows the same procedure as natural gas (refer to *Testing after installation of appliances* section).

If no meter is installed, do the following steps:

1) Do a main manual shut-off valve seepage test. Refer to *Checking for shut-off valve seepage* section.
2) Place a pressure gauge on the system. Refer to CSA B149.1 for pressure gauge requirements.
3) If it is a two-stage system:
   a) Place another pressure gauge on the second stage. You can use a manometer in place of a pressure gauge on low-pressure systems.
   b) Perform a seepage test on the manual shut-off valve at the second-stage regulator.
4) Pressurize the system by opening the manual valves on each stage.
5) When the system is up to pressure, close the manual valves.
6) Mark the pressure gauges and observe for leakage.

Leak detection

If a drop in pressure in the system indicates a leak, you will need to do a "soap test" to locate the source of the leak:

1) Wipe each joint or fitting in the suspect portion of the system with the leak detector solution (soap and water).
2) A leak will cause the solution to form bubbles at its source.

Documenting test results on test tag

Documenting test results

In some jurisdictions, the gas technician/fitter is required to attach a test tag to the system in a prominent position after completing testing on a natural gas or propane system. The test tag must contain the following information:

- address of test;
- contractor's name;
- contractor's registration number;
- date of test;
- test pressure;
- test duration;
- total pipe length;
- pipe size;
- fitter's name;
- fitter's certificate number and classification; and
- statement "DO NOT REMOVE."

Figure 2-3
Test tag