

Fire Engineering®

Construction Concerns: Natural Gas and Propane

Article by Gregory Havel

September 28, 2015

For the purposes of this article, I will discuss the use of natural gas and propane [liquefied propane (LP)] gas in buildings under construction, in buildings undergoing renovation, and in the temporary structures that are found on construction job sites including scaffold enclosures.

In permanent structures, natural gas is carried by pipe from the utility company meter to the location of the heating appliances. Natural gas from utility companies is lighter than air and is odorized.

In temporary structures and in buildings under construction or renovation, the gas may be carried from the utility company meter by pipe or a hose rated for natural gas at the pressure to be used to the location of the heating appliances. These pipes and hoses must be properly supported and must be protected from damage including from foot and wheeled traffic. The hoses, pipes, and connections must be checked regularly for leaks.

For permanent and temporary structures, LP gas is usually stored in horizontal tanks outside the structure (photo 1) at a distance from the structure.



(1)

In Photo 1, note the frost on the bottom third of the tank that indicates the approximate amount of LP that is left in the tank. LP gas for fuel is heavier than air and is odorized. It is carried from the tank to the heating appliances by pipe or hose rated for LP gas at the pressure to be used. As it is for natural gas, these pipes and hoses must be properly supported and protected from damage including from foot and wheeled traffic. Also similar to natural gas, the hoses, pipes, and connections must be checked regularly for leaks.

For temporary heat and appliances with smaller fuel demand, vertical cylinders are also used. Photo 2 shows a small convection-type open-flame gas heater that is supplied by a hose connected to a 100-pound (45 kg) LP cylinder.



(2)

Ideally, the hose should be long enough for the tank or cylinder to be located outside the building or temporary structure. However, the National Fire Protection Association (NFPA) codes and standards contain an exception and additional requirements for temporary heat on construction job sites.

According to NFPA 58, *Liquefied Petroleum Gas Code*, 2014 edition:

6.2 Location of Containers.

6.2.1 LP-Gas containers shall be located outside of buildings unless they are specifically allowed to be located inside of buildings.

6.2.2 LP-Gas containers shall be allowed in buildings only for the following applications: (1) Cylinders as specifically provided for in Section [6.20](#)

6.20.2 Additional Equipment Requirements for Cylinders, Equipment, Piping, and Appliances Used in Buildings, Building Roofs, and Exterior Balconies.

6.20.2.1 Cylinders shall be in accordance with the following:

- *(1) Cylinders shall not exceed 245 lb (111 kg) water capacity [nominal 100 lb (45 kg) propane capacity] each.*
- *(2) Cylinders shall comply with other applicable provisions of Section [5.2](#), and they shall be equipped as provided in Section [5.7](#).*
- *(3) Cylinders shall be marked in accordance with [5.2.8.1](#) and [5.2.8.2](#).*

- (4) Cylinders with propane capacities greater than 2 lb (0.9 kg) shall be equipped as provided in [Table 5.7.4.1\(D\)](#), and an excess-flow valve shall be provided for vapor service when used indoors.
- (5) Cylinder valves shall be protected in accordance with [5.2.6.1](#).
- (6) Cylinders having water capacities greater than 2.7 lb (1.2 kg) and connected for use shall stand on a firm and substantially level surface.
- (7) Cylinders shall be secured in an upright position if necessary.
- (8) Cylinders and the valve-protecting devices used with them shall be oriented to minimize the possibility of impingement of the pressure relief device discharge on the cylinder and adjacent cylinders.

6.20.2.6* Portable heaters, including salamanders, shall comply with the following:

- (1) Portable heaters shall be equipped with an approved automatic device to shut off the flow of gas to the main burner and to the pilot, if used, in the event of flame extinguishment or combustion failure.
- (2) Portable heaters shall be self-supporting unless designed for cylinder mounting.
- (3) Portable heaters shall not be installed utilizing cylinder valves, connectors, regulators, manifolds, piping, or tubing as structural supports.
- (4) Portable heaters having an input of more than 50,000 Btu/hr (53 MJ/hr) shall be equipped with either a pilot that must be lighted and proved before the main burner can be turned on or an approved electric ignition system.

Additional requirements apply to the heaters used during construction, remodeling, and in temporary structures. From NFPA 58, 2014 edition:

6.20.4.2 The use and transportation of cylinders in the unoccupied portions of buildings or structures under construction or undergoing major renovation that are partially occupied by the public shall be approved by the authority having jurisdiction.

6.20.4.3 Cylinders, equipment, piping, and appliances shall comply with [6.20.2](#).

6.20.4.4 Heaters used for temporary heating shall be located at least 6 ft (1.8 m) from any cylinder. (See [6.20.4.5](#) for an exception to this requirement.)

6.20.4.5 Integral heater-cylinder units specifically designed for the attachment of the heater to the cylinder, or to a supporting standard attached to the cylinder, and designed and installed to prevent direct or radiant heat application to the cylinder shall be exempt from the spacing requirement of [6.20.4.4](#).

6.20.4.6 Blower-type and radiant-type units shall not be directed toward any cylinder within 20 ft (6.1 m).

6.20.4.10 Where compliance with the provisions of [6.20.4.6](#) through [6.20.4.9](#) is impractical, alternate installation provisions shall be allowed with the approval of the authority having jurisdiction.

Photo 3 shows a larger open-flame heater in use inside a building under construction.



(3)

This heater has interchangeable burner orifices so that it can use either natural gas or LP, electronic burner controls, electric ignition, and a fan to distribute the heat horizontally throughout the structure. This type of heater has a large enough fuel demand that it will be supplied by a hose rated for natural or LP gas, from a utility company gas meter, or from a large LP tank outside the structure. Note that the heater is a double steel tube with open air space between, similar to a double-wall metal chimney assembly, so that the possibility of burns to workers is reduced and so that combustibles that may accidentally contact the outside of the burner are less likely to ignite.

Photo 4 shows a pair of these heaters in a temporary structure supported by scaffolding for the winter protection of new masonry construction.



(4)

Photo 5 shows a refinement of a construction job site temporary heating system.



(5)

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The heating unit shown in photo 5 has a combustion chamber with a natural gas fuel supply (yellow flexible pipe) and an electrical supply (coiled yellow cord), a combustion-gas-to-liquid heat exchange, and circulating pumps, all located outside the building under construction. Through large hoses, a heated antifreeze solution is circulated from the heating unit outside the building to terminal units (photo 6) inside the building, each containing a heating coil and a fan to circulate the warmed air throughout the space.



(6)

This type of temporary heating system has the following advantages:

- Fuel is stored and burned outside the structure.
- Since no combustion gases are released into the structure, there are greatly reduced ventilation requirements, since carbon monoxide is not an issue.
- Since no combustion gases are released into the structure, the water vapor in the combustion gases will not condense on surfaces, or saturate unfinished building materials, providing better quality control for the contractor.

NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations*, 2013 Edition, outlines the requirements for fuel and temporary heating appliance safety in Chapter 5.2. The same information is located in NFPA 1, *Fire Code*, 2015 edition, in Chapter 16.2, and in NFPA 58, 2014 edition.

All of these codes and standards provide that some of the decisions on temporary heat and fuel installations are to be made by the authority having jurisdiction (AHJ). State statutes, local ordinances, and legally-binding administrative rules indicate when these decisions can be made by the AHJ or are included additional rules that make the decisions for us. It is up to us to know how the codes and standards are to be implemented and enforced in our state or municipality for the protection of the lives and property we are sworn to protect.

NPFA codes and standards are available for review on the NFPA Web site. They may also be available for your use at your local technical college library or at your local fire department or fire prevention bureau.



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