

The School District of Palm Beach County

Project Name:

SDPBC Project No.:

**SECTION 33 56 16**  
**UNDERGROUND LP STORAGE AND DISTRIBUTION**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Pipe, fittings appurtenances for liquid-petroleum gas (LP gas) distribution at individual sites
- B. Underground LP gas storage tanks

**1.2 REFERENCES**

- A. NFPA 54-National Fuel Gas Code
- B. NFPA 58-Liquefied Petroleum Gas Code
- C. FBCFG - Florida Building Code Fuel Gas
- D. AASHTO T180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in) Drop
- E. ANSI, as referenced in A-C, above
- F. ASME - Boiler and Pressure Vessel (BPV) Code, Section VIII, Division 1, Unfired Pressure Vessels and Section IX, Welding
- G. ASTM, as referenced in A-C, above
- H. AWS, as referenced in A-C, above
- I. AWWA C105 –Polyethylene Encasement for Ductile Iron Pipe Systems

**1.3 SUBMITTALS FOR REVIEW**

- A. Section 01 33 00 – Submittals Procedures, procedures for submittals
- B. Product Data: Provide data on tanks, pipe materials, fittings, valves, and accessories.
- C. System Design: Provide an isometric drawing of the entire proposed system.
- D. Provide radiographic examination records for the tank welds.

**1.4 SUBMITTALS AT PROJECT CLOSEOUT**

- A. Section 01 77 00 - Contract Closeout, procedures for submittals.
- B. Record actual locations of tanks, pipes, valves, fittings, accessories, and invert elevations.
- C. Identify and describe unexpected variations in subsoil conditions and discovery of uncharted utilities.

**1.5 QUALITY ASSURANCE**

- A. Perform Work in accordance with referenced standards, gas supplier requirements, and the authority having jurisdiction.
- B. All welding will comply with AWS and ASME codes.
- C. Pipe and tank installation will comply with NFPA 54, 58, and the FBC-Fuel Gas.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, protect, and handle products to site under provisions of Section 01 60 00.
- B. Deliver and store valves and appurtenances in shipping containers with labeling in place.

**PART 2 PRODUCTS**

**2.1 GENERAL REQUIREMENTS**

- A. Design the LP Gas system to allow a maximum working pressure of 5-psig or less in the gas distribution pipe network. (The LP Gas distribution network commences immediately downstream of the pressure regulator at the LP Gas storage tank.)
  - 1. Design the LP Gas distribution network to convey only LP Gas.
    - a. Entry of liquefied LP Gas into the distribution network from the tank will be precluded by safety devices, including drips, and regulators.

2. The design operating pressure for pipe, fittings, and appurtenances in the distribution network will be 125 psig.
  - B. Design the LP Gas delivery manifold (between delivery vehicle connection and storage tank), supply manifold (between tank and first stage regulator), attached appurtenances, and LP Gas storage tank for an operating pressure of 250 psig.
    1. Smaller tanks may require higher pressures; refer to NFPA 58.
    2. Rate the valve that separates the distribution system from the storage system for the higher operating pressure if the valve is a bulkhead during field pressure testing.
  - C. Design documents specify size, material, system configuration, and location for all tanks, piping, fittings, and appurtenant devices.
    1. Gas demands determine the size of the gas distribution network, appurtenant items, and gas storage tank.
- 2.2 PIPE, FITTINGS, AND APPURTENANT DEVICES
- A. Buried locations:
    1. Buried shall mean in direct contact with soil on all or some surfaces.
    2. Pipe shall be wrought iron, black or galvanized steel, brass, copper, or polyethylene and comply with applicable standards.
    3. Tubing shall be steel, brass, copper, or polyethylene and comply with applicable standards.
    4. Joints on pipe; provide welded, threaded, compression type using mechanical fittings, or fused, fittings and appurtenances matching the pipe material per applicable standards.
      - a. Flanged joints require suitable asbestos, metal or other fire resistant material.
      - b. Anode-less risers will transition between buried polyethylene pipe or tubing to an acceptable material at exposed locations.
    5. Fittings for pipe and tubing shall be steel, brass, copper, malleable iron, ductile iron, or polyethylene and comply with applicable standards.
    6. Prophylaxis for buried metal pipe will comply with AWWA C105, which requires a continuous polyethylene jacket using 10-mil polyethylene tubing.
      - a. Provide Prophylaxis only where investigation of the soil type indicated that excess corrosion of the pipe and fittings will occur.
      - b. District may accept other pipe and fitting materials depending on a life cycle cost evaluation.
    7. Manufacture appurtenant items from materials that match the materials identified above or from proprietary materials specifically formulated for the intended service.
    8. Do not use cast iron for pipe, fittings, or appurtenances.
  - B. Exposed locations:
    1. Means in direct contact with atmosphere and on all surfaces in an open or enclosed location.
    2. Pipe shall be wrought iron, black or galvanized steel, brass, or copper and comply with applicable standards.
    3. Tubing shall be steel, brass, or copper and comply with applicable standards.
    4. Provide a welded or threaded joint on pipe, fittings, and appurtenances, matching the pipe material per applicable standards.
    5. Fittings for pipe and tubing shall be steel, brass, copper, malleable iron, ductile iron and comply with applicable standards.
    6. Manufacture appurtenant items from materials matching the materials identified above or from proprietary materials specifically formulated for the intended service.
    7. Do not use cast iron for pipe, fittings, or appurtenances.
    8. Do not use polyethylene in exposed locations.

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### 2.3 UNDERGROUND PROPANE STORAGE TANKS

- A. Manufacture the tank will in accordance with ASME BPV Code, Section VIII Division 1.
- B. Code stamp and provide a partial radiography of tank to ensure soundness of welded joints.
- C. Fabricate tank with steel and weld all joints in accordance with procedures qualified under ASME BPV Code, Section IX.
- D. Openings in the tank will be sufficient to attach fill and draw piping, and all required vents and safety appurtenances.
- E. Properly label the tank in accordance with ASME Code requirements.
- F. Interior tank coating shall be a suitable multi-component system formulated for exposure to LP Gas in its liquid and gaseous forms.
- G. Exterior tank coating shall be a suitable multi-component system formulated for exposure to underground conditions in general and specific conditions at the site.

### 2.4 BEDDING AND COVER MATERIALS

- A. Bedding: Fill as specified in Section 31 20 00.
- B. Cover: Fill as specified in Section 31 20 00.

### 2.5 PUMPS, VAPORIZERS AND GAS-AIR MIXERS

- A. Avoid the use of gas-air mixers, transfer pumps, and vaporizers.

## **PART 3 EXECUTION**

### 3.1 EXAMINATION

- A. Verify existing conditions under provisions of Section 01 31 00.
- B. Verify that building service connection and utility gas main size, location and invert are as indicated.

### 3.2 PIPE PREPARATION

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.
- B. Bevel plain end ferrous pipe over 2" diameter, thread ferrous pipe 2" diameter and under.
- C. Remove scale and dirt from inside and outside of the pipe before assembly.
- D. Prepare piping connections with threading and unions.
- E. Install proper gaskets on flanged joints.
- F. Use pipe dope on threaded joints.

### 3.3 PIPE BEDDING

- A. Excavate pipe trench in accordance with Section 31 20 00 for work of this section.
  - 1. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 8" compacted depth, compact to 98%.
- C. Backfill around sides and to top of pipe with cover fill tamped in place and compacted to 98%.
- D. Maintain optimum moisture content of bedding material to attain required compaction density.

### 3.4 PIPE INSTALLATION

- A. Maintain separation of gas line from sewer and water piping in accordance with code.
- B. Route piping in straight line, use fittings to change direction of the pipe run.
- C. Install piping to conserve space and not interfere with use of site space.
- D. Install piping to allow for expansion and contraction without stressing pipe or joints.
- E. Install fittings, valves, and appurtenances per plans.
- F. Establish elevations of buried piping to ensure not less than 36" of cover in non-traveled areas and 48" of cover in driveways and parking areas.
- G. Lay pipe on bedding.

- H. Wrap couplings and fittings of steel pipe with polyethylene tape and heat shrink over pipe when prophylaxis is required.
  - I. Install locator wire and warning markers along with all plastic pipe used to carry any type of fuel gas.
    - 1. Locator wire shall be single or multi-strand copper and insulated with a yellow high molecular weight jacket having a minimum thickness of 30 mils.
    - 2. Install locator wire in the same trench as the pipe approximately 6" over the pipe crown.
    - 3. Locator wire shall be looped or terminated at all warning markers and be accessible for attachment of impressed radio signal locating devices by removing a cap or access port located near the warning marker.
    - 4. Locator wire shall be terminated near the gas meter and near the tank access manhole and be accessible by removing a cap or access port.
    - 5. Warning markers shall be provided at all points where the pipeline changes direction, at intervals not exceeding 1,000 feet, at all locations where the gas pipe enters School District Property, and at all locations where the gas pipe enters a building.
    - 6. Warning markers shall be embedded at least 36" into the ground and terminate between 12" and 36" above the ground unless within the limits of a sport field.
      - a. Other provisions will be made within sport field limits.
    - 7. Warning markers shall be yellow and purchased from a company regularly engaged in the manufacture of utility line markers.
  - J. Install warning tape 12" above crown of buried gas pipe.
    - 1. Tape shall be detectable with magnetic location devices.
  - K. Backfill trench in accordance with Section 31 20 00
  - L. Center and plumb valve box over valve, then set box cover flush with finished ground surface.
    - 1. Prevent shock or stress from being transmitted through valve box to valve or pipe.
- 3.5 BUILDING SERVICE CONNECTIONS
- A. Provide sleeve in foundation wall for gas service main.
    - 1. Seal sleeve annulus around carrier pipe with suitable material that is compatible with carrier pipe and will produce a watertight, durable seal.
  - B. Anchor service main to exterior surface of foundation wall using approved anchors and pipe supports or straps.
  - C. Install secondary service regulator adjacent to building wall in specified location.
  - D. Install secondary service regulator and riser pipe to prevent undue stress upon service pipe.
  - E. Provide regulator vent with rain and insect proof opening, terminating away from building openings.
- 3.6 UNDERGROUND PROPANE TANK LOCATION
- A. Tank location shall provide required separation from property lines, buildings and ignition sources for the tank and all vents, safety devices, and fill location.
  - B. Protect tank location from vehicular traffic with fencing, bollards, landscaping, or other approved method.
  - C. Fill location shall be accessible by LP Gas delivery trucks.
  - D. Protect tank access manholes from vehicular traffic and protection shall meet District Standards.
  - E. Avoid multi-tank installations, but if multi-tank installations are necessary provide proper separation distances between the tanks per NFPA 54.
  - F. Coordinate tank location with location of fire protection system water delivery devices to ensure that adequate water will be available for fire suppression.

### 3.7 UNDERGROUND PROPANE TANK INSTALLATION

- A. Install tank with anchors that make the tank non-buoyant under conditions of high ground water.
- B. Install tank with a minimum of 12" cover.
- C. Over-excavate hole for tank installation. Set anchor system in excavation and backfill with suitable material to bottom elevation of tank.
- D. Set tank in prepared excavation and attach required anchoring system, pipe, or accessories prior to backfilling.
- E. Backfill around tank until only the crown of the tank is exposed.
- F. Place access manholes at the fill and draw locations.
  - 1. Locate the connections to ASME containers installed underground within a substantial dome, housing, or manhole with a cover.
    - a. Install underground containers so all connections for hoses and any opening through which there can be a flow from pressure relief devices or pressure regulator vents are located above the normal maximum water table.
    - b. Provide proper venting for such manholes or housings.
    - c. The area of ventilation openings shall equal or exceed the combined discharge areas of the pressure relief devices and other vent lines discharging into the manhole or housing.
  - 2. The ASME code label will be visible and legible from inside an access manhole.
- G. Provide tank with all required vents, pressure relief devices, safety devices, and withdrawal and filling connections per applicable regulations.
  - 1. These devices and connections should include, but not necessary be limited to, relief valve, shut off valve on all pipe connections, pressure regulator, pressure gage, drip, and removable protection cover on access manholes.

### 3.8 PROTECTION

- A. Provide bollards or chain link fence for protection around all above ground gas system components and buried tanks.
- B. The Contractor shall install protective fence or bollards for all natural and LP gas components, even when others furnish those components.

### 3.9 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Control, field inspection and testing.
- B. Perform compaction testing in accordance with ASTM D1557.
- C. Pressure-test all gas lines
  - 1. Pipe joints shall be visible during the test.
  - 2. Test medium will be air or an inert gas; do not use oxygen as a test medium.
  - 3. Use the greater of; the system's design operating pressure or 1½ times the maximum working pressure, but not less than 3-psig.
  - 4. Test duration shall be not less than ½ hour for each 500 ft<sup>3</sup> of pipe volume or fraction thereof.
    - a. When testing a system with a volume less than 10 ft<sup>3</sup>, the test duration shall be a minimum of 10 minutes.
    - b. Maximum duration of the test not to exceed 24 hours
  - 5. The piping system shall withstand the test pressure specified without showing any evidence of leakage or other defects.
- D. All failing work shall be removed or repaired and be re-tested until passed with no additional cost.

END OF SECTION