

TESTING MANHOLE ATMOSPHERE GENERAL

Contents	Page
1. General	1
2. Precautions	2
3. Tests for Combustible Gases	3
4. Testing Special Manholes	4
5. Cable Vaults	5
6. Gases Found in Manholes.....	5

1. GENERAL

1.01 This section covers the tests to be made in determining whether combustible or toxic gases are present in manholes or cable vaults; outlines the tests required as a precaution against carbon monoxide (including hydrogen sulphide); and describes the conditions under which ventilation is required. Detailed instructions for testing with gas indicators or detectors are covered in other sections of the G10 Division.

1.02 The section has been reissued to clarify Paragraph 2.04←
on "Sail Ventilation." ←

1.03 This section permits subsequent operation of a hot wire gas indicator within the manhole, provided the previous test indicated a satisfactory condition. The Suction Gas Indicator should not be used in a manhole.

1.04 The descriptions, operation and maintenance of the testing facilities are contained in the G80 Division.

1.05 Manhole guards and warming devices should be set up at the manhole before the cover is removed as covered in other sections. Tests shall be made immediately upon removing the cover. **Never enter a manhole that has not been tested for the presence of gas.**

1.06 When making a test, place the equipment used and yourself in such position as to cause minimum interference to approaching traffic. Plan the work so that minimum time is spent in the traffic area.

1.07 When household gas is detected in a manhole or cable vault, the matter should be reported to the gas company in accordance with local routine to ensure that the condition is taken care of.

1.08 If any other commercial gas is detected in a manhole or cable vault, the condition should be reported to the appropriate company, if known, otherwise to the local city authorities.

1.09 If liquid gasoline is found in a manhole, the procedure outlined in Section G10.217.1, covering the removal of gasoline, should be followed.

1.10 Gas conditions should be reported in accordance with local routine to ensure that all interested persons are advised in order that they may initiate the steps required to clear the condition.

2. PRECAUTIONS

2.01 Open flames, torches, lighted cigars, cigarettes, or pipes shall not be brought near an open manhole, into a cover or tent over a manhole opening nor taken into a manhole even though tests indicate that the atmosphere is satisfactory. Where it is necessary to use an open flame near an open manhole, keep the flame as far away as practicable. Only approved lighting and heating equipment shall be used in a manhole or vault. Connection and disconnection of electric lighting equipment should not be made in the manhole, since the breaking of an electric circuit may cause an arc. Batteries should not be taken into a manhole.

2.02 No one shall enter a manhole or cable vault when a test indicates a combustible or toxic condition. In an emergency rescue situation, follow precautions outlined in G10.209.

2.03 Always enter a manhole slowly and cautiously. If any irritation of the eyes, nose, or throat is experienced or, if any difficulty is encountered in breathing when entering or working in the manhole, leave it at once. Do not re-enter the manhole until it has been thoroughly ventilated.

2.04 **Sail Ventilation:** A sail may be suspended from the manhole guard except when a power blower is required to ventilate the manhole.

2.05 **Power Ventilation:** A power blower should be used to ventilate the manhole when tests indicate the presence of gas or where local practice requires that a blower be used when working in a manhole.

3. TESTS FOR COMBUSTIBLE GASES

Initial Test

3.01 Every manhole or cable vault opened for the first time during the day or reopened after having been closed for any length of time, shall be tested to determine whether combustible gas is present. Entrance shall be made only after the tests indicate that the atmosphere is safe. The initial tests for combustible gas shall be made as follows:

- (a) The test shall be made immediately after the manhole cover is removed and before the manhole is ventilated.
- (b) The test shall be made at the point where a man's head will be while working in the manhole. If sufficient water is present to require pumping, make the test about one foot above the level of the water. (See Paragraph 3.03 (d).)

3.02 The devices to use in testing for various types of gases are:

(a) **Natural and Petroleum Gases:** Use a Gas Indicator (hot wire type) or Suction Gas Indicator where combustible gases other than manufactured gas are supplied.

(b) **Mixture of Natural and Manufactured Gas:** Either a Gas Indicator or a Suction Gas Indicator may be used. If a Suction Gas Indicator is used, a test first for carbon monoxide shall be made using a Carbon Monoxide Detector or a Carbon Monoxide Indicator.

(c) **Manufactured Gas:** Where manufactured gas is supplied, test the atmosphere using a Carbon Monoxide Detector or Carbon Monoxide Indicator.

Additional Tests

3.03 If the test made on opening or reopening the manhole is satisfactory, the manhole or vault may be entered and worked in. Additional tests should be made as follows:

- (a) When each crew begins work.
- (b) At intervals not to exceed 2 hours.
- (c) When the manhole is covered with a tent or tarpaulin, it shall be tested at intervals not to exceed one hour. Place the tent or tarpaulin so that an opening is left in the covering for ventilation.

(d) **After the Manhole Has Been Pumped:** The removal of water may permit gas to flow into the manhole. Tests should be made just above the duct entrances. If a test indicates that gas is entering, ventilate the manhole with a power blower.

(e) **Testing After Removal of Duct Plugs:** Immediately upon the removal of the duct plugs, make a test just above the opened duct. If the test indicates that gas is entering, ventilate with a power blower.

Tests After Gas Is Detected

3.04 When more than the allowable trace of gas is found on the initial test, the manhole shall be ventilated with a power blower. Then make a second test with the blower running and if it tests satisfactory the manhole may be entered. Make the test away from the direct blast of the blower.

3.05 If gas is again found on the second test continue to ventilate the manhole with a power blower until it tests satisfactory. Work can then be started in the manhole, provided adequate power blower ventilation is continued so as to hold the quantity of gas in the manhole at an allowable value until the work has been completed and the cover is about to be replaced. While working in a manhole being ventilated with a power blower because of previous gas detection, test the atmosphere every hour.

3.06 Operate the blower outside of the manhole vent or tarpaulin.

3.07 If the blower stops, leave the manhole at once and do not re-enter until ventilation has been restored and the atmosphere tests satisfactory.

4. TESTING SPECIAL MANHOLES

Deep or Long-Necked Manholes

4.01 When working in deep or long-necked manholes the following testing procedures are recommended in addition to those covered in Parts 2 and 3 of this section.

(a) Where necessary, use additional lengths of hose to obtain a proper sample of air from the bottom portion of deep manholes.

(b) A power blower shall be used for ventilating during the entire period when working in manholes more than fifteen (15) feet deep.

Tunnel Entrance

4.02 A manhole with tunnel entrance shall be ventilated continuously with a power blower.

5. CABLE VAULTS

5.01 Every cable vault opened for the first time during the day or reopened after having been closed for any length of time, shall be tested to determine if gas is present. Entrance shall be made only after test indicates that the atmosphere is safe.

5.02 To test vault atmosphere proceed as follows:

- (a) Open the vault door, lay the free end of the hose or probe of the gas indicator on the floor and close the door as much as practicable without constricting the hose.
- (b) Test the atmosphere by aspirating air from the vault.

5.03 If gas is found in this test, withdraw the hose or probe and close the door.

5.04 If no gas is found, make a second test for gas above the duct entrances.

5.05 If gas is found in either test, immediately advise your supervisor, who will arrange for ventilation and take any other steps necessary to prevent the ignition of the gas. Care should be exercised to ensure that the method of ventilating employed does not force gas from the vault into other parts of the building. The ducts in the office manhole should be sealed to minimize entrance of gas through these ducts.

5.06 In some buildings tubes or pipes have been placed between the vault and some location outside the vault to facilitate testing the vault atmosphere instead of the test specified in Paragraph 5.02. When such tubes or pipes have been placed, specific instructions indicating the number of tubes and the location where the tests can be made shall be posted on the cable vault door. It is recommended that the length of each tube be indicated at the various test points. These tubes or pipes shall be considered as an extension of the sampling hose.

6. GASES FOUND IN MANHOLES

6.01 The dangerous gases most often found in manholes (or cable vaults) are those used for household heating and cooking. There are, however, commercial gases and gases generated in the soil, as well as liquid fuels which occasionally escape into conduit and manholes; these likewise create hazardous conditions that must be guarded against.

6.02 The following shows the gases and other hazardous conditions which may occur in manholes:

<u>Type</u>	<u>Dangerous Constituent</u>	<u>Effect</u>
Household Gases		
Manufactured	Carbon Monoxide	Toxic and Explosive
Mixture of Manufactured and Natural Gas	Carbon Monoxide, Hydrogen and Natural Gas	Toxic and Explosive
Natural and Petroleum	Methane, Ethane, Ethylene, Propane, Butane and Hexane	Suffocating and Explosive
Natural Gas	Methane	Explosive
Soil Gases		
Hydrogen Sulphide	Hydrogen Sulphide	Toxic
Carbon Dioxide	Carbon Dioxide	Suffocating
Marsh Gas	Methane	Suffocating and Explosive
Commercial Gases		
Sulphur Dioxide	Sulphur Dioxide	Irritating
Ammonia	Ammonia	Irritating
Butadiene	Butadiene	Explosive
Hydrogen Sulphide	Hydrogen Sulphide	Toxic and Explosive
Liquid Fuels		
Gasoline	Fumes	Toxic and Explosive
Benzol	Fumes	Toxic and Explosive
Fuel Oils	Fumes	Irritating and Explosive
Oxygen Deficiency		
Oxygen Deficiency	Lack of Oxygen	Suffocating