

TESTING AND VENTILATING MANHOLES

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1. GENERAL

1.01 This section describes the methods of testing with a hot filament-type gas indicator for the presence of combustible gas in manholes, unventilated cable entrance facilities, and unattended offices or buildings with underground cable entrances. Included in the section are the requirements for power ventilation before entry and during occupancy

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of conventional manholes, offset access manholes, deep neck manholes, and irregular shaped manholes of sizes up to 10,000 cubic feet. *The use of power ventilation does not preclude the necessity of testing for the presence of combustible gas.*

1.02 This section is reissued to revise purging time requirements. The revised requirements are based on the manhole size and *effective blower capacities*. Since this is a general revision, arrows used to show changes have been omitted.

1.03 A routine for reporting suspected gas leaks should be established within each operating area. Telephone numbers of the gas company department or personnel responsible for investigating the reports shall be available so the proper people can be informed and measures taken to repair the leak.

1.04 If petroleum products (gasoline, diesel fuel, etc) are found in a manhole, proceed as outlined in Section 620-145-010.

2. PRECAUTIONS

2.01 Manhole guards and warning devices shall be set up at the manhole in accordance with Sections 620-135-010 and 620-135-100 before the manhole cover is removed.

2.02 *Never enter a manhole, even momentarily, until it has been tested for combustible gas and then power ventilated (purged) with the blower operating at a maximum rated speed for the times specified in this section.*

2.03 Where a tent is placed over a manhole opening before initial ventilation begins, roll up and tie the skirts of the tent at least 1 foot above the ground to provide an open area around the bottom of the tent for adequate air circulation and for dissipation of possible gas accumulations. Opening the tent entrance flaps alone will not provide sufficient movement of air and may cause "pocketing of gases" inside the tent. When a

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manhole shield is being used, raise the tent skirts at least 1 foot above the top of the shield to provide an area for ventilation. **When a tent is in place during the purge, increase the purge time by 5 minutes.** After purging, the tent skirts may be lowered, but the tent must be arranged to permit unrestricted air circulation from the tent. **The tent shall not be fully closed at any time.**

2.04 The blower must remain in operation during the entire time anyone is in the manhole. Do not operate the blower in any type of enclosure such as a tent, vehicle (except Electro-van and similar trucks), trailer, tool cart, etc. Locate the blower in an unconfined space with the blower intake away from traffic and the blower exhaust away from the manhole opening. The blower should be located a minimum of 5 feet from the manhole opening to avoid returning purged air into the manhole.

2.05 *Care should be taken when setting up the blower hose to prevent unnecessary bends or restrictions.* Bends or restrictions should be kept to a minimum as this will reduce the air output at the end of the blower hose to below the certified rate. During purging (hose in dropped position) the hose end should extend into the manhole a minimum of 1 foot below the ceiling and shall be at least 2 feet above the floor level.

2.06 No open flame, torch, lighted cigar, cigarette, or pipe shall be brought near an open manhole, into a covering or tent over an open manhole, nor taken into a manhole. **Under no circumstances shall a cigarette lighter, match, or other item that produces a hot spark be operated or ignited in a manhole.**

2.07 The propane furnace and other open flames should be kept as far from an open manhole as practical and away from the blower air intake.

2.08 Only approved lighting and heating equipment shall be used. Connections and disconnections to electric lighting, equipment, etc, shall be made outside the manhole. Storage batteries shall not be brought into a manhole.

2.09 Hazardous gases most likely to be found in underground structures are those used for household fuel. However, gases generated in the soil, liquid fuels that occasionally escape into conduit and manholes, and oxygen deficiency can occur and can cause hazardous conditions. **Since the gas indicator used to test for the presence of gas will detect combustible gas only, and since other hazardous gases can be present or there can be an oxygen deficiency, the requirements for purging and continuous ventilation covered in this section must be carried out to assure a safe working atmosphere. In manholes where toxic gases are likely to occur, increase the purge times given in this section by 50 percent.**

3. INTERPRETING GAS INDICATOR READINGS

3.01 Two types of gas indicators are available; the hand aspirated indicator and the continuous gas monitor. The continuous gas monitor description and use is covered in Section 081-700-110. The hand aspirated indicator is a hot filament-type gas indicator (B, C, E, F, or G gas indicator) which, when properly used, will indicate the percentage of the lower explosive limit (LEL) of combustible gas present in the atmosphere being tested. A gas indicator reading showing a gas concentration above the 10 percent LEL in a manhole, cable entrance facility, or building indicates an unsafe atmosphere. An indicator reading showing a gas concentration below the 10 percent LEL indicates a nonexplosive atmosphere. **However, the meter indication of a nonexplosive manhole atmosphere does not eliminate the necessity of purging for the prescribed times and maintaining continuous ventilation during occupancy.**

3.02 All new gas indicators and modified existing gas indicators have a meter scale with a green band from 0 to 10 or 0 to 0.1, which represents zero to 10 percent LEL, and a red band above 10 or 0.1, which represents values above 10 percent LEL. A reading of 100 percent LEL

indicates a concentration of gas in air that will explode or continue to burn when ignited. When using the gas indicator, observe the guidelines in Table A to determine if explosive gas is present and to prevent meter damage if gas concentrations are high.

TABLE A

INTERPRETATION OF GAS INDICATOR READINGS

SCALE READING	TYPE OF INDICATOR	INTERPRETATION
0 to 10	B, F, and G Gas Indicators	Satisfactory; however, purge before entering and ventilate while working in manhole.
0 to 0.1		
Above 10 to 100	B, F, and G Gas Indicators	Hazardous Condition — Purge for required time and retest.
Above 0.1 to 1.0		
Needle moves to right end of scale and either remains there or returns to some point on scale, zero, or below	B, C, E, F, and G Gas Indicators	Hazardous Condition — Concentration of gas may be in explosive range. Purge for required time and retest.

* New and modified meters

3.03 If, when using the gas indicator in any area, the meter pointer moves to 100 percent, or the top of the scale, and stops there, it indicates a hazardous gas concentration near or above the LEL. When this occurs, turn the instrument off and purge it with fresh air, by removing the hose and squeezing the bulb about five times, to prevent meter damage.

3.04 If, when using the gas indicator in any area, the meter pointer moves rapidly to the top of the scale and then returns to some point on the scale, or to zero or below, it indicates a gas concentration above the LEL, possibly a very heavy concentration of gas. When this occurs, turn the instrument off immediately and purge with fresh air to prevent damage to the meter. Also recheck the instrument with the gas test kit, as the high gas concentration may have burned out the meter filament.

4. BLOWER CAPACITIES

4.01 Manhole ventilation with forced air is necessary first, to expel hazardous gases that may be present in the manhole atmosphere and second, to maintain an adequate supply of oxygen. To determine initial ventilation (purge) times, the effective blower capacity and manhole volume must be known.

4.02 The effective blower capacity is defined as the actual blower air output in cubic feet per minute (CFM) delivered at the end of the standard blower hose (AT-8418). Effective blower capacity, as stated by the blower manufacturer, must have been determined by precision airflow chamber tests performed by independent testing laboratories. The tests are made with one 90 degree bend (purging position) in the blower hose and with two 90 degree bends (continuous ventilation

position) in the blower hose, and the results are certified by the testing laboratory.

4.03 Newly purchased blowers will have the certified capacity displayed on the nameplate. Blowers in service must be equipped with a metal tag or other permanent label or marked with a paint stencil to show the effective blower capacity.

5. BLOWER MAINTENANCE

5.01 All blower units need to be cleaned and checked periodically to be sure they are operating at rated capacity. Improper blower operation can cause a reduction in blower motor speed and thus a reduction in air delivery.

5.02 Air delivery of electrically powered blowers generally will not vary from the norm if line voltage and frequency are held at the value for which the motor is designed and there is no damage to the blower components. Air delivery of blowers powered by internal combustion engines will vary appreciably if the engine is not properly maintained and adjusted to operate at the governed engine speed per the manufacturer's specifications.

5.03 Blower hoses shall be in good condition.

Hoses with leaks, tears, or other damage can cause a marked reduction in air delivery and, therefore, must be repaired or replaced as required.

6. SETUPS FOR TESTING AND PURGING MANHOLES

6.01 Initially, test for combustible gas with the end of the sampling tube at about head height in the manhole. If this cannot be accomplished by lowering the tube directly into the manhole, a permanent installation of gas sampling tubing extending into the manhole should be provided. The tubing should be installed with one end at or near the middle of one side wall and at about head height away from the direct output of the blower. The other end should terminate in the manhole entrance and be accessible from a position outside the manhole collar. The end in the manhole entrance should be equipped with a capped end fitting for attaching the gas indicator hose and a valve for connecting an air chuck to clear the tubing of any residual gas, dirt, or water.

CONVENTIONAL MANHOLES

6.02 Conventional manholes are rectangular in shape with access through the manhole roof and with the collar height short enough so the standard blower hose is adequate in length for purging and for continuous ventilation. Manholes that are smaller than 1000 cubic feet are purged

by opening one manhole cover and dropping the end of the blower hose into the manhole (one 90 degree bend in the blower hose). Conventional manholes larger than 1000 cubic feet are purged with two manhole covers removed, at opposite ends of the manhole. The purge times are specified in Part 7 of this section. A typical setup is shown in Fig. 1.

NOTES:

1. USING TWO BLOWERS, ONE IN OPENING A, AND ONE IN OPENING B, WILL REDUCE PURGE TIME.
2. PLACE MANHOLE GUARDS AND WARNING DEVICES AS SPECIFIED IN THE BELL SYSTEM PRACTICES.

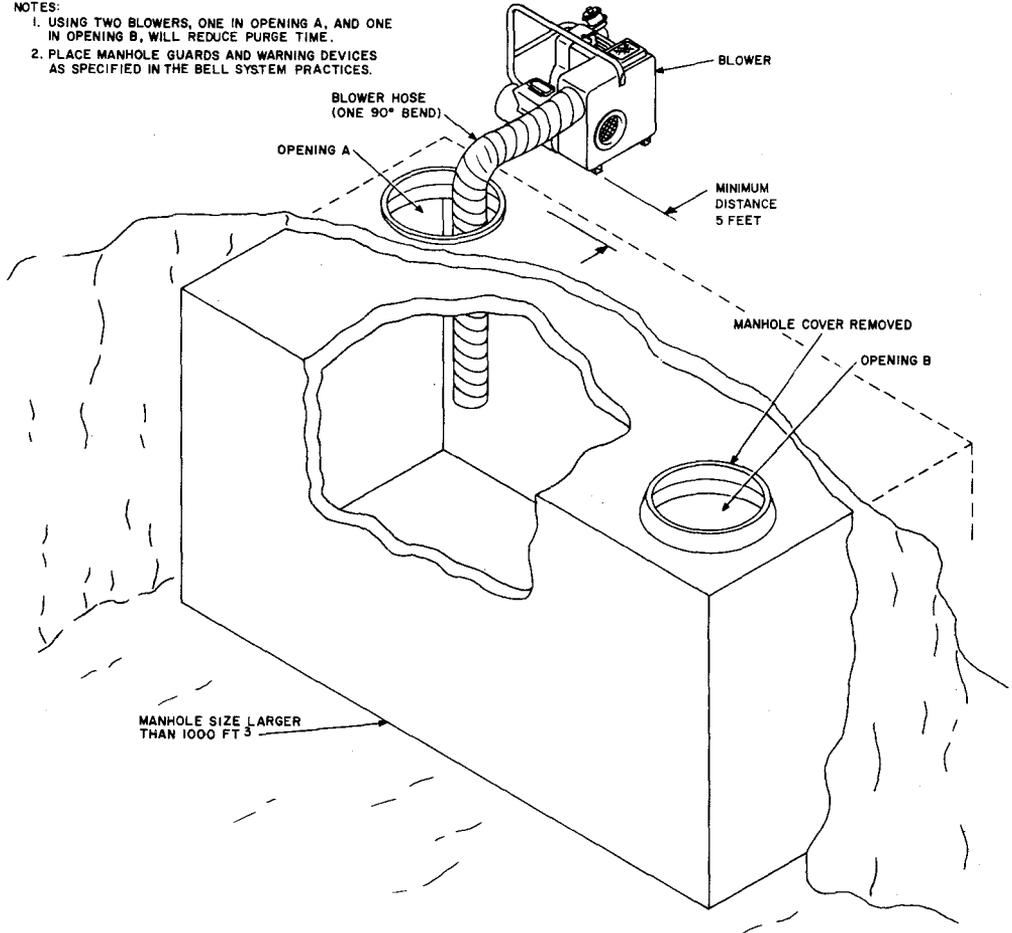


Fig. 1—Typical Setup for Purging Large Conventional Manholes

IRREGULAR SHAPE MANHOLES

6.03 Irregular shape manholes often result from enlarging an existing manhole. A typical example is shown in Fig. 2. If the manhole has

two floor levels or if it is congested so that air flow is restricted, purge time should be based on the effective blower capacity with two 90 degree bends in the hose. Purge by dropping the blower hose into the manhole (one 90 degree bend in blower hose).

NOTES:

1. BASE PURGE TIME ON EFFECTIVE BLOWER CAPACITY WITH TWO 90° BENDS IN BLOWER HOSE.
2. PLACE MANHOLE GUARDS AND WARNING DEVICES AS SPECIFIED IN THE BELL SYSTEM PRACTICES.

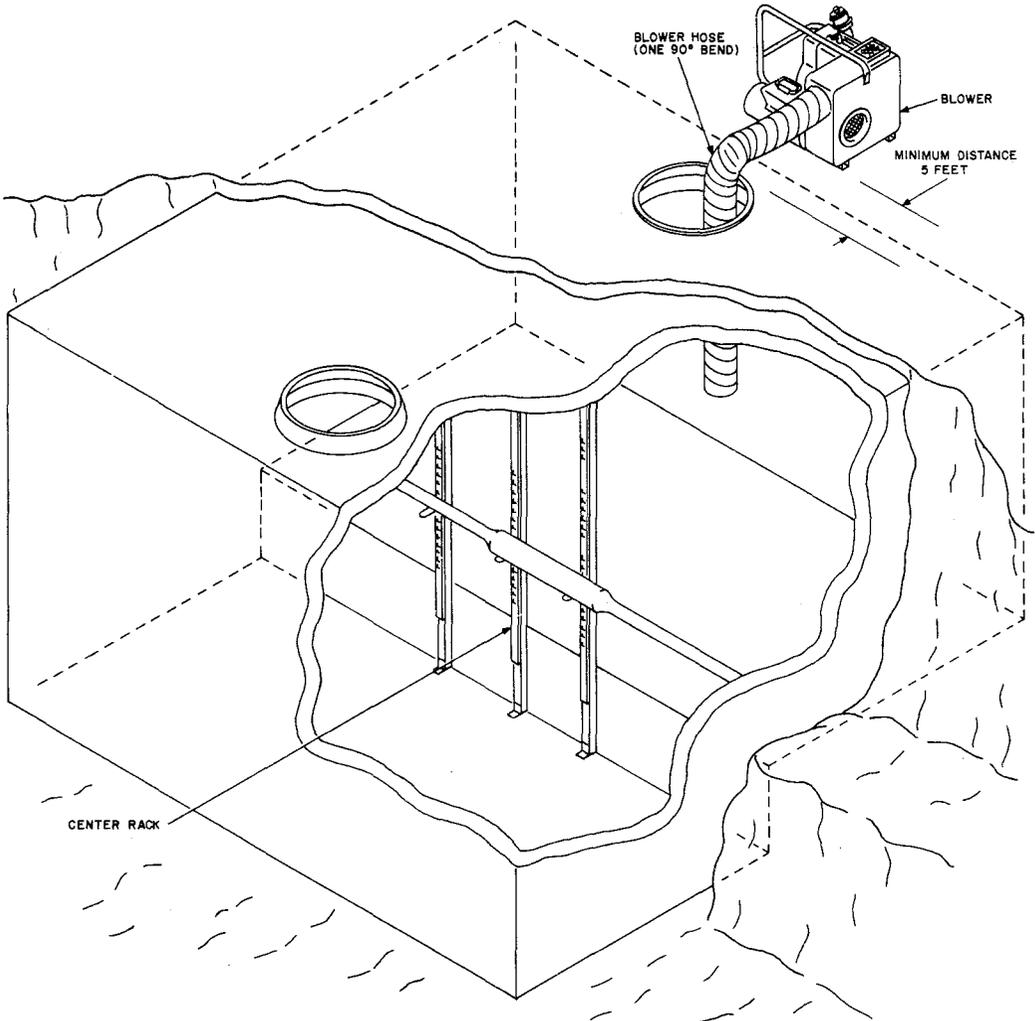


Fig. 2—Typical Setup for Purging Irregular Shape Manholes

OFFSET ACCESS MANHOLES

6.04 Offset access manholes are those manholes situated so entry must be made through either an access opening several feet from the manhole or an adjacent manhole and a connecting

horizontal passageway. Adequate purging and ventilation for these manholes can be achieved only through permanently installed ventilating ducts that will introduce air directly into the offset access manhole. Examples of ventilating duct locations are shown in Fig. 3 and 4.

NOTES:

1. BASE PURGE TIME ON EFFECTIVE BLOWER CAPACITY WITH ONE 90° BEND IN BLOWER HOSE.
2. PLACE MANHOLE GUARDS AND WARNING DEVICES AS SPECIFIED IN THE BELL SYSTEM PRACTICES.

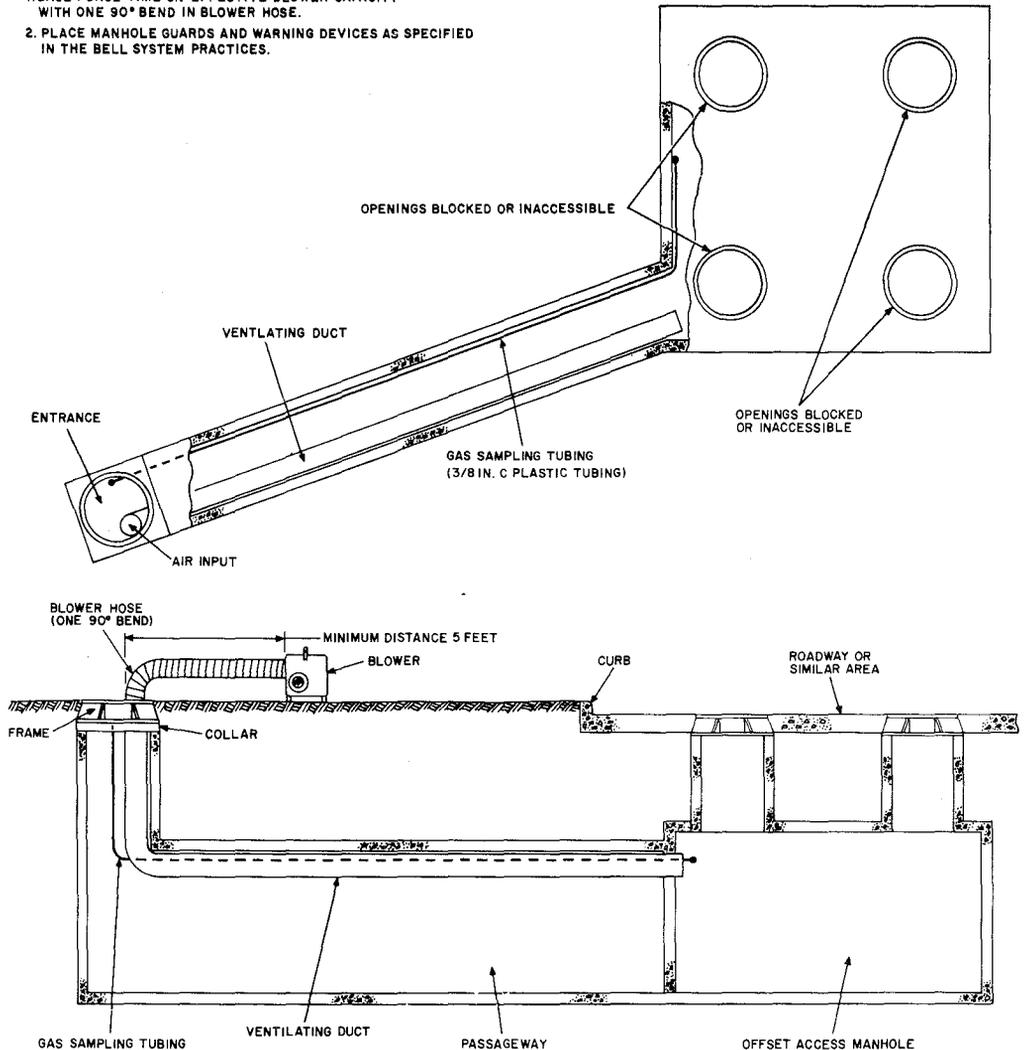


Fig. 3—Typical Setup for Purging Offset Access Manhole With No Entrance Manhole

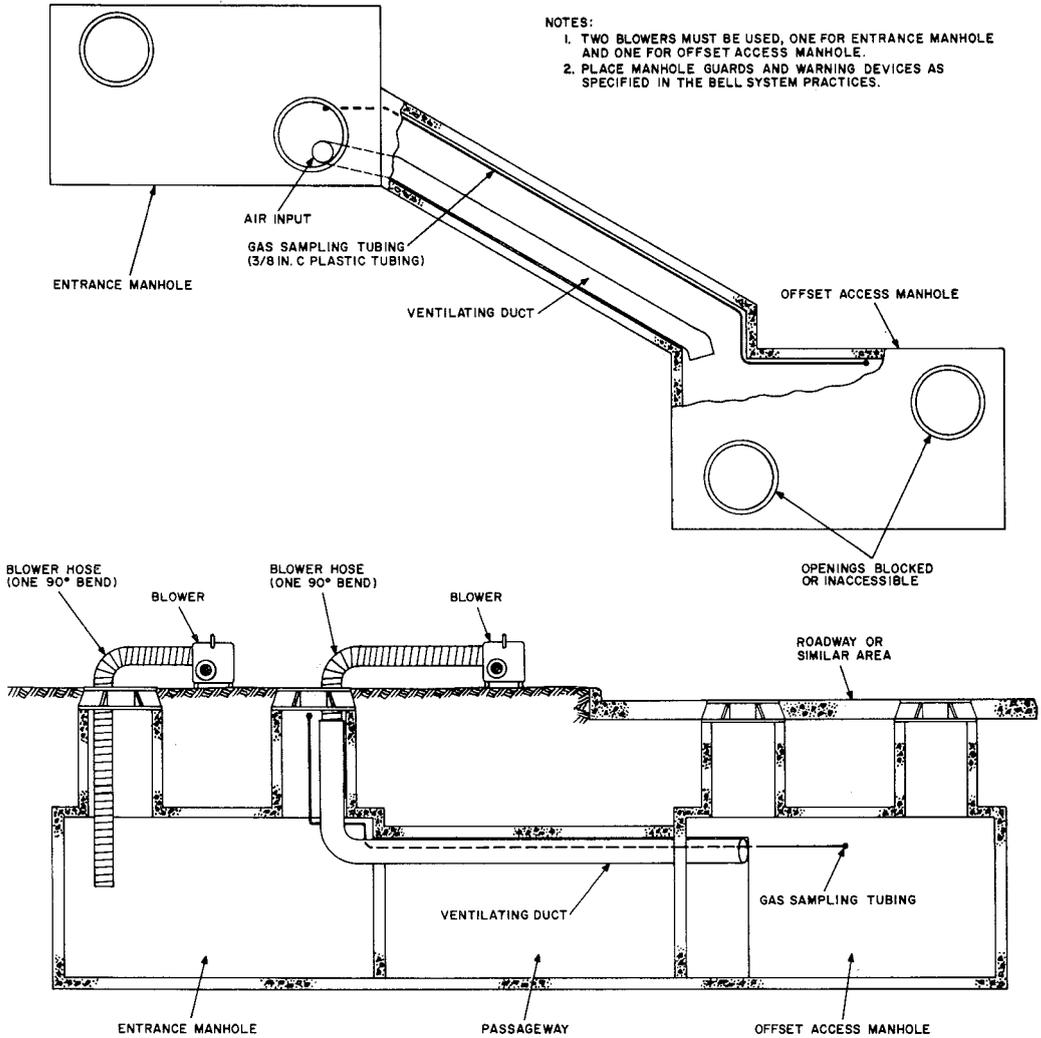


Fig. 4—Typical Setup for Purging Offset Access Manhole With Entrance Manhole

6.05 Purging and ventilation of offset access manholes is accomplished by inserting the end of the blower hose into the upper end of the permanently installed ventilating duct. When inserting the blower hose, be sure its end is several inches above any 90 degree elbow in the duct so airflow will not be impeded.

6.06 Purge times for offset access manholes are determined using the effective blower capacity with one 90 degree bend in the blower hose and the sum of the volumes of the manhole and the passageway. When entry into the offset access manhole is through an adjacent manhole and a passageway, both the entrance manhole and the offset access manhole must be ventilated any time work is done in either one or both of the manholes. Each manhole is ventilated independently (two blowers, hoses, gas tests, etc), however, purge

time for each manhole will be the same and will be the purge time determined for the larger of the two manholes. The volume of the passageway added to the volume of the offset access manhole is considered as the total volume of the offset access manhole.

DEEP NECK MANHOLES

6.07 For the purposes of this section, deep neck manholes are defined as those manholes with entry through the roof and with a long collar height so that one 15-foot blower hose is not adequate in length for purging and for continuous ventilation. Deep neck manholes may be purged and ventilated by coupling two standard blower hoses together (Fig. 5) or by utilizing permanent ventilating duct installed either in the collar (Fig. 6) or adjacent to the manhole (Fig. 7).

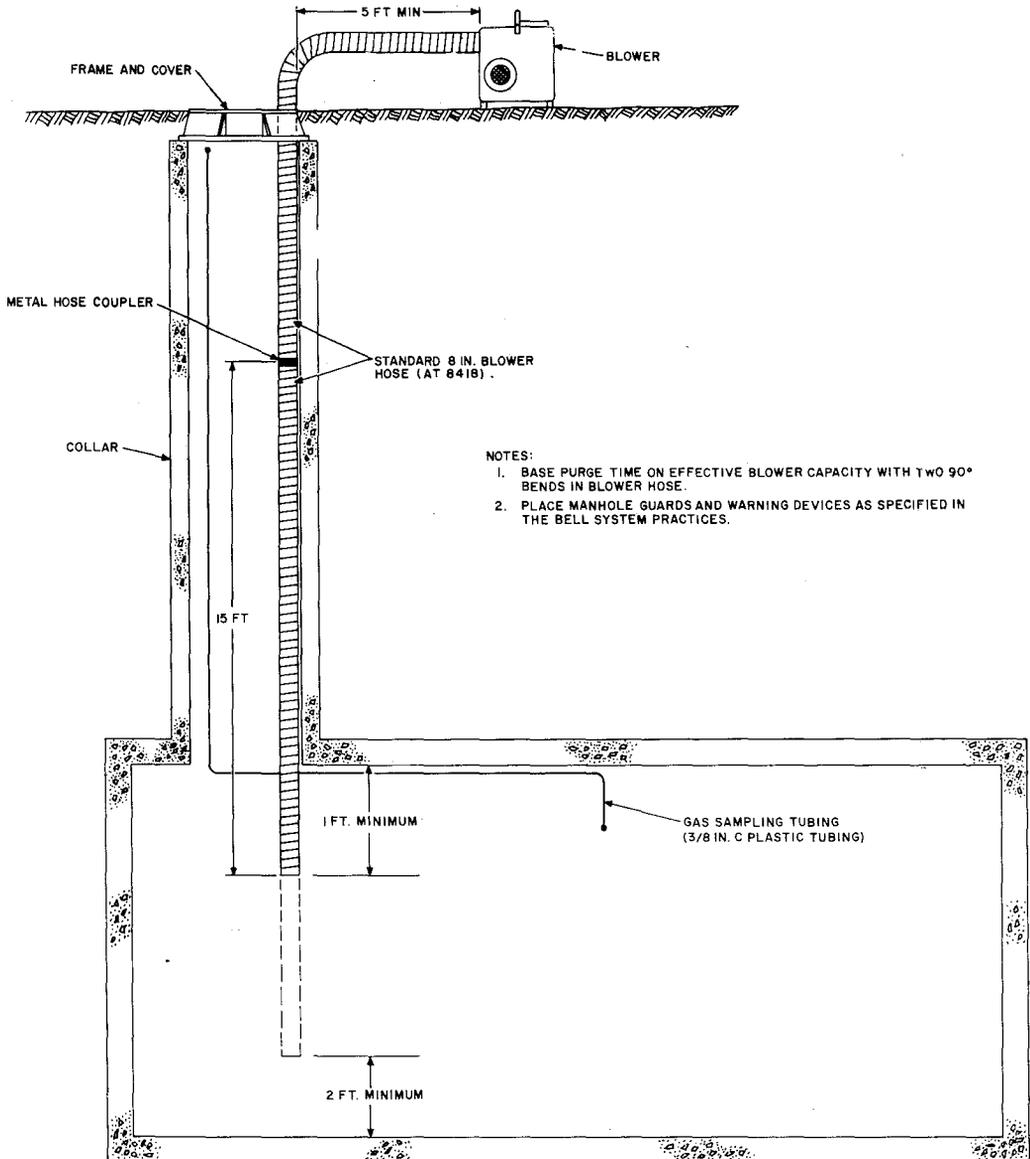


Fig. 5—Deep Neck Manhole Ventilated by Coupling Two Blower Hoses

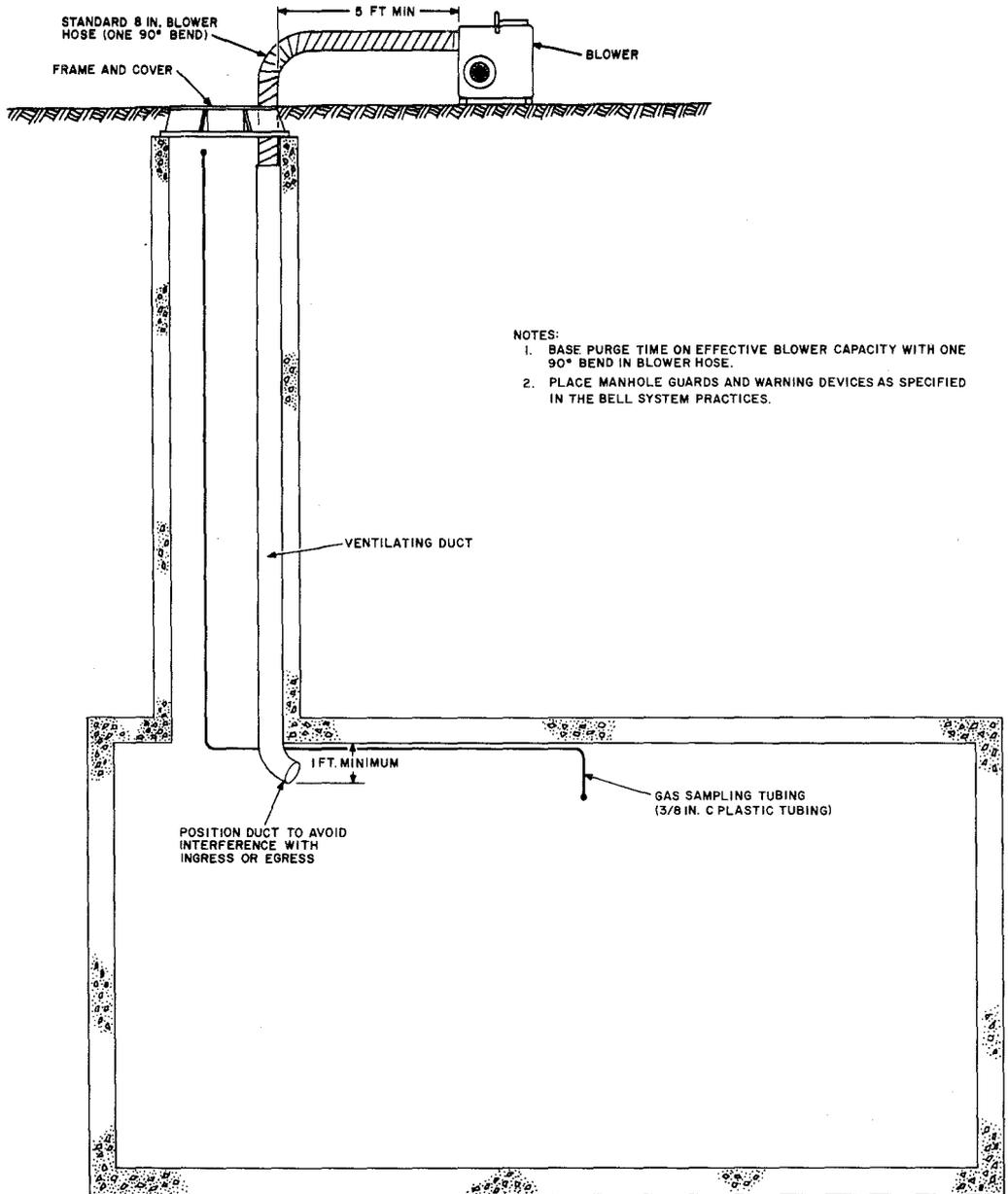


Fig. 6—Deep Neck Manhole Ventilated With Permanent Ventilating Duct Installed in Collar

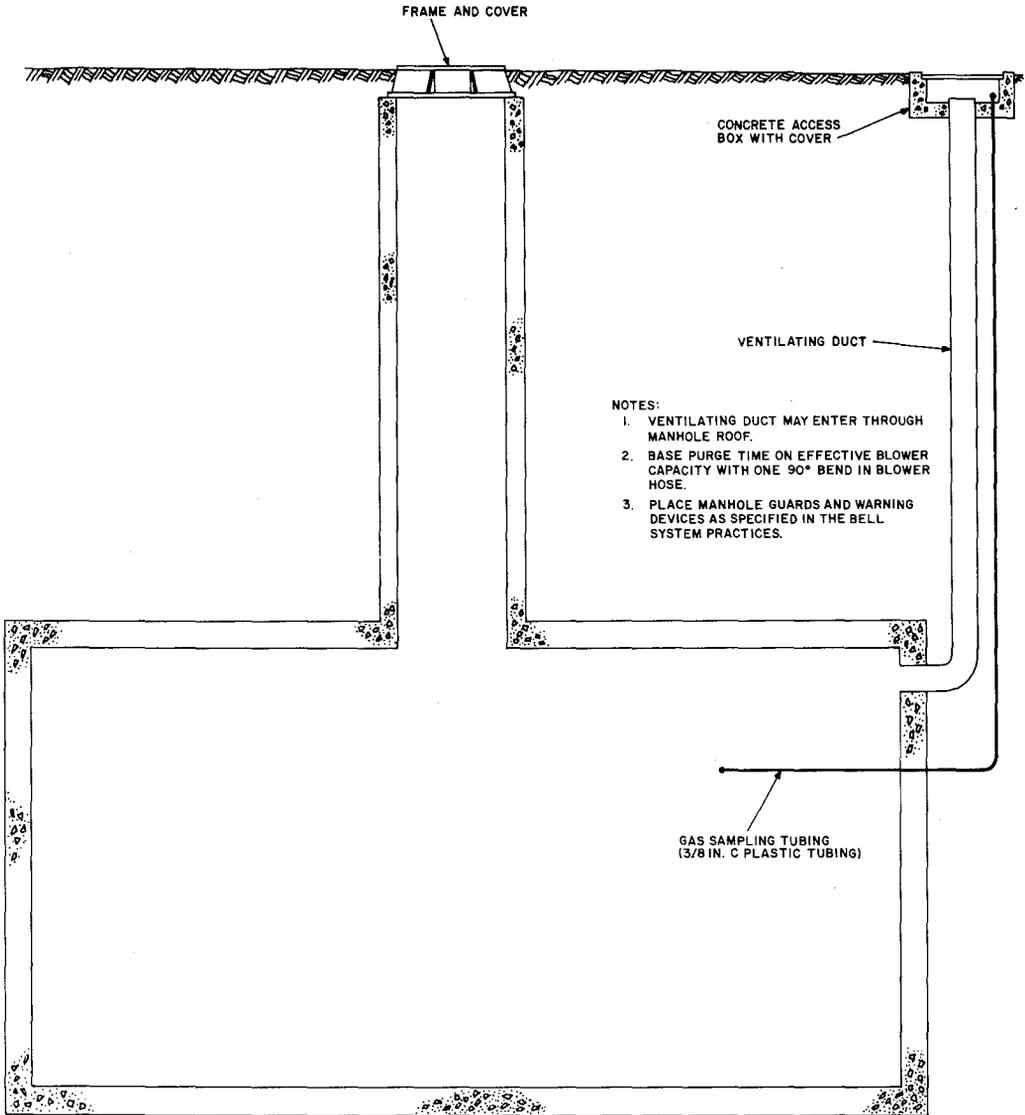


Fig. 7—Deep Neck Manhole With Permanent Ventilating Duct Installed Adjacent to Manhole

6.08 If the collar height is greater than 5 feet, the volume of the collar must be added to the volume of the manhole for determining purge time.

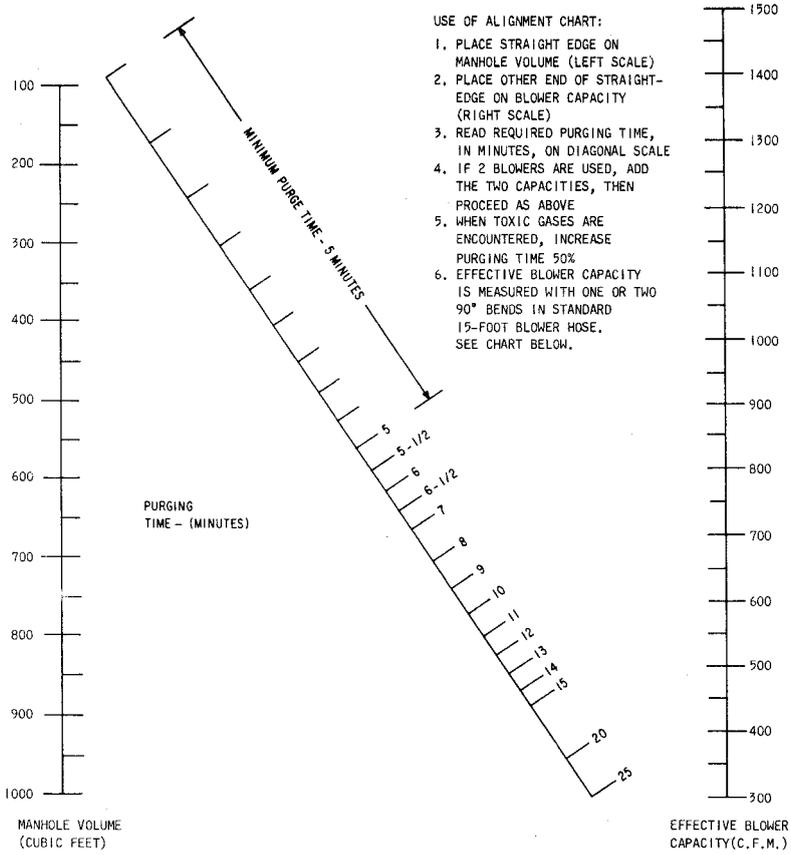
6.09 When purging with the coupled hose, purge time should be based on the effective blower capacity with two 90 degree bends in the standard blower hose to compensate for pressure drop in the longer hose.

6.10 Where permanent ventilating duct is installed, the effective blower capacity with one 90 degree bend in the blower hose is used to determine purge time. Ventilating ducts should be placed to avoid interference with winch lines, suction hoses

used for pumping water, etc, and to direct the airflow either diagonally across the manhole or along a long dimension of the manhole. A cap or cover should be provided for the upper end of the ventilating duct when it is not in use. Ventilate by inserting blower hose into ventilating duct.

7. DETERMINING PURGE TIMES

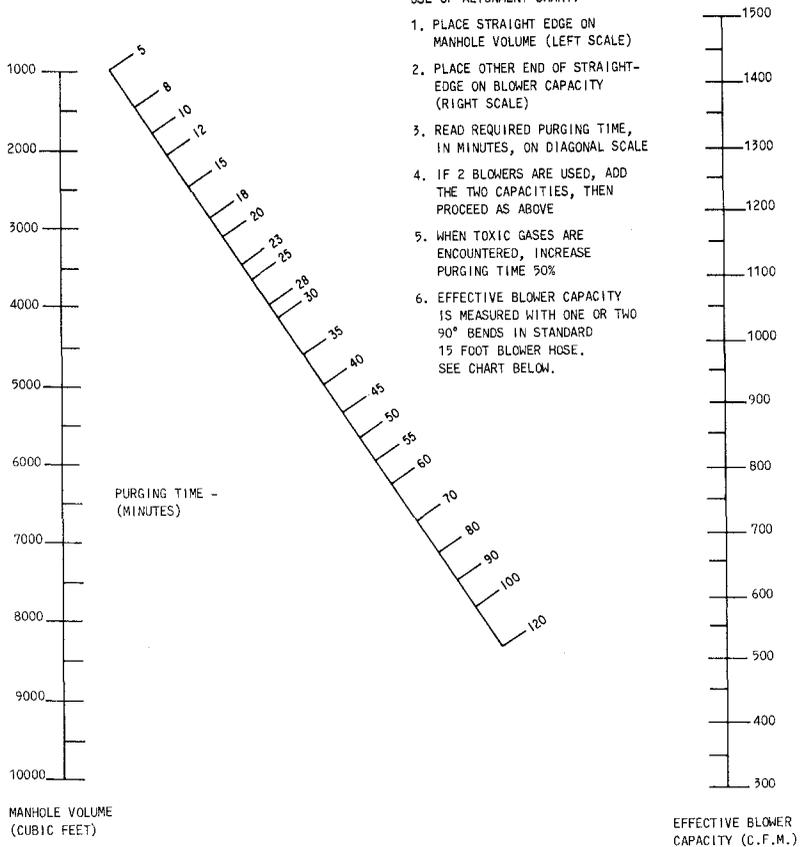
7.01 Purge times specified in the alignment charts (Fig. 8 and 9) are based upon 10 percent LEL for a combustible gas. When toxic commercial or soil gases are presumed to be present or detected by odor in the manhole, the purge time determined by using the alignment charts should be increased by 50 percent.



EFFECTIVE BLOWER CAPACITY (CFM) WITH:	CONVENTIONAL MANHOLE (TO 1000 FT ³)	OFFSET ACCESS MANHOLE (WITH PERMANENT VENTILATING DUCT)	DEEP NECK MANHOLE		IRREGULAR SHAPE MANHOLE	
			PERMANENT VENTILATING DUCT	COUPLED HOSE	UNCONGESTED	CONGESTED
ONE 90° BEND	✓	✓	✓		✓	
TWO 90° BENDS				✓*		✓

* USE BLOWER CAPACITY WITH TWO 90° BENDS UNLESS BLOWER HAS BEEN CERTIFIED WITH COUPLED HOSE WITH ONE 90° BEND.

Fig. 8—Alignment Chart—Side 1



- USE OF ALIGNMENT CHART:
1. PLACE STRAIGHT EDGE ON MANHOLE VOLUME (LEFT SCALE)
 2. PLACE OTHER END OF STRAIGHT-EDGE ON BLOWER CAPACITY (RIGHT SCALE)
 3. READ REQUIRED PURGING TIME, IN MINUTES, ON DIAGONAL SCALE
 4. IF 2 BLOWERS ARE USED, ADD THE TWO CAPACITIES, THEN PROCEED AS ABOVE
 5. WHEN TOXIC GASES ARE ENCOUNTERED, INCREASE PURGING TIME 50%
 6. EFFECTIVE BLOWER CAPACITY IS MEASURED WITH ONE OR TWO 90° BENDS IN STANDARD 15 FOOT BLOWER HOSE. SEE CHART BELOW.

EFFECTIVE BLOWER CAPACITY (CFM)	CONVENTIONAL MANHOLE (1000 TO 10,000 FT ³)	OFFSET ACCESS MANHOLE (WITH PERMANENT VENTILATING DUCT)	DEEP NECK MANHOLE		IRREGULAR SHAPE MANHOLE	
			PERMANENT VENTILATING DUCT	COUPLED HOSE	UNCONGESTED	CONGESTED
ONE 90° BEND	✓	✓	✓		✓	
TWO 90° BENDS				*✓		✓

* USE BLOWER CAPACITY WITH TWO 90° BENDS UNLESS BLOWER HAS BEEN CERTIFIED WITH COUPLED HOSE WITH ONE 90° BEND.

Fig. 9—Alignment Chart—Side 2

7.02 Accurate purge times can be determined from the alignment charts if effective blower capacity and manhole volume are known. **Minimum purge time shall be 5 minutes.** For large manholes, purge times may be reduced by using two blowers, if the manhole has two access openings. When using two blowers the sum of the blower capacities is used as the effective blower capacity on the alignment chart. Only one blower hose may be placed in any manhole access opening if the opening is to be used for ingress and egress.

7.03 Each manhole with a volume greater than 500 cubic feet, or other volume designated by the company as the cut-off size, should have its volume in cubic feet recorded on a permanent plastic or metal tag that is secured in the manhole collar on a patch of high visibility paint. The tag must be clearly visible without having to enter the manhole. One method of recording the manhole volume is to use the Manhole Marking Kit 1379 available from General Machine Products, Trevoise, Pennsylvania. The kit consists of a 1-inch by 4-inch orange plastic strip, which can be marked on with a "permanent" felt-tip marker, and a masonry nail for mounting the plastic strip in the manhole collar. The purge times for all manholes of a size equal to or smaller than the 500 cubic foot cut-off size are:

- 10 minutes with 400 CFM blower
- 8 minutes with 500 CFM blower
- 5 minutes with 800 CFM blower

If a different cut-off size is adopted or blower capacities differ, purge times must be established from the alignment charts. Minimum purge times shall be 5 minutes.

7.04 To determine purge times for a manhole that has not been tagged or has the tag missing, as indicated by a paint patch but no tag, obtain the manhole volume from work prints or other records. If the manhole volume is not recorded, estimate the volume. When the purge time will be based on estimated manhole volume, double the purge time indicated on the alignment chart to compensate for possible errors in the estimate. After testing, purging, and ventilating, as covered in Part 8, measure the manhole, apply the patch of high visibility paint, and install a tag on which the manhole volume has been recorded.

Notify the person responsible for maintaining records of manhole sizes so the volume of the manhole will be placed on the records.

7.05 Continuous ventilation is required after purging to assure a safe working atmosphere. A blower operating with an effective blower capacity of no less than 345 CFM at the end of the blower hose with two 90 degree bends will maintain a safe working atmosphere in manholes of the sizes and configurations covered in this section, provided no additional contaminants enter the manhole (see 8.09) and air from the blower is introduced directly into the manhole via the blower hose or permanent ventilating ducts.

8. TESTING FOR COMBUSTIBLE GAS AND VENTILATING MANHOLES

8.01 The person making a gas test should set up in a position that will cause a minimum interference with traffic. Plan the work so a minimum amount of time is spent in the traffic area.

8.02 Every manhole opened after having been closed for any period of time shall be tested for the presence of combustible gas and purged. The initial test shall be made immediately after the manhole cover is removed and before the manhole is purged.

8.03 The approved gas test kit (081 Division of the Bell System Practices) shall be used to test the gas indicator. The gas indicator should be tested for proper operation each day before the first manhole test is made, at each change of work shift, if dropped, or if exposed to a high concentration of gas. Never test the operation of a gas indicator by sampling fumes from a tank or can containing gasoline, because the high concentration of gas could damage the meter.

8.04 The initial test for combustible gas **using the hand aspirated indicator** shall be made as follows:

- (1) Hold the instrument securely or place it on a firm support during the test to prevent the instrument from falling.
- (2) Position the free end of the hose at the height where a person's head will be when working in the manhole (see note). Additional

lengths of hose may be used to test the lower portions of deep manholes or permanently installed gas sampling tubing can be provided. If water in the manhole is above head height, hold the sampling hose 1 foot above the water.

Note: Use permanently installed sampling tubing in offset access manholes. Any water in the manholes equipped with permanently installed gas sampling tubing must be pumped out to a level at least 1 foot below the end of the tubing. Blow air through the tubing to clear it of water.

(3) Draw a sample of the manhole atmosphere through the gas indicator, compressing and releasing the aspirator bulb about five times plus one squeeze for each 5 feet of hose. **The meter pointer must be observed continuously from the first squeeze of the bulb until the test is completed.** Keep aspirating until the highest reading is obtained. The needle will fluctuate slightly at each aspiration, showing that the indicator is functioning properly.

Warning: All users of combustible gas indicators must be aware that the rise and fall of the indicating needle is generally extremely rapid, and as a result the operator may not see the initial up-scale deflection unless the meter is continuously observed. **If a very heavy concentration of gas is present, the pointer will move rapidly to the top of the scale and then return to some point above zero, zero, or below zero. If not seen, this could lead to the erroneous assumption that the atmosphere being tested is safe when actually a very dangerous condition exists. This is the reason for stressing continuous observation of the pointer from the first squeeze of the bulb until the test is complete.**

8.05 After completing the initial test, purge the manhole for the appropriate time specified in the alignment chart.

Note: Removal of water from a manhole may permit gas to flow from the ducts into the manhole; therefore, after purging and before entering the manhole, an additional test shall be made after the manhole has been pumped or a minimum water level has been reached with continuous pumping.

(a) **If the initial test indicated an unsatisfactory atmosphere** in the manhole, make a second test after the blower has operated for the specified purge time. Make the test with the sampling hose away from the direct output of the blower. If this test indicates an unsatisfactory atmosphere, operate the blower for an additional 10 minutes and repeat the test. If any gas is detected at this time, do not enter the manhole. Report the condition to the supervisor. If the manhole atmosphere is satisfactory, the manhole may be entered. **(See following Note.)** The blower must be in continuous operation while anyone is in the manhole.

(b) **If the initial test indicated a satisfactory atmosphere**, the manhole may be entered after purging has been completed. **(See following Note.)** The blower must be in continuous operation while anyone is in the manhole.

Note: Before entering a deep neck or an offset access manhole, or any manhole equipped with gas sampling tubing, test the atmosphere in the collar area just below the manhole cover location. Make this test with the blower(s) operating. This test is required in addition to the test of the manhole atmosphere and even though the manhole atmosphere tests clear.

8.06 Enter the manhole with the gas indicator, and where possible, place the blower hose in a horizontal position along a sidewall approximately midway between the floor (or platform) and the manhole roof. Direct the blower hose outlet toward an end wall, preferably away from the work area. Next, make tests for gas by probing in the area of all duct entrances, in corners, crevices, etc, and then generally throughout the manhole. To purge the gas indicator while in the manhole, detach the sampling hose and hold the gas indicator in the fresh air near the end of the blower hose or ventilating duct.

8.07 For offset access manholes; upon entry into the entrance manhole, test for gas at the duct entrances and in the corners, test for gas in the passageway, and finally test for gas at the duct entrances and in the corners of the offset access manhole.

8.08 If the tests in the manhole are satisfactory proceed with the work operation. If gas is

detected, leave the manhole at once. Purge the manhole for an additional 10 minutes. Retest the manhole atmosphere from street level. If gas is detected, do not enter. Notify supervisor. If atmosphere is clear, reenter the manhole and repeat the tests in the manhole. If gas is detected after reentering, leave the manhole at once and notify the supervisor. If the atmosphere is clear, proceed with the work operation.

8.09 After the work in any manhole has begun, additional tests must be made as follows:

(a) If duct plugs are removed, immediately test for combustible gas at the ducts that were opened. If gas is detected, leave manhole at once. Purge for 10 minutes and retest manhole from street level. If gas is detected, notify supervisor. If atmosphere is clear, reenter the manhole and repeat tests. If gas is detected, leave manhole at once and notify supervisor. If atmosphere is clear, continue the work operation.

(b) When each crew begins work repeat tests at ducts and throughout manhole. If gas is detected leave manhole at once. Report the condition to the supervisor.

(c) At intervals of not more than two hours, every hour if gas was detected initially (shorten intervals to one-half these times if a tent is being used), repeat tests at ducts and

throughout manhole. If gas is detected, leave manhole at once. Report the condition to the supervisor.

8.10 *Continuous gas monitors* utilize a dual filament gas detector designed to continuously test the working atmosphere. This type of gas detector eliminates the need to make periodic tests while the manhole is occupied. It can provide an extra measure of security in a manhole that has a history of combustible gas occurrences. The monitor is factory set to trigger an audible and a visual alarm when the gas concentration exceeds 10 percent LEL. After work in the manhole has begun and the monitor is in use, leave the manhole at once if the alarm should operate. Follow procedures in 8.09(a) when removing duct plugs.

8.11 If the blower should stop, leave the manhole at once. Remove the blower hose from the manhole. The blower hose shall be kept out of the manhole while the blower is not operating. When the blower is again operating, purge the hose. While purging hose, test the manhole atmosphere. If satisfactory, replace the blower hose and reenter the manhole. If the test is not satisfactory, purge the manhole for 10 minutes and retest the manhole atmosphere from street level. If atmosphere tests clear, reenter the manhole and repeat tests in manhole. If gas is detected, leave manhole at once and notify supervisor. If atmosphere tests clear, continue the work operation.

8.12 Figure 10 is a brief summary of the manhole testing and ventilating procedures. Read the complete section thoroughly to be sure the procedures are understood.

9. TESTING CABLE ENTRANCE FACILITIES (CEF) FOR COMBUSTIBLE GAS

9.01 *The testing of cable entrance facilities shall be in accordance with local building practices. If the responsible building supervisor has determined that the CEF is adequately ventilated, no testing is required.* In the absence of any local practices or requirements, cable entrance facilities shall be tested for gas in accordance with the procedures in the following paragraphs.

9.02 In some buildings, tubes or pipes have been placed between the cable entrance facility and some location outside the facility to facilitate testing. 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 or adjacent to the CEF 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 and should be aspirated accordingly when making tests.

9.03 If no tubes, pipes, etc, are provided to facilitate testing for gas, open the CEF door just enough to lay the free end of the hose of the gas indicator on the floor and into the CEF. Perform the test for gas. If no gas is detected at floor level, lay the free end of the hose over the top of the door. Close the door as much as is possible without constricting the hose and test for gas.

9.04 If gas is detected during the tests do not enter. Withdraw the hose, close the door, and notify the supervisor. If no gas is found, enter the CEF and test for gas in the area of the conduit entrance and generally throughout the CEF. If gas is found in the CEF, leave immediately, close the door, and immediately inform the supervisor and the person in charge of the building.

9.05 If gas is found, the person in charge of the building must arrange for ventilation and any other steps necessary to prevent ignition of the gas. Care should be exercised to ensure that the method of ventilating does not force gas from the CEF into other parts of the building.

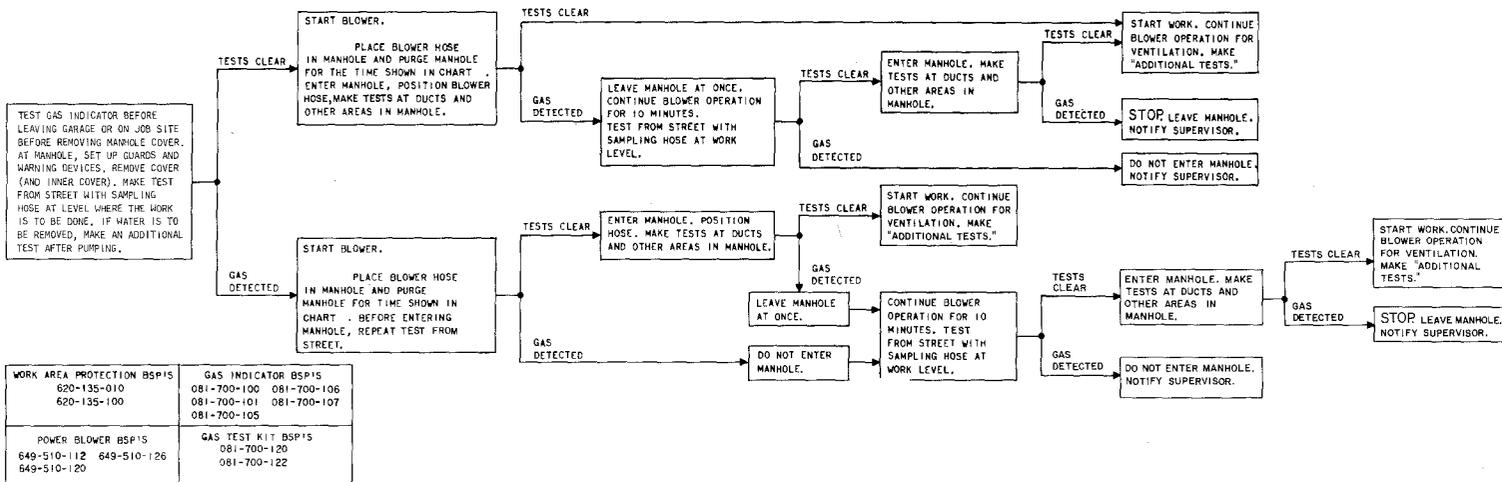
9.06 After each operation involving the duct plugs or duct seals in the office manhole and CEF, the ducts should be resealed to minimize the possibility of gas entering through these ducts.

9.07 Cable entrance facilities are considered to be central office equipment spaces and, therefore, no open flame, torch, lighted cigar, cigarette, or pipe shall be brought into such areas. Under no circumstances shall a cigarette lighter, match, or other device that produces a hot spark be operated or ignited in a CEF.

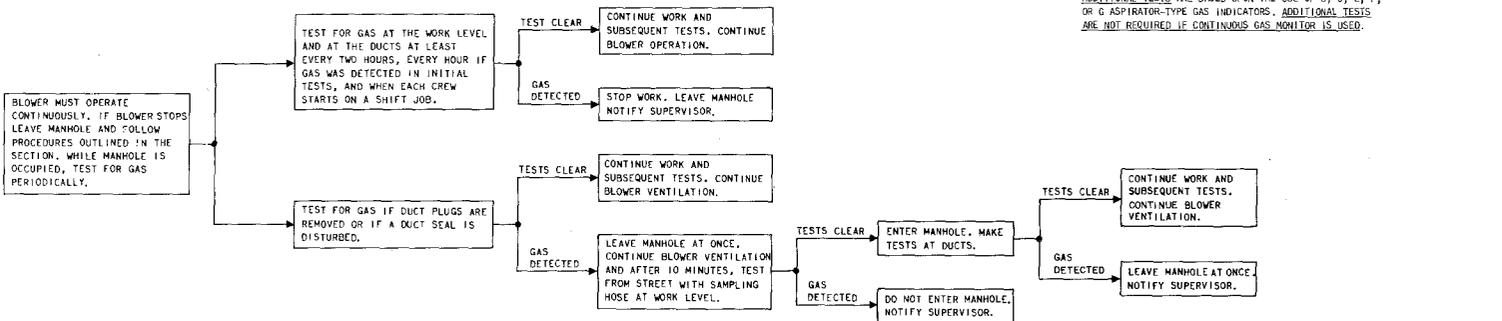
10. TESTING UNATTENDED BUILDINGS FOR COMBUSTIBLE GAS

10.01 When entering an unattended building having an underground cable entrance, the test for gas may be omitted if so posted or covered by local instructions. Otherwise, the area above and around the cable ducts entering the building shall be tested with the gas indicator. If gas is detected, ventilate by opening windows and doors. Notify the supervisor and the gas company and/or local authority in accordance with local routine.

INITIAL TESTS



ADDITIONAL TESTS



NOTE:
ADDITIONAL TESTS ARE BASED UPON THE USE OF B, C, E, F, OR G ASPIRATOR-TYPE GAS INDICATORS. ADDITIONAL TESTS ARE NOT REQUIRED IF CONTINUOUS GAS MONITOR IS USED.

Fig. 10—Summary of Manhole Testing and Ventilatin Procedures