

BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

SECTION G10.212.2
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AT&TCo Standard

TESTING MANHOLE ATMOSPHERE CARBON MONOXIDE DETECTOR AND HEATER

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1. GENERAL

1.01 This section replaces Issue 1. It describes the Carbon Monoxide Detector and the Ampoule Heater and covers the method of using them in testing for the presence of manufactured gas (carbon monoxide), mixtures of manufactured and natural gases or hydrogen sulphide in manholes and cable vaults.

1.02 The section has been reissued to advise that additional instructions have been placed on the cardboard case and the color chart calling for the use of the Ampoule Heater when the temperature is 40° F or lower.

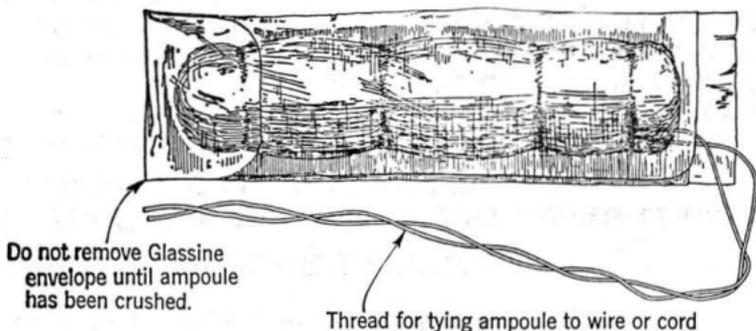
1.03 The method of ventilating manholes and cable vaults when carbon monoxide or hydrogen sulphide is detected is covered in another section of the Practices.

2. CARBON MONOXIDE DETECTOR

2.01 The Carbon Monoxide Detector consists of two parts: an ampoule and a color chart.

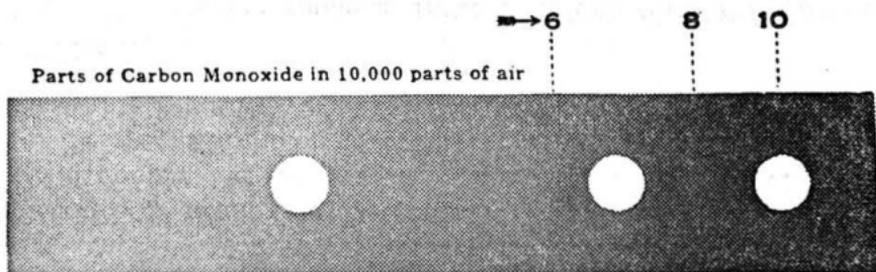
2.02 **Ampoule:** The glass ampoule contains a solution of palladium chloride which darkens on exposure to carbon monoxide or hydrogen sulphide. The ampoule is covered with absorbent cotton. To prevent soiling of the cotton covering, each ampoule is enclosed in a removable glassine envelope, as shown on next page.

CARBON MONOXIDE AMPOULE



2.03 Color Chart: The color chart, illustrated below, affords a means of determining the approximate concentration of carbon monoxide or hydrogen sulphide in the atmosphere. This is done by comparing the color of the darkened ampoule with the color scale on the chart.

CARBON MONOXIDE DETECTOR COMPARE AMPOULES WITH COLOR SCALE BELOW



The Carbon Monoxide Detector may also be used to test for **HYDROGEN SULPHIDE** gas. The ampoule will darken when **HYDROGEN SULPHIDE** gas is present in dangerous concentration.

IF THE AMPOULE BECOMES DISCOLORED DURING TEST, VENTILATE MANHOLE AND PROCEED AS OUTLINED IN THE BELL SYSTEM PRACTICES.

DO NOT ENTER MANHOLE WHEN ANY TEST DISCOLORS AMPOULE.

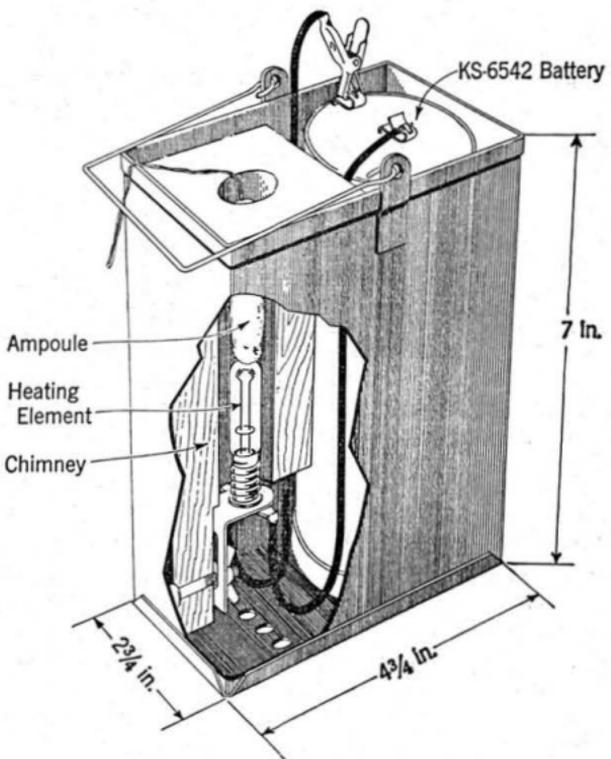
LOW TEMPERATURES AFFECT THE EFFICIENCY OF THIS DETECTOR. THE AMPOULE HEATER SHALL BE EMPLOYED WHEN THE TEMPERATURE IN THE MANHOLE IS 40°F OR LOWER (SURFACE TEMPERATURE 32°F OR LOWER).

2.04 Ten ampoules and one color chart are packed in a small carton. Instructions for using the detectors are printed on the face of the carton. **The ampoules shall not be used after the date stamped on the carton.** Ampoules shall not be transferred from one carton to another.

2.05 The palladium chloride solution contained in the ampoule will evaporate within ten to fifteen minutes. Because of this, an ampoule is good for only one test.

3. AMPOULE HEATER

3.01 **The Ampoule Heater** is illustrated below.



3.02 The heater is used as follows: Crush an ampoule in the usual manner, drop it into the chimney, connect the clip to the battery and lower the heater into the manhole with houseline.

3.03 After the ten-minute test period, raise the heater from the manhole, observe the heating element to see that it is still glowing, and disconnect the battery. Then remove the ampoule and compare its color with the scale on the chart as described in Paragraph 4.01. Any scorch on the cotton where the ampoule was in contact with the heating element should be disregarded in making the color comparison.

3.04 The battery can generally be used for several tests.

The glowing of the heating element at the end of the ten-minute test period is an indication that the battery was sufficiently strong for the test. If after any test the heating element is not glowing, repeat the test with a fresh battery. Batteries should not be exposed to freezing temperatures for long periods because the electrical output of dry batteries is materially reduced at low temperatures. Ordinarily, a fresh battery will deliver sufficient current to operate the heater even if cooled to about 0° F. It is desirable to store batteries in a place where the temperature is above freezing.

3.05 If the heating element is broken, it can be replaced as follows: Remove the chimney from the case, loosen the nut which holds the socket in place, withdraw the socket, insert a new heating element and then replace the socket.

3.06 The standard listing for the element is given below and should be used for ordering purposes.

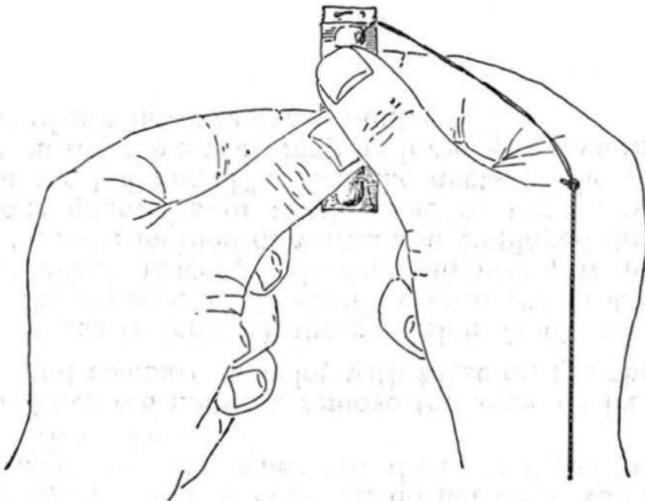
Element, for Ampoule Heater

4. TESTING MANHOLES

4.01 The ampoule of the Carbon Monoxide Detector should be prepared and used as outlined below:

- (1) Attach the ampoule to a length of string or cord by means of the threads at one end of the ampoule.
- (2) Without removing the ampoule from the glassine envelope, hold the ampoule in a vertical position between the thumbs and forefingers so that any sediment which may be present will be concentrated at the bottom of the ampoule. Crush and press the ampoule flat to obtain uniform saturation of the cotton. Use a gripping pressure and avoid sliding motion which might cause the solution to accumulate at the ends of the ampoule. It is important that the crushing be done as outlined; otherwise the cotton may not be saturated uniformly, in which case the reaction in the ampoule when exposed to the gases would not produce a uniform color.

METHOD OF CRUSHING CARBON MONOXIDE AMPOULE



- (3) After the ampoule has been crushed, remove it from the glassine envelope. A small dark spot or streak may be observed in some instances at the lower end of the cotton covering. This is due to a small quantity of sediment in the glass tube.
- (4) Without entering the manhole, suspend the ampoule in the manhole for ten minutes at about one foot from the floor or level of water in the manhole. If a ventilating cloth is suspended in the manhole, the ampoule should be lowered on the sheltered side of the sail.
- (5) After the test period, remove the ampoule and hold it at the bottom where the cotton may be spotted by sediment.
- (6) Compare the color of the ampoule with the scale on the color chart. This is done by placing the ampoule behind the chart under one of the holes and then moving the ampoule from one hole to another until the closest match of color is obtained. The darkest portion of the ampoule, except for the spot or streak produced by the sediment, should be used in matching the color on the chart. If the ampoule indicates gas, proceed to ventilate as covered in another section.
- (7) The reaction of the ampoule to carbon monoxide or hydrogen sulphide decreases as the atmospheric temperature falls. Readings obtained at temperatures of

approximately 40° F or lower may not give a reliable indication of the quantity of gas present. In order to make the ampoule efficient at low temperatures, it is necessary to heat the atmosphere that comes in contact with ampoule. The Ampoule Heater is provided for this purpose. The method of using the heater is covered in Part 3.

(8) Generally it is not necessary to employ a thermometer to determine the temperature in the manhole as a satisfactory indication can be obtained by observation. When the outside temperature is 32° F or lower, as indicated by frost or ice along the street or road (particularly if the outside temperature has remained at 32° F or lower a day or more), it can be assumed that the temperature in the manhole is 40° F or lower and the heater should be employed. If freezing outdoor temperatures have prevailed for several days and a rise in temperature occurs, the heater should be used for several days because some time will elapse before the temperature in the manhole will rise to 40° F. The number of days will depend on the length and severity of the cold spell and the rapidity and the extent of the subsequent rise in the street temperature.

5. CABLE VAULTS

5.01 To test the atmosphere, proceed as follows:

- (1) Unlock, but do not open the door to the vault.
- (2) Prepare an ampoule as covered in Part 2, and place it on a sheet of clean paper.
- (3) Open the vault door but do not enter vault. Place the sheet of clean paper with the ampoule on the vault floor and close the door.
- (4) After ten minutes, remove the ampoule from the vault and compare its color with those on the chart.

5.02 If gas is detected, the condition should be reported to the supervisor. He should discuss the problem with the building maintenance people and engineers, if necessary, to ensure that the method of ventilation employed does not force dangerous quantities of combustible or toxic gas into other parts of the building. Plugging the ducts in the first manhole away from the cable vault may be found effective in minimizing the flow of gas into the cable vault.