

AIR POLLUTION CONTROL DISTRICT
REGULATORY COMPLIANCE DIVISION

POLICIES AND PROCEDURES

Policy No. III.H
Supersedes Date _____
Date October 24, 1989

Draft _____
Final x
Pages 4

Topic: Draeger Detector Tubes

Distribution: All Policy Holders

This policy and procedure document provides guidance on sampling with Draeger detection tubes. Draeger detection tubes can be used to obtain an approximate gas concentration. Depending on the gas being sampled, their inherent accuracy may only be $\pm 5\%$. The sampling system consists of two essential components, the gas detector pump and the Draeger detection tube. The pump is packaged in a carrying case along with a carrying strap, a break-off husk (to remove the ends of the tube), tools and spare parts for maintenance of the pump and a supply of rubber caps for sealing the used detector tubes. The pump draws into the tube a pre-measured gas volume (100 cubic centimeters per pump stroke). The presence of the gas to be measured is denoted by a discoloration of the detection tube, with the length of discoloration proportional to the concentration. Different tubes are available for various gases and concentration ranges.

In many situations, Draeger tube sampling is conducted in an environment which may pose respiratory hazards to the inspector. Toxic gases such as H_2S occur in crude oil production, processing and transfer as well as in waste water treatment and disposal and well water treatment operations. The inspector is to follow the guidance spelled out in Policy and Procedure I.E.1, "Safety".

Prior to leaving the office and conducting the sampling, the inspector/ engineer should perform the following tasks:

1. Verify that the detection tube(s) is for the type of gas that is to be sampled, e.g., H_2S , NO_x , SO_x .
2. Verify that the tube(s) has not passed the expiration date printed on the plastic box containing the tubes and that the tube(s) have been stored properly.
3. Check the facility ATC/PTO permit file to ascertain the concentration(s) which is to be sampled. Verify that the concentration range of the tube(s) is suitable for the gas. If the permit file does not indicate the concentrations, bring tubes which include several ranges.
4. Verify that the ambient temperature and the temperature of the gas to be sampled are within the permissible range of the detection tube as listed on the instruction sheet accompanying the tubes.

5. Estimate the number of tubes of each concentration range which would be needed. It is prudent to have a surplus rather than run out of tubes in the field.

The following steps are to be followed when conducting the sampling:

1. Select a detection tube with a concentration range that closely brackets the concentration of the gas to be sampled, as this will increase the accuracy of reading the concentration. For example, if the gas concentration should be 50 ppm H₂S, use the 0-60 ppm tube and not the 0-2000 ppm tube. When sampling a process stream (as opposed to ambient air) and the gas concentration is unknown, use the tube with the widest and highest range first. If that tube is not discolored, there is either no gas or the concentration is so low that it cannot be easily detected. In this situation, continue to sample using tubes of lower and smaller ranges until either a tube is discolored or there is no discoloration in the tube with the smallest and lowest range. When conducting ambient sampling, the reverse procedure should be followed - i.e., use the smallest and lowest range first.
2. Break off both tips of the tube in the break-off eyelet in the pump or by using the break-off husk.
3. Insert one end of the opened tube in the pump head so that the arrow on the tube points towards the pump. The tube must fit firmly and tightly in the pump head so that no by-pass air can be sucked in.
4. Compress the pump bellows completely and release. When the bellows is released, 100 cubic centimeters of air is drawn in the detection tube. The end of the suction movement is reached when the limit chain is completely taut. If the pump bellows is not completely compressed, errors will be introduced into the measurement.
5. Note the number of pump strokes needed for the detection tube used. This number is written on the tube as "n = ". Make the number of pump strokes specified for the detection tube.
6. Read the concentration off the calibrated scale marked on the tube.
7. If the used detection tube is to be saved as evidence, remove it from the pump and enclose each end with a rubber cap. Fill out a Sample Identification Tag (Attachment 1) and follow the chain of custody steps outlined in Policy and Procedure III.B. Additionally, as soon as possible (within 4-6 hours), place the tube, numbers down, in a copy machine with a piece of white paper over it and make a copy. Label the photocopy as if was a photograph.
8. After each use, flush out the pump with air by making two to three strokes without a detection tube.

9. When sampling gas that is not under positive pressure (i.e., not in a pipeline or pressure vessel), place the pump so that the other opened end of the tube is in a location where a representative sample of gas can be drawn into the pump.

Sampling gas which is under positive pressure requires the use of a "sample container". The sample container is a small clean plastic jar with a fitting screwed securely to the mouth. The fitting must be one which can be attached to the sampling port/outlet of the equipment (e.g., gas line, pressure vessel) to be tested. The side of the jar will have two holes, one just large enough to accommodate the Draeger tube and the other a little bit smaller. The first step is to attach the sample container to the sampling port/outlet and flush the container with a quantity of gas equal to at least three to four volumes of the container. Then insert the opened end of the Draeger tube through the large hole and follow the procedures outlined in Steps 4 through 8, above. After sampling has been completed, close the sampling outlet/port.

Use a new sample container for each sampling location.

Sample container(s) suitable for each facility should be prepared at the office prior to conducting the sampling, particularly for those facilities where Draeger tubes are routinely used.¹ This may require a pre-sampling inspection to determine the correct fitting(s).

10. When sampling ambient air, position the pump between 5' and 6' above the ground.

If the pump is used frequently (e.g., two to three times weekly) or is not used for prolonged periods, the following maintenance procedures should be performed in the office either monthly (in case of frequent use) or prior to the next use:

1. Check the pump for leaks by inserting an unopened sample tube and completely compressing the bellows. The pump is sufficiently air-tight if the bellows has not expanded out completely after 30 minutes.
 - a. Any leaks can usually be eliminated by cleaning the valve in the pump. Remove the front plate and unscrew the valve by using the special wrench supplied with the pump. Raise the valve disk to prevent it from being damaged by the wrench. Clean the valve by blowing it through with air or by rinsing it with water. Dry and reinsert.
 - b. If the rubber material of the valve disk is sticky, brittle, hard or cracked, it must be replaced.
2. The wire mesh sieve under the rubber bung in the pump head may become blocked after prolonged use. Loosen the two-hole nut with

¹ Sample containers provided by the facility owner/operator may be used if the inspector/engineer does not have one.

the special wrench and remove the rubber bung. Remove the sieve and clean it with a brush under running water. Dry and reinsert.