Preparation and Field Use of the Drager Pump and Colorimetric Indicator Tubes

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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions for preparation and use of the Drager pumps and colorimetric indicator tubes in support of field monitoring performed in accordance with TF-OPS-IHT-007 and applicable industrial hygiene sampling plan.

This procedure can be performed in multiple locations. A work area and/or location specific hazard analysis must be performed prior to starting the activity per TFC-ESHQ-S_SAF-C-02.

1.2 Scope

This procedure involves the functional checks and use of the Drager pump with different colorimetric indicator tubes to assess a variety of organic and inorganic gases and vapors, such as ammonia, carbon monoxide, and nitrogen oxides.

2.0 INFORMATION

2.1 General Information

The Drager pump and colorimetric tubes should be operated within the following parameters:

- Pump stroke volume: 100 ml (± 5 %) or use equivalent 15 minute leak test
- Pump operating temperature: 20 to 50°C (-4 to 122°F)
- While this is the operating temperature for the Drager pump, colorimetric tube specifications may differ. Review colorimetric tube instructions for specific temperature ranges.
- Any other parameters (such as expiration date, operating temperature range, relative humidity, pump strokes, color change, interferences, etc.) is specific to each colorimetric indicator tube. Follow the individual instructions (rice paper) given with each tube
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Radiation and Contamination Control

3.1.1 Planned work in radiological areas must be approved by Radiological Control personnel per the Radiological Risk Screening procedure TFC-ESHQ-RP-RWP-C-01.

3.1.1.1 When performed without a formal work package or approved procedure (i.e., Level 3 or 4 work), this procedure is limited to radiological areas and work activities permitted by a low risk Radiological Work Permit (RWP).

3.1.2 Before conducting or monitoring, contact the responsible Radiological Control personnel for the facility or area to determine any specific survey or monitoring requirements.

- Pre, during, and post contamination survey requirements.

3.1.3 Comply with the requirements set forth by the RWP, HPT coverage, Release Survey Plan (RSP), and any other applicable procedures as determined above.

3.1.4 When exiting radiological areas where no HPT coverage was provided, inform the radiological control personnel of the use/history for the equipment being presented (e.g., only sampled air in the Contamination Area, No known history of contamination based on use, etc.) to aid them in properly evaluating the radiological release criteria needed.
4.0 PREREQUISITES

4.1 Performance Documents

The following documents may be needed to perform this procedure:

- TFC-ESHQ-RP_RWP-C-03, “ALARA Work Planning."
- Site Form A-6003-860, “IH DRI Monitoring Field Log” or approved equivalent
- Site Form A-6003-861, “IH DRI Functional Test Data” or approved equivalent
- Drager Accuro Pump instructions for use
- Colorimetric indicator tube instruction sheets (rice paper).

4.2 Field Preparation

4.2.1 ENSURE a review of applicable industrial hygiene sampling plan or work instructions have been completed before proceeding with functional checks.

4.2.2 REVIEW colorimetric indicator tube instruction sheets (rice paper) for the specific tube(s) selected.

4.2.3 PERFORM a work area and/or a location specific hazards analysis per TFC-ESHQ-S-SAF-C-02.
5.0 **PROCEDURE**

5.1 **Drager Pump Leak Check**

5.1.1 **CONFIRM** the maintenance calibration date is current for the Drager pump.

5.1.2 **IF** the calibration is past due, **RETURN** the instrument to the equipment custodian with the completed green tag, i.e., “IH Instrument Service Tag” (BT-6004-019) indicating iScheduled Maintenance Calibration” is due” **AND** **OBTAIN** another Drager pump.

5.1.3 **INSERT** an unopened colorimetric tube into the inlet of the Drager pump.

5.1.4 **SQUEEZE** the pump completely **AND**

**THEN** release.

5.1.5 **ALLOW** the pump to try to draw air off the sealed inlet for fifteen minutes.

5.1.6 **CONFIRM** that the end-of-stroke indicator (i.e., white dot) does not appear.

5.1.7 **IF** the end-of-stroke indicator does appear before fifteen minutes, **RETRY**, **OR**

**RETURN** the instrument to the equipment custodian with the completed green tag, i.e., “IH Instrument Service Tag” (BT-6004-019) indicating Function Check Failure,” **AND**

**OBTAIN** another Drager pump.

5.1.8 **IF** the pump passes this leak check, **REMOVE** the colorimetric tube from the Drager pump inlet.

5.1.9 **PRESS** the reset button on top of the pump next to the stroke counter to reset it to zero.
5.2  Colorimetric Indicator Tube and Drager Pump Use

5.2.1  SELECT the appropriate colorimetric tube for the contaminant of interest and its expected concentration.

5.2.2  OBTAIN appropriate colorimetric tubes from the equipment custodian.

NOTE - The date of expiration is stamped at the end of each box of tubes.

5.2.3  CONFIRM that the shelf life of the colorimetric tube has not expired.

5.2.4  IF the tube has exceeded its shelf life, PERFORM the following:

5.2.4.1  RETURN the colorimetric tube and the box it came from to the equipment custodian.

5.2.4.2  OBTAIN another colorimetric tube from a different box.
5.2 Colorimetric Indicator Tube and Drager Pump Use (Cont.)

5.2.5 REVIEW the instructions contained in the box of colorimetric tubes to determine the following:

- operating temperature and relative humidity range
- proper number of pump strokes
- expected color change
- concentration range
- possible interferences
- other specific information, eg disposal information.

NOTE - Exercise caution when breaking glass tubes and follow appropriate disposal methods.

5.2.5.1 USE a Drager tube opener to OPEN a colorimetric tube. INSERT the colorimetric tube into the center opening of the Drager tube opener AND TURN it to score the tip.

5.2.5.2 PUSH tube into the second opening and lever with light pressure until the end pops off.

5.2.5.3 REPEAT Steps 5.2.5.1 and 5.2.5.2 to open the opposite end of the tube.

5.2.6 ENSURE the arrow on the tube is pointing towards the pump AND INSERT the colorimetric tube into the pump inlet.
5.2 Colorimetric Indicator Tube and Drager Pump Use (Cont.)

5.2.7 **OBTAIN** the measurement as follows:

5.2.7.1 **HOLD** the pump between the thumb and index finger so that the end-of-stroke indicator and stroke counter are easily visible.

5.2.7.2 **PLACE** the inlet of the colorimetric tube in the location of the atmosphere to be measured.

5.2.7.3 **SQUEEZE** the pump fully away from the breathing zone until it stops and release until the bellows are fully expanded.

5.2.7.4 **WAIT** for the end-of-stroke indicator to appear.

5.2.7.5 **SQUEEZE** the pump again fully, repeating Steps 5.2.7.3 and 5.2.7.4 for the required number of pump strokes (as indicated on the instructions/rice paper).

5.2.8 **EVALUATE** the color result in accordance with the instructions (rice paper) for the colorimetric tube.

5.2.9 **RECORD** the time, location, weather conditions, and results in accordance with TFC-ESHQ-IH-STD-03 in the Site Wide Industrial Hygiene Database.
5.2 Colorimetric Indicator Tube and Drager Pump Use (Cont.)

NOTE - The disposal of tubes should follow environmental requirements for the chemical sampled and tube contents, as well as radiological requirements.

5.2.10 REMOVE the used tube from the Drager pump socket.

5.2.11 TAPE the broken ends of the colorimetric tube to prevent injury by broken glass.

5.2.12 DISCARD the used tube into the tube box.

5.2.13 SQUEEZE the pump several times away from the breathing zone when sampling is completed to clear the residual gases and vapors out of the pump bellows.

NOTE - An adequate number of measurements should be taken which are representative of the scope of work being performed. Always watch the work to ensure that the “worst-case scenario” is being captured.

5.2.14 OBTAIN remaining measurements in accordance with Steps 5.2.6 through 5.2.12.

AND

PROCEED to Step 5.2.15 once all measurements are conducted.

NOTE - The disposal of tubes should follow environmental requirements for the chemical sampled and tube contents, as well as radiological requirements.

5.2.15 RETURN the used tubes and tube box to the Industrial Hygiene Lab for proper disposal.

5.2.16 PROVIDE completed monitoring forms and associated field records to the Project Industrial Hygienist within 2 working days.
5.3 Records

Data and attachments are entered into the Site-Wide Industrial Hygiene Database and when reviewed and completed by the Industrial Hygienist, are uploaded to IDMS via an automated interface.

The record custodian identified in the Company Level Records Inventory and Disposition Schedule (RIDS) is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.