

<b>EVERSOURCE</b>		<b>TD710</b>		<b>Revision 9</b>	
<b>TD PROCEDURE</b>		<b>Handling and Use of Sulfur Hexafluoride (SF6) Gas</b>			
<b>Issue Date:</b> 02/03/2016	<b>Effective Date:</b> 02/03/2016	<b>Owner Department:</b> Substation Operations		<b>Applicability:</b>	
		<b>Subject Matter Expert:</b> Jorin Gori, Tracy Gionfriddo		CT-NH- Western MA	

**All changes to TD procedures are controlled by TD 001**

**“Writing, Revising, and Publishing Transmission and Distribution Procedures.”**

This procedure replaces and supersedes the following procedures (in whole or in part), as described in Section 3 “Summary of Changes”:

- TD 710 “Handling and use of Sulfur Hexafluoride (SF<sub>6</sub>) Gas”, Rev 8 editorial change, dated 5/8/15

**Roll Out Instructions:**

Prior to initial use of this procedure, each individual using this procedure is required to take e-learning SF<sub>6</sub> Gas Management training or advanced training in cleaning by-products.

**Approvals:**

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**Procedure applicable only to states for which an approval signature appears above.**

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## 1. INTRODUCTION

### 1.1 Objective

This procedure establishes safe working practices for handling sulfur hexafluoride (SF<sub>6</sub>) gas. It specifies methods for handling SF<sub>6</sub> gas and removal, handling, and disposal of hazardous by-products.

### 1.2 Applicability

This guideline pertains to Eversource CT, Western MA, and NH. Please see Eastern MA W10216 for use at Eastern MA Electric facilities.

This procedure applies to all employees assigned to tasks involving equipment containing or operated using sulfur hexafluoride gas.

### 1.3 References

Unless otherwise specified:

- Forms are available through Lotus Notes Forms Catalog or Forms Catalog on the Eversource intranet.

Procedures are available in the:

- Lotus Notes Field Documentation Database
- Lotus Notes Regulated Businesses Policies & Procedures database
- Distribution Engineering Standards Bookshelf

#### **Development References**

Documents used to develop this procedure and the process it controls:

- TD 001 “Writing, Revising, and Publishing Transmission & Distribution Procedures”

#### **Supporting References**

Documents that support performance of activities directed by this procedure:

- SBST0607, Gas Release Reporting Requirements to CTDEP, MADEP, & NHDES
- 29CFR1910.1000, Air contaminants (OSHA regulation)
- 29CFR1910.134, Respiratory Protection (OSHA regulation)
- 29 CFR 1910.1200, Hazard Communication
- EE’s SH-02, Respiratory Protection Program and SH-01, Hazard Communication Program
- <http://nunet.nu.com/T2AllPurpose.aspx?id=4294968152>
- M4-WP-3115, Leftover Pressurized SF<sub>6</sub> Cylinder Management
- M1-EG-3002, Environmental Procedure: SF<sub>6</sub> Gas Management and Inventory Reporting
- [SA-03-2015, Sulfur Hexafluoride Gas and By-products](#)

- GHG Monitoring Plan for the EPA Mandatory Greenhouse Gas Reporting Rule, SF<sub>6</sub> Use, Subpart DD, CL&P, WMECO, and PSNH (10/13 r3).

### **Supporting Programs and Databases**

Programs and databases that support performance of activities directed by this procedure:

- US Environmental Protection Agency SF<sub>6</sub> Emission Reduction Partnership for Electric Power Systems.
- [40 CFR Parts 86, 87, 89 et al. Mandatory Reporting of Greenhouse Gases: Final Rule](#)
- [40 CFR Part 98 Mandatory Greenhouse Gas Reporting](#)
- [National Greenhouse Gas Emissions Data](#)
- Massachusetts Regulations 310 CMR 7.72 Reducing Sulfur Hexafluoride Emissions from Gas-Insulated Switchgear.

## 1.4 Discussion

### 1.4.1 Sulfur Hexafluoride (SF<sub>6</sub>) Gas

Clean SF<sub>6</sub> gas is an inert, stable, colorless, odorless, nontoxic, nonflammable gas. It is approximately five times heavier than air and will displace air in confined areas. SF<sub>6</sub> gas contains no oxygen and will not support life.

#### **WARNING**

Confined areas must be force-ventilated when working with SF<sub>6</sub> gas to eliminate a potential asphyxiation hazard.

The Occupational Safety and Health Administration (OSHA) regulation on air contaminants, 29 CFR1910.1000, establishes SF<sub>6</sub> as inert gas, with no potential adverse health effects when exposed to airborne level up to Permissible Exposure Limit (PEL) of 1,000 ppm.

Federal regulations require equipment containing SF<sub>6</sub> gas at pressures greater than 39.6 psia to be certified to transport compressed gas.

The Environmental Protection Agency (EPA) has identified Sulfur Hexafluoride as a greenhouse gas with a global warming potential 23,900 times the effect of an equal mass of Carbon Dioxide and an atmospheric lifetime of 3,200 years. With limited exception for test purposes, under no circumstances should equipment pressurized with SF<sub>6</sub> be voluntarily vented to the atmosphere. If discharge of small quantities is necessary for test purposes (i.e., contamination, moisture analysis, etc.), such discharge is to be kept to the minimum required to obtain a reading (ref. Attachment 1). Eversource Energy (including all operating subsidiaries) is subject to the USEPA Green House Gas Reporting Rule (40CFR98), which requires monitoring and reporting of annual usage and leakage amounts (sec. 2.2.2).

MassDEP has promulgated regulations (310 CMR 7.72) to control emissions of SF<sub>6</sub> from gas-insulated switchgear (GIS). The regulation limits all MA companies that purchase new GIS to a 1% emission rate for such equipment, and require appropriate handling of SF<sub>6</sub> when GIS is removed from service. The regulation also requires companies that own, lease, operate, or control the largest amount of GIS in Massachusetts to comply with a declining emission rate standard until a rate of 1% or less is achieved in 2020.

Maximum Annual SF <sub>6</sub> Emission Rate	
Calendar Year	Maximum Allowable SF <sub>6</sub> Emission Rate
2015	3.5%
2016	3.0%
2017	2.5%
2018	2.0%
2019	1.5%
2020, and each calendar year thereafter	1.0%

SF<sub>6</sub> Emissions are further reportable to the individual state regulatory agencies as described in SBST-06-07 (sec. 2.2.1).

**WARNING**

Exercise appropriate lifting and handling procedures for heavy objects when manually manipulating SF<sub>6</sub> gas cylinders.

Sulfur Hexafluoride Gas is normally supplied in 51” tall cylinders (s/c 0207159) which have a gross weight of approximately 230 lb. and contain a net 115 lb. of gas when full, or 32.5” tall cylinders (s/c 0206835) having a gross weight of approximately 100 lb. and containing a net 38 lb. of gas when full.

**WARNING**

Exercise caution when handling recently-discharged cylinders, due to the possibility of cold surfaces.

**WARNING**

Smoking and use of open flames or high-temperature heat sources are prohibited while working with SF<sub>6</sub> gas.

Sulfur Hexafluoride Gas supplied in cylinders represents a cryogenic hazard when the liquid is vaporized. Discharge of gas may rapidly decrease the temperature of the cylinder.

1.4.2 Decomposition Gasses and Solid By-Products

**CAUTION**

In case of physical damage to SF<sub>6</sub> containing equipment, assume by-products have been potentially generated. Barricade/tape off a 5’ radius and make safe electrically by operating other devices to isolate the equipment that has been damaged. Notify Safety and Environmental representatives for further support.

When exposed to intense heat, SF<sub>6</sub> gas decomposes to form sulfur-fluoride and sulfur-oxide gases and metal-fluorides, which are strong irritants. If moisture is present, the decomposition by-products may also include sulfur-oxyfluorides and hydrofluoric and sulfuric acids. The presence of these by-products can be readily detected by a white or gray powdery substance or a very pungent odor similar to rotten eggs.

All in-service SF<sub>6</sub> equipment shall be sampled for gas purity and decomposition gasses prior to entry for maintenance purposes. Distribution class SF<sub>6</sub> switches and equipment outside the substations typically do not require maintenance. In addition, all in-service SF<sub>6</sub> Equipment subjected to internal arcing (Circuit Breakers, Circuit Switchers, or faulted equipment) shall be assumed to contain decomposition by-products, requiring decontamination in accordance with section 2.6. If by-products are suspected, immediately notify supervisor. Supervisor will notify Safety and Environmental representatives.

A vacuum cleaner equipped with high-efficiency particle air (HEPA) filters (s/c 0193602) must be used to remove solid decomposition byproducts

Below is a link of who to call in Environmental Operations:

[http://nunet.nu.com/downloads/who\\_to\\_call.pdf?id=4294970178&dl=t](http://nunet.nu.com/downloads/who_to_call.pdf?id=4294970178&dl=t)

Proper Personal Protective Equipment (PPE) shall be worn whenever handling of decomposition by-products is required (ref. section 2.6). PPE shall include as a minimum:

- Chemical-resistant Gloves, Coveralls, and Boots:

ITEM	S/C
Glove, Solvent And P.C.B., Large	0189176
Glove, Solvent And P.C.B., X-Large	0189178
Coveralls, Disposable, Flame/Chemical Resistant, Med.	0424799
Coveralls, Disposable, Flame/Chemical Resistant, Lg	0424800
Coveralls, Disposable, Flame/Chemical Resistant, XL	0424802
Coveralls, Disposable, Flame/Chemical Resistant, XXL	0424803
Coveralls, Disposable, Flame/Chemical Resistant, XXXL	0424805
Coveralls, Disposable, Flame/Chemical Resistant, XXXXL	0429574
Coveralls, Disposable, Flame/Chemical Resistant, XXXXXL	0429575
Boot, Pullover, Small (Size 3 – 5), Disposable	0186525
Boot, Pullover, Medium (Size 6 – 8), Disposable	0186521
Boot, Pullover, Large (Size 9 - 11), Disposable	0186522
Boot, Pullover, X-Large (Size 12 - 13), Disposable	0186523

- Respirator with two HEPA cartridges for organic vapor/acid gas:

ITEM	S/C
Respirator, Half Face, Silicone, Small	0191704
Respirator, Half Face, Silicone, Medium	0191221
Respirator, Half Face, Silicone, Large	0191705
Respirator, Full Face, Silicone, Small	0134343
Respirator, Full Face, Silicone, Medium/Large	0191293
Cartridge, Respirator, Yellow/Magenta	0187861

## WARNING

OSHA regulations on respiratory protective equipment (29CFR1910.134) and EE Respiratory Protection Program require that all employees wearing respiratory protective equipment be medically cleared and properly trained in their use and fit tested prior to use in field conditions.

If a half-face respirator is used, also include:

- Chemical splash resistant goggles, indirect vent, anti-fog, clear lens [s/c 0403452] or grey lens [s/c 0189094]

An emergency eyewash station (eyewash, station, portable, 5 gal, free standing [s/c 0185047]) shall also be available in the immediate vicinity of the work area whenever handling decomposition by-products.

### 1.4.3 Sample Analysis

New Gas: Newly purchased SF<sub>6</sub> Gas shall meet the physical characteristics required by EE Material Specification G-104

In-Service Gas: Guidelines for assessing the condition of service-aged SF<sub>6</sub>

**Gas are indicated in the table below.**

Property	Condition	Range	Recommended Action
Moisture Purity Sulfur Dioxide	Nominal	<300ppmv (GIS Bus) <200ppmv (Other Equipment) >95% <500ppmv	None
Moisture Purity	Degraded	>300ppmv but <800ppmv (GIS Bus) >200ppmv but <500ppmv (Other Equipment) <95% but >90%	Reclaim gas and replace desiccant if necessary
Moisture Purity Sulfur Dioxide	Severe	>800ppmv (GIS Bus) >500ppmv (Other Equipment) <90% >500 ppmv	Reclaim or replace gas and perform Major Maintenance

A high Sulfur Dioxide content in SF<sub>6</sub>-filled circuit breaker after a lockout has occurred is indicative of a failure. Additional diagnostic testing and/or internal inspection is required to determine the nature of the failure and feasibility of repair.

**End of Section**

## 2. INSTRUCTIONS

### 2.1 Handling of Sulfur Hexafluoride Gas – Central Facilities

*Maintenance Manager or designee:*

2.1.1 MAINTAIN SF<sub>6</sub> gas inventory at a designated facility identified below:

State	Distribution Inventory	Transmission Inventory
CT	CMS – Berlin	Transmission Warehouse
MA	East Springfield *	N/A
NH	1250 Hooksett	13 Legends Dr., Hooksett

\* Inventory maintained at the East Springfield facility is used for both Distribution and Transmission purposes.

2.1.2 MAINTAIN an accurate account, by weight, of SF<sub>6</sub> gas retained in inventory.

2.1.3 SHIP or DELIVER SF<sub>6</sub> gas in DOT-approved cylinders to district personnel upon request.

2.1.4 MAINTAIN scale calibrations done at least annually as per USEPA GHG Reporting regulations.

### CAUTION

SF<sub>6</sub> gas shall not be voluntarily discharged into the atmosphere.

### 2.2 Sulfur Hexafluoride Gas Emission Reporting Requirements

*Maintenance Supervisor or  
Environmental Coordinator*

2.2.1 Immediate reporting:

- a. When it is determined that an emissions of SF<sub>6</sub> Gas to the environment has occurred, it shall be reported to the respective state environmental regulatory body as identified in the following matrix:

Incident Type	Action, By State		
	Connecticut	Massachusetts	New Hampshire
Operational Release	Report if release > 1.0 lb. per 24-hours <sup>a</sup>	Report <sup>b</sup>	No Report
Catastrophic Release	Report	Report <sup>b</sup>	No Report
Fire / Explosion	Report	Report	Report

<sup>a</sup> Determine release rate by dividing quantity of gas added to equipment by number of days since last addition

<sup>b</sup> Reporting will be determined by Environmental Department on a case-by-case basis.

*Assigned Employee:*

- b. If the notification threshold is exceeded based on the above matrix, immediately NOTIFY the individual identified below:
- 1) For Distribution Equipment: Environmental Coordinator, Central Maintenance Services, or after hours – the On-Call Environmental Coordinator
- For Transmission Equipment: the appropriate Maintenance Supervisor, or after hours - the On-call Maintenance Supervisor.

*Maintenance Supervisor or Environmental Coordinator:*

- c. NOTIFY the appropriate state environmental agency as soon as possible as indicated below:
- Connecticut Department of Environmental Protection: 860-424-3338
  - In Massachusetts, a case by case determination will be made which MassDEP group to contact. This determination will be made by the Environmental Affairs Department SME in conjunction with the Transmission Maintenance Supervisor. If notification must be made, the SME will call 888-304-1133.
  - New Hampshire Department of Environmental Services: 603-271-3899 (Mon.-Fri. 8am – 4pm); 800-346-4005 (after hours)
- d. PROVIDE the following information:
- Your name, company and title
  - Location & amount of release in pounds
  - Date & time of release
  - Cause of release
  - Equipment type & nomenclature
  - Corrective action & status
- e. RECORD the report number provided by the state agency.
- a. (CT Only): COMPLETE Form OP 4608-1: Hazardous Substance Spill Report the next work day and forward a copy to Transmission - Safety & Environmental Programs Administrator or Distribution - Central Maintenance Services Environmental Coordinator as appropriate. Notify Environmental compliance SME and provide information listed in 2.2.1 (d)

## 2.3 Filling Equipment with Sulfur Hexafluoride Gas in Substation Equipment

### WARNING

It is preferable to de-energize equipment prior to adding SF<sub>6</sub> gas. If it is necessary to add gas to equipment while energized, obtain approval from the Maintenance Director responsible for the equipment and obey all company safety rules and manufacturer's recommendations to prevent possible personnel injury or equipment damage.

#### *Maintenance Supervisor*

- 2.3.1 OBTAIN a SF<sub>6</sub> Gas Processing or Transfer Cart as needs dictate.
- 2.3.2 Use form from Attachment 2 and completed by Assigned Employee to complete entry into Cascade. Provide copy to Environmental Affairs Department in Berlin.

### WARNING

Smoking and use of open flames or high-temperature heat sources are prohibited while working with SF<sub>6</sub> gas.

### NOTE

An approved Halogen Detector (s/c 0439477) or SF<sub>6</sub> Gas Detector shall be available whenever work is performed on equipment containing SF<sub>6</sub> Gas.

#### *Assigned Employee*

### NOTE

Complete all SF<sub>6</sub> system tubing connections or verify completed with the construction personnel responsible for the installation of the SF<sub>6</sub> device.

- 2.3.3 CONNECT SF<sub>6</sub> source to gas compartment valve.
  - a. Processing cart (preferred method)
    - 1) CONNECT hose to gas compartment valve and tighten all fittings.
    - 2) EVACUATE hose using vacuum pump.
    - 3) BREAK vacuum using SF<sub>6</sub> gas.
    - 4) OPEN gas compartment valve.

- b. Transfer Cart/Cylinder (alternate method – processing cart not available or “topping off” equipment due to low pressure)

**WARNING**

Exercise caution when handling recently-discharged cylinders, due to the possibility of cold surfaces.

- 1) Loosely CONNECT hose to gas compartment valve.
- 2) Partially OPEN the gas cylinder valve.
- 3) CHECK for presence of SF<sub>6</sub> gas in the vicinity of the connection to the gas compartment valve using an approved halogen detector (s/c 0439477 or SF<sub>6</sub> Gas Detector).
- 4) SEAL all fittings as soon as SF<sub>6</sub> gas is detected.
- 5) OPEN gas compartment valve.

2.3.4 FILL and PRESSURIZE the equipment per manufacturer’s instructions.

2.3.5 Using an approved halogen leak detector (s/c 0439477) or SF<sub>6</sub> Gas Detector, CHECK the gas compartment and associated devices for any SF<sub>6</sub> gas leaks into the atmosphere.

2.3.6 REPAIR all leaks to prevent discharge of SF<sub>6</sub> gas.

2.3.7 CLOSE gas compartment valve and source valve.

2.3.8 DISCONNECT hose from gas compartment valve and cap hose fitting.

2.3.9 CHECK gas compartment valve and fittings to ensure there are no leaks.

2.3.10 Complete form in Attachment 2 and give to your Supervisor for entry into the Cascade system.

**2.4 Sampling Sulfur Hexafluoride Gas**

**WARNING**

Smoking and use of open flames or high-temperature heat sources are prohibited while working with SF<sub>6</sub> gas.

**NOTE**

An approved Halogen Detector (s/c 0439477) or SF<sub>6</sub> Gas Detector shall be available and used to manufacturer’s instructions whenever work is performed on equipment containing SF<sub>6</sub> Gas.

## WARNING

It is preferable to de-energize equipment prior to sampling SF<sub>6</sub> gas. If it is necessary to sample gas while equipment is energized, obtain approval from the Maintenance Director responsible for the equipment and obey all company safety rules and manufacturer's recommendations to prevent possible personnel injury or equipment damage.

### 2.4.1 Use of manually-regulated sampling instruments (e.g., COSA, Shaw, etc.):

## CAUTION

Use of this type of equipment may result in a gas discharge in excess of the reporting requirements stipulated in 2.2.1 if flow rates or sample durations outlined below are exceeded. Manually-regulated sampling equipment **SHALL NOT** be used without a suitable flow meter.

#### *Assigned Employee*

- a. CONNECT all PTFE or flexible Stainless Steel sample tubing and instrumentation in accordance with manufacturer's instructions.
- b. CONNECT sample inlet to a dry air or nitrogen cylinder.
- c. OPEN the cylinder regulator to establish flow through the instrument not exceeding maximum flow indication on flowmeter or 10.0 l/min., whichever is lower.
- d. PURGE the instrument and tubing for 5 – 8 minutes until a stable dewpoint below -50°C is achieved.
- e. Immediately RE-CONNECT the sample inlet to the SF<sub>6</sub> connection on the equipment to be tested.

## NOTE

Use tubing or regulating products containing rubber components may result in erroneous high moisture readings

- f. Slowly OPEN the equipment valve to admit gas to the sample instrument at a rate of 0.5 – 2.0 l/min.
- g. MAINTAIN gas flow until a stable reading is obtained (no longer than 5 minutes).
- h. SECURE sample flow and record final reading.
- i. DISCONNECT sample instrumentation.
- j. CHECK equipment valve and fittings to ensure there are no leaks.

2.4.2 Use of auto-regulated multi-purpose SF<sub>6</sub> sampling instruments (e.g., Dilo):

*Assigned Employee*

- a. CONNECT all PTFE or flexible Stainless Steel sample tubing and instrumentation in accordance with manufacturer's instructions.
- b. Turn instrument(s) "ON" and allow to stabilize.
- c. OPEN gas compartment valve to admit gas to instrument.
- d. SELECT measurement menu on instrument.
- e. VERIFY checklist menu to begin sample process.

**NOTE**

The sample process will run for a pre-determined duration, after which the results will be displayed.

- f. RECORD sample results (in units of ppmv)

**NOTE**

Use tubing or regulating products containing rubber components may result in erroneous high moisture readings

- g. CLOSE Gas Compartment Valve and disconnect all tubing and instrumentation.
- h. CHECK gas compartment valve and fittings to ensure there are no leaks.

## 2.5 Removal of Sulfur Hexafluoride Gas from In-Service Equipment.

### WARNING

Smoking and use of open flames or high-temperature heat sources are prohibited while working with SF<sub>6</sub> gas.

### NOTE

An approved Halogen Detector (s/c 0439477) or SF<sub>6</sub> Gas Detector shall be available and used to manufacturer's instructions whenever work is performed on equipment containing SF<sub>6</sub> Gas.

#### *Assigned Employee*

- 2.5.1 VERIFY that equipment is properly de-energized, isolated, and grounded.
- 2.5.2 CHECK the gas compartment and associated devices, prior to removal of gas, for leaks, using an approved halogen leak detector (s/c 0439477) or SF<sub>6</sub> gas detector.
  - a. IDENTIFY any components that must be repaired while SF<sub>6</sub> gas is evacuated from equipment.
  - b. OBTAIN replacement parts as necessary to repair leaks.
- 2.5.3 ATTACH the hose from the SF<sub>6</sub> Processing Cart to the gas compartment valve.
- 2.5.4 DRAW a vacuum on the hose to remove air and moisture.
- 2.5.5 OPEN the gas compartment valve.
- 2.5.6 REMOVE SF<sub>6</sub> gas from the gas compartment via the processing cart filtration system as described in the processing cart operating/maintenance instruction booklet.
- 2.5.7 While gas is being removed, CHECK the Processing Cart for leaks using an approved halogen leak detector (s/c 0439477) or SF<sub>6</sub> gas detector.
- 2.5.8 DRAW a vacuum on the gas compartment to complete the SF<sub>6</sub> gas removal process.
- 2.5.9 BREAK vacuum with nitrogen or dry air as applicable.
- 2.5.10 Complete form in Attachment 2 and give to your Supervisor for entry into the Cascade system.

*Maintenance Supervisor*

2.5.11 KEEP SF<sub>6</sub> gas that is to be reused on the same equipment in the processing cart until maintenance is complete.

**NOTE**

Gas kept for reuse shall be checked for purity and moisture content prior to being returned to the equipment. Gas that fails this check shall be returned to the applicable central facility for reprocessing or disposal.

- a. If equipment is to be retired from use, TRANSFER SF<sub>6</sub> gas to DOT-approved cylinders for return to the central facility or disposal by the approved vendor. Refer to Environmental Procedure: SF<sub>6</sub> Gas Management and Inventory Reporting for additional information regarding disposal of gas from retired equipment.
- b. RETURN cylinders of SF<sub>6</sub> gas from retired equipment to the central facility and a log indicating cylinder net weight and the nomenclature of the equipment from which the gas was removed. A copy of this log must be sent to Environmental Affairs indicating disposal of the SF<sub>6</sub>.
- c. DO NOT TRANSPORT reservoir-equipped gas carts over public roadways if gas pressure exceeds 25 psig unless the cart is properly certified for transportation of compressed gas.

2.5.12 Use form from Attachment 2 and completed by Assigned Employee to complete entry into Cascade. Provide copy to Environmental Affairs Department in Berlin.

**2.6 Removal of Hazardous Solid By-Products**

**CAUTION**

In Substations, after the SF<sub>6</sub> gas has been removed from the gas compartment and prior to opening the gas compartment cover(s), the equipment specified in section 1.4.2 shall be available at the work site for the personnel to perform the following steps. If any required equipment is not available, an Environmental Services contractor shall be contacted to perform the necessary clean-up. Refer to Section 2.2 for SF<sub>6</sub> Emission Reporting Requirements.

**CAUTION**

For distribution equipment outside the substations refer to section 1.4.2 and request an Environmental Services contractor to perform the necessary clean-up.

*Assigned Employee working in substation on equipment*

2.6.1 OPEN the cover(s) to gain access to the gas compartment.

### **NOTE**

If, upon opening a gas compartment, an excessive amount of solid byproduct (e.g., more than a moderate dusting) is found, close the cover and notify Supervision. Supervision will contact an Environmental Services contractor to perform the necessary clean-up.

- a. TEST the compartment with an approved air monitor (s/c 0419532) to verify oxygen content of 19.5 – 23.5%, combustible gas content less than 10% of the Lower Explosive Limit (LEL), and toxic gas content less than the Permissible Exposure Limit (PEL).
  - b. Using an approved halogen detector (s/c 0439477) or SF<sub>6</sub> Gas Detector, per manufacturer's instructions, PERFORM checks at various low points within the gas compartment to determine any presence of SF<sub>6</sub> gas.
  - c. VENTILATE in low point areas until the detector indicates that SF<sub>6</sub> gas has been purged.
- 2.6.2 REMOVE powdery deposits using an approved vacuum cleaner equipped with high-efficiency particle air (HEPA) filters.

### **WARNING**

Contact with solid and or powder by-products may be irritating to the upper respiratory system, eyes, skin, and especially open wounds.

- 2.6.3 CLEAN UP any powdery residue using wipes moistened with denatured alcohol.
- 2.6.4 PLACE powdery deposits contained in the vacuum cleaner disposal bag along with any wipes and other contaminated materials in a plastic waste bag.
- 2.6.5 SEAL all covers of the gas compartment upon completion of maintenance and/or repair work.
- 2.6.6 REMOVE personal protective equipment.
- 2.6.7 Place disposable clothing, boots, and respirator cartridges, and any other contaminated materials in the plastic waste bag.
- 2.6.8 SECURE bag with filament tape.
- 2.6.9 PLACE plastic waste bag in a 55 gallon drum.
- 2.6.10 WASH face and hands following completion of work and before eating or drinking.

#### *Maintenance Supervisor*

- 2.6.11 LABEL the side of the drum with Hazardous Waste sign (s/c 0191045).
- a. LEAVE the drum in a safe location at job site for proper disposal.
  - b. INFORM the responsible Environmental Coordinator that a drum containing Hazardous Waste is at the job site and is ready for removal.

*Environmental Coordinator*

2.6.12 ARRANGE for disposal of the drum in accordance with federal and state regulations.

2.6.13 RETAIN copies of all manifests in a central file.

**End of Section**

### 3. SUMMARY OF CHANGES

Changes to TD Procedures are controlled by TD 001 “Writing, Revising, and Publishing Transmission & Distribution Procedures.”

#### **Revision 0 - Effective date 10/15/99**

Initial Release

#### **Revision 1 - Effective date 01/30/03**

Procedure extensively revised as part of TD Procedure Upgrade Project initiated in June 2002, which included:

- Upgrading to new T&D procedure format
- Accommodating processes and NU organization in place at time of upgrade
- Reviewing applicable regulations and policies, and revising procedure based on that review

#### **Revision 2 - Effective date 01/04/06**

- Added stock codes for approved items
- Added Caution statements for smoking and open flames, cold surfaces, heavy materials, etc.
- Modified field tracking method
- Added MOU text (Attachment 2) to describe responsibilities associated with EPA partnership

#### **Revision 3 - Effective date 09/01/06**

- Added Warning regarding filling of energized equipment
- Added step (2.3.1) to ensure equipment is de-energized prior to removal of gas.

#### **Revision 4 - Effective date 4/21/08**

- Added new Section 2.2 for guidance on Reporting of SF<sub>6</sub> Emissions and removed attachment 2 – MOU Text.
- Added inventory form (Attachment 2)
- Revised stock-coded item list

#### **Revision 5 –Effective date 1/22/2010**

- Added Effective date to Revision dates per an Audit request.
- Added stock code for approved HEPA vacuum cleaner to section 1.4.2.
- Added requirement to contact an environmental services contractor to Caution statement in section 2.6.

**Revision 6 –Effective date 02/21/2012**

- Updated Approvers and SME.
- Updated Section 1.3 References to reflect documentation databases
- Added M4-SP-2026, M4-WP-3115, 29CFR 1910.1200 Hazard Communications, NU’s Respiratory Protection Program and Hazard Communication Program to Section 1.3 Supporting References
- Updated link for EPA information in Section 1.3 Supporting Programs and Databases
- Section 1.4 Discussion – updates to second paragraph
- Section 1.4 Discussion, fourth paragraph, replaced “member of EPA Partnership for the Reduction of SF<sub>6</sub> Emissions” with “subject to the USEPA GHG Reporting Regulations
- Updated step 1.4.2 table with new stock code for the full face silicone m/l respirator
- Changed note after step 1.4.2 table to warning box and added additional information
- Updated table in Step 2.1.1 changed CT location from Deming Rd. to Transmission Warehouse and updated Hooksett to 1250 Hooksett
- Replaced step 2.1.4
- Updated table in section 2.2, step 2.2.1a
- Deleted Step 2.2.2 in Section 2.2 “Annual Reporting”
- Added Warning box to step 2.6.1
- Removed Attachment 2, Inventory Log

**Revision 7 –Effective date 12/3/2013**

- Section 2.4 Sampling of Sulfur Hexafluoride Gas, step 2.4.2 f. added (in units of ppmv)
- Added note to check connections after Section 2.3.2

**Editorial Change –Effective date 05/06/2014**

- Updated Transmission inventory location in table, Section 2.1.1 from Sutton Circle to 13 Legends Dr., Hooksett.
- Per Environmental, no other changes are required to this procedure at this review.

**Revision 8 –Effective date 07/22/2014**

- Updated Approvers and their department names to reflect current organization.
- Updated Section 1.3 Supporting References and Supporting Programs and Databases
- Section 1.4 Discussion: step 1.4.1 was updated to include MassDEP regulations, a new step 1.4.3 was added “Sample Analysis”

- Section 2.2: step 2.2.1a - updated table, step 2.2.1c – updated Mass notification information
- Section 2.3: added steps 2.3.2 and 2.3.10 to complete SF<sub>6</sub> Gas Sampling Form (Attachment 2)
- Section 2.5: added steps 2.5.10 and 2.5.12 to complete SF<sub>6</sub> Gas Sampling Form, updated steps 2.5.11a and 2.5.11b
- Added new Attachment 2 – SF<sub>6</sub> Gas Sampling Form

**Editorial Change –Effective date 05/08/2015**

- Updated to new Eversource template
- Added document number M1-EG-3002 to Supporting Reference in Section 1.3

**Revision 9 –Effective date 2/3/2016**

- Updated Approvers and their department names to reflect current organization.
- Differentiated responsibilities between equipment inside and outside of Substations.
- Added more information on By-Products and who to contact when a cleanup is needed.

# Attachment 1

## Definitions

(Sheet 1 of 1)

### **SPECIFIC TO THIS PROCEDURE:**

**Processing Cart** – A gas-handling unit equipped with a vacuum pump, storage tanks(s), and filtration equipment necessary to recycle SF<sub>6</sub> gas.

1. The storage tank(s) on these carts is either a large central reservoir or one or more DOT-approved cylinders.
2. Reservoir-equipped carts shall not be transported over public roadways if the gas pressure is above 25 psig, unless the cart is properly certified for transportation of compressed gas.

**Transfer Cart** – A cart used to invert and/or heat gas cylinders when filling equipment to ensure the cylinder is thoroughly emptied.

**Voluntary Discharge** – any manually-controlled discharge of gas from equipment or storage cylinders, not associated with required construction or maintenance procedures.

### **NOTE**

Excluded from the above definition are discharges necessary for purposes of required Purity, Moisture, or other tests mandated by approved Construction, Commissioning, Test, or Maintenance procedures.

**Attachment 2**  
**SF<sub>6</sub> Gas Sampling (Substations)**  
(Sheet 1 of 2)

**Date** \_\_\_\_\_

**S/S** \_\_\_\_\_

**Equipment #** \_\_\_\_\_

**Ambient Temp** \_\_\_\_\_

<b>Pole</b>	<b>#1</b>	<b>#2</b>	<b>#3</b>
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<b>Percentage SF<sub>6</sub></b>	_____	_____	_____
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<b>Dew Point PPMV</b>	_____	_____	_____
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<b>SO<sub>2</sub></b>	_____	_____	_____
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<b>Equipment PSI</b>	_____	_____	_____
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<b>Analyzer PSI</b>	_____	_____	_____
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**Notes** \_\_\_\_\_

\_\_\_\_\_

**Attachment 2**  
**SF<sub>6</sub> Gas Sampling**  
 (Sheet 2 of 2)

Acceptable readings from M8-MT-1101 Rev 13 TPM pg 37

	No Action	Reclaim Gas and Replace Desiccant If Necessary	Reclaim or Replace Gas and Perform Major Maintenance
Purity	➤ 95%	<95% but > 90%	<90%
SO <sub>2</sub>	<500 ppmv		>500 ppmv

Moisture ppmv-

Brk/Swt	<200 ppmv	>200 but < 500 ppmv	>500 ppmv
GIS Bus	<300 ppmv	>300 but < 800 ppmv	>800 ppmv