

WP 04-ED1001

Revision 3

13.8 KV Surface Transformer Operating Instructions

Technical Procedure

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APPROVED FOR USE

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INTRODUCTION

This procedure provides detailed instructions for operating 13.8 kV surface distribution transformers at the Waste Isolation Pilot Plant (WIPP).

REFERENCES

BASELINE DOCUMENTS

- SG-3348, Siemens-Allis, Installation, Operation and Maintenance Instructions for Ventilated Dry Type Transformer

REFERENCED DOCUMENTS

- WP 04-ED1021, Surface Electrical Distribution

PRECAUTIONS AND LIMITATIONS

- Loading and unloading transformers will be at discretion of Facility Shift Manager (FSM).
- Effects of humidity **MUST** be considered if Dry Type Transformer is de-energized and allowed to cool to ambient temperature.
- Dry Type Transformers **SHALL NOT** be energized if moisture is present on enclosure.
- At direction of FSM, Maintenance and Engineering will be requested to investigate cause of moisture.
- Liquid Temperature should **NOT** exceed 105°C (221°F) in liquid filled transformers.
- Winding Hot Spot temperature reading should **NOT** exceed 105°C (221°F) in liquid filled transformers.

PREREQUISITE ACTIONS

1.0 Prior to energizing transformers perform the following:

- Verify Tank Liquid Level gauge is between high and low marks on liquid filled transformers.
- Inspect transformers for oil leaks.

PERFORMANCE

1.0 ENERGIZING SUB 1 TRANSFORMER

NOTE

In Section 1.0, Maximum Power Limit for Sub 1 transformer is 1,932 KVA @ 65°C rise above 40°C ambient with Full Load Current (FLC) of 2,324 amps.

- 1.1 Open Sub 1 Circuit Breaker (CB)-1 Main Breaker.
- 1.2 Verify open Sub 1 Load Interrupter Switch (LIS) 25P-SW15/1B1.
- 1.3 Close Sub 1 LIS 25P-SW15/1B2.
- 1.4 Check transformer for abnormal noises. (Transformer should have steady hum when energized.)
- 1.5 Close Sub 1 CB-1 Main Breaker.
- 1.6 At direction of Central Monitoring Room Operator (CMRO)/FSM, energize Bus loads as required in accordance with WP 04-ED1021.

2.0 DE-ENERGIZING SUB 1 TRANSFORMER

- 2.1 Open Sub 1 CB-1 Main Breaker.
- 2.2 Open Sub 1 LIS 25P-SW15/1B2.
- 2.3 Verify open Sub 1 LIS 25P-SW15/1B1.

3.0 ENERGIZING SUB 2 TRANSFORMER

NOTE

In Section 3.0, Maximum Power Limit for Sub 2 transformer is 1,932 KVA @ 65°C rise above 40°C ambient with FLC of 2,324 amps.

- 3.1 Open Sub 2 CB-1 Main Breaker.
- 3.2 Close **ONE** of the following Sub 2 LISs as required for normal or alternate line-up in accordance with WP 04-ED1021:
 - 25P-SW15/2A (normal)
 - 25P-SW15/2B (alternate)
- 3.3 Check transformer for abnormal noises. (Transformer should have steady hum when energized.)

3.4 Close Sub 2 CB-1 Main Breaker.

3.5 At direction of CMRO/FSM, energize Bus loads as required in accordance with WP 04-ED1021.

4.0 DE-ENERGIZING SUB 2 TRANSFORMER

4.1 Open Sub 2 CB-1 Main Breaker.

4.2 Verify open Sub 2 LIS 25P-SW15/2A.

4.3 Verify open Sub 2 LIS 25P-SW15/2B.

5.0 ENERGIZING SUB 3A TRANSFORMER

NOTE

In Section 5.0, Maximum Power Limit for Sub 3A is 1,288 KVA @ 65°C rise above 40°C ambient with FLC of 1,549 amps.

5.1 Open Sub 3A CB-8 Main Breaker.

5.2 Close Sub 3A LIS 25P-SW15/3A.

5.3 Check transformer for abnormal noises. (Transformer should have steady hum when energized.)

5.4 Close Sub 3A CB-8 Main Breaker.

5.5 At direction of CMRO/FSM, energize Bus loads as required in accordance with WP 04-ED1021.

6.0 DE-ENERGIZING SUB 3A TRANSFORMER

6.1 Open Sub 3A CB-8 Main Breaker.

6.2 Open Sub 3A LIS 25P-SW15/3A.

7.0 ENERGIZING SUB 3B TRANSFORMER

NOTE

In Section 7.0, Maximum Power Limit for Sub 3B is 1,288 KVA @ 65°C rise above 40°C ambient with FLC of 1,549 amps at 480 V.

7.1 Open Sub 3B CB-10 Main Breaker.

7.2 Close Sub 3B LIS 25P-SW15/3B.

7.3 Check transformer for abnormal noises. (Transformer should have steady hum when energized.)

7.4 Close Sub 3B CB-10 Main Breaker.

7.5 At direction of CMRO/FSM, energize Bus loads as required in accordance with WP 04-ED1021.

8.0 DE-ENERGIZING SUB 3B TRANSFORMER

8.1 Open Sub 3B CB-10 Main Breaker.

8.2 Open Sub 3B LIS 25P-SW15/3B.

9.0 ENERGIZING SUB 4 TRANSFORMER

NOTE

In Section 9.0, Maximum Power Limit for Sub 4 is 1,288 KVA @ 65°C rise above 40°C ambient with FLC of 1,549 amps.

9.1 Open Sub 4 CB-1 Main Breaker.

9.2 Close **ONE** of the following Sub 4 LISs as required for normal or alternate lineup in accordance with WP 04-ED1021:

- Sub 4 LIS 25P-SW15/4A (normal)
- Sub 4 LIS 25P-SW15/4B (alternate)

9.3 Check transformer for abnormal noises. (Transformer should have steady hum when energized.)

9.4 Close Sub 4 CB-1 Main Breaker.

9.5 At direction of CMRO/FSM, energize Bus loads as required in accordance with WP 04-ED1021.

NOTE

The performance of Section 10.0 may place the Plant in Limiting Conditions of Operations (LCO) 3.1.2.

10.0 DE-ENERGIZING SUB 4 TRANSFORMER

10.1 Open Sub 4 CB-1 Main Breaker.

10.2 Verify open Sub 4 LIS 25P-SW15/4A.

10.3 Verify open Sub 4 LIS 25P-SW15/4B.

11.0 ENERGIZING SUB 5 TRANSFORMER

NOTE

In Section 11.0, Maximum Power Limit for Sub 5 is 1,120 KVA @ 65°C rise above 40°C ambient with FLC of 1,345 amps.

- 11.1 Open Sub 5 CB-1 Main Breaker.
- 11.2 Close Sub 5 LIS 25P-SW15/5.
- 11.3 Check transformer for abnormal noises. (Transformer should have steady hum when energized.)
- 11.4 Close Sub 5 CB-1 Main Breaker.
- 11.5 At direction of CMRO/FSM, energize Bus loads as required in accordance with WP 04-ED1021.

12.0 DE-ENERGIZING SUB 5 TRANSFORMER

- 12.1 Open Sub 5 CB-1 Main Breaker.
- 12.2 Verify open Sub 5 LIS 25P-SW15/5.

13.0 ENERGIZING SUB 6 TRANSFORMER

NOTE

In Section 13.0, Maximum Power Limit for Sub 6 is 1,500 KVA with FLC of 1,800 amps.

- 13.1 Open Sub 6 CB-1 Main Breaker.
- 13.2 Close **ONE** of the following Sub 6 LISs as required for normal or alternate lineup in accordance with WP 04-ED1021:
 - Sub 6 LIS 25P-SW15/6A (normal)
 - Sub 6 LIS 25P-SW15/6B (alternate)
- 13.3 Check transformer for abnormal noises. (Transformer should have steady hum when energized.)
- 13.4 Close Sub 6 CB-1 Main Breaker.
- 13.5 At direction of CMRO/FSM, energize Bus loads as required in accordance with WP 04-ED1021.

14.0 DE-ENERGIZING SUB 6 TRANSFORMER

- 14.1 Open Sub 6 CB-1 Main Breaker.
- 14.2 Verify open Sub 6 LIS 25P-SW15/6A.
- 14.3 Verify open Sub 6 LIS 25P-SW15/6B.

15.0 ENERGIZING SUB 7 TRANSFORMER

NOTE

In Section 15.0, Maximum Power Limit for Sub 7 is 2,500 KVA 65°C rise above 40°C ambient with FLC of 347 amps.

- 15.1 Open Sub 7 CB-1 Main Breaker.
 - 15.2 Close **ONE** of the following Sub 7 LISs as required for normal or alternate lineup in accordance with WP 04-ED1021:
 - Sub 7 LIS 25P-SW15/7A
 - Sub 7 LIS 25P-SW15/7B
 - 15.3 Check transformer for abnormal noises. (Transformer should have steady hum when energized.)
 - 15.4 Close Sub 7 CB-1 Main Breaker.
 - 15.5 At direction of CMRO/FSM, energize Bus loads as required in accordance with WP 04-ED1021.
- #### 16.0 DE-ENERGIZING SUB 7 TRANSFORMER
- 16.1 Open Sub 7 CB-1 Main Breaker.
 - 16.2 Verify open Sub 7 LIS 25P-SW15/7A.
 - 16.3 Verify open Sub 7 LIS 25P-SW15/7B.

17.0 ENERGIZING SB SUB TRANSFORMER

NOTE

In Section 17.0, Maximum Power Limit for SB Sub is 1,333 KVA @ 150°C rise above 30°C ambient with FLC of 1,603 amps.

- 17.1 Prior to energizing, inspect Dry Type Transformer for moisture.
 - 17.2 **IF** moisture is present on transformer enclosure, **THEN** prior to re-energizing, have FSM notify Maintenance to check insulation resistance of transformer.
 - 17.3 Open SB Sub CB-1 Main Breaker.
 - 17.4 Close ONE of the following SB Sub LISs as required for normal or alternate lineup in accordance with WP 04-ED1021:
 - SB Sub LIS 45P-SW15/1B (normal)
 - SB Sub LIS 45P-SW15/1A (alternate)
 - 17.5 Inspect transformer for abnormal noises. (Transformer should have steady hum when energized.)
 - 17.6 Verify fan control panel is energized by observing green fan pilot light on.
 - 17.7 Close SB Sub CB-1 Main Breaker.
 - 17.8 At direction of CMRO/FSM, energize Bus loads as required in accordance with WP 04-ED1021.
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- ## 18.0 DE-ENERGIZE SB SUB TRANSFORMER
- 18.1 Open SB Sub CB-1 Main Breaker.
 - 18.2 Verify open SB Sub LIS 45P-SW15/1A.
 - 18.3 Verify open SB Sub LIS 45P-SW15/1B.
 - 18.4 Verify off fan motor controls.

19.0 OPERATION OF SB DRY TYPE TRANSFORMER COOLING FANS

19.1 To operate cooling fans in manual perform the following:

NOTE

In Step 19.1.1, pushing FANS ON selector button by-passes automatic controls and operates fans continuously.

19.1.1 Push in FANS ON selector button to start cooling fans.

19.1.2 Monitor transformer temperature and kW load at beginning and end of cooling fan manual operation.

NOTE

Performance of Step 19.1.3 may cause fans to stop.

19.1.3 At completion of cooling fan manual operation, return fan controls to automatic operation by pulling selector button out to AUTO position.

20.0 SB DRY TYPE TRANSFORMER OVERLOAD ALARMS

NOTE

These three notes apply to Section 20.0.

Contact T1, temperature is set at 180°C. Contact T2, red light and ALARM bell are set @ 210°C.

As transformer temperature rises above T1 contact setting and continues to T2 contact setting, contact T2 will close, energizing red OVERLOAD ALARM light and alarm bell.

Red OVERLOAD ALARM light will remain lit until temperature falls below T2 contact setting.

20.1 Push OVERLOAD ALARM silence button to stop bell alarm.

20.2 At direction of CMRO/FSM, remove loads until alarm condition clears.

20.3 Notify CMRO/FSM when alarm clears.

20.4 Reload transformer as directed by CMRO/FSM.

21.0 WINDING HOT SPOT IN EXCESS OF 180°C OR 356°F.

21.1 **IF** Winding Hot Spot is in excess of 180°C or 356°F, **THEN** perform the following:

21.1.1 Verify cooling fans are operating, if installed.

21.1.2 Reduce loads as directed by FSM.

21.1.3 At direction of FSM, request Maintenance and Engineering to investigate cause of overheating.

22.0 ENERGIZING SUB 8 TRANSFORMER

NOTE

In Step 22.1, maximum power limit for Sub 8 is 1,333 KVA at 80°C rise above 40°C ambient with FLC of 1,603 amps at 480 V.

22.1 Prior to energizing, inspect Dry Type Transformer for moisture.

22.2 **IF** moisture is present on transformer enclosure, **THEN**, prior to re-energizing, have FSM notify Maintenance to check insulation resistance of transformer.

22.3 Verify Sub 8 CB-1 Main Breaker is open.

22.4 Close Sub 8 LIS 25P-SW15/8.

22.5 Inspect Transformer for abnormal noises. (Transformer should have steady hum when energized.)

NOTE

In Step 22.6, fan control panel is powered from 25P-DP03/40 CB-6. When power is applied, control panel digital display lights and shows transformer hot spot temperature.

22.6 Verify fan control panel is energized.

22.7 Close Sub 8 CB-1 Main Breaker.

22.8 At direction of CMRO/FSM, energize Sub 8 loads as required in accordance with WP 04-ED1021.

23.0 DE-ENERGIZING SUB 8 TRANSFORMER

23.1 Open Sub 8 CB-1 Main Breaker.

23.2 Verify Sub 8 LIS 25P-SW15/8 is open.

23.3 Verify fan motor control panel is off.

24.0 OPERATION OF SUB 8 DRY TYPE TRANSFORMER COOLING FANS

24.1 Perform the following to operate cooling fans in MANUAL:

NOTE

In Step 24.1.1, positioning FAN CONTROL switch to MANUAL bypasses automatic controls and operates cooling fans continuously.

24.1.1 Position FAN CONTROL switch to MANUAL to start cooling fans.

24.1.2 Monitor transformer temperature and kW load at the beginning and end of cooling fan manual operation.

24.1.3 Return FAN CONTROL switch to AUTO at completion of cooling fan manual operation.

25.0 SUB 8 DRY TYPE TRANSFORMER OVERLOAD ALARMS

NOTE

In Section 25.0, with fan control switch in auto, transformer fans will run when transformer hot spot temperature exceeds 120°C. Fans will continue to run until temperature drops to approximately 100°C. If transformer hot spot temperature exceeds 180°C, the alarm light illuminates. LIS trips if transformer hot spot temperature exceeds 210°C.

25.1 Verify cooling fans are operating.

25.2 At direction of CMRO/FSM, remove loads until alarm condition clears.

25.3 **IF** directed by FSM,
THEN reload transformer.

25.4 Initiate Action Request for Maintenance and Engineering to investigate cause of overheating.