UST CATHODIC PROTECTION SYSTEM EVALUATION IMPRESSED CURRENT TYPE

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF WASTE MANAGEMENT – UNDERGROUND STORAGE TANK PROGRAM
SFN 60640 (08-2022)

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Instructions: Within 30 days, send completed form to:

North Dakota Department of Environmental Quality
Division of Waste Management
4201 Normandy Street
Bismarck ND 58503-1324

Clear Form

- All reports must be submitted regardless of results (pass, fail, or inconclusive).
- Incomplete, unsigned, or illegible forms will not be accepted and will be returned.

ND UST ID Number

1. UST FACILITY

Name		
Address		
City	State	ZIP Code
County	Telephone Number	
Name of Contact		Telephone Number

2. UST OWNER/OPERATOR

Name		
Address		
City	State	ZIP Code
County	Telephone Number	
Name of Contact		Telephone Number

3. CATHODIC PROTECTION (CP) TESTER INFORMATION AND QUALIFICATIONS

Name of Tester	Name of Company		
Address	City	State	ZIP Code
Telephone Number	E-mail Address		
National Association of Corrosion Engineers (NACE) International Certification Number	Steel Tank Institute (STI) Certification Number		

4. TEST REQUIREMENTS

Reason Test Was Conducted (check one)

☐ Routine - 3 year ☐ Routine - within 6 months of install ☐ 30-day re-survey after fail ☐ Re-survey within 6 months of

DATE NEXT SURVEY MUST BE CONDUCTED BY: (Required within 6 months of installation/repair and every 3 years)

5. EVALUATION

CP Tester's Evaluation (check one)

☐ **Pass**	All protected structures at this facility pass the CP survey and the continuity survey indicates all protected structures are isolated. It is judged that adequate CP has been provided to the UST system. (Complete Sections 7 and 8.)
☐ **Fail**	One or more protected structures at this facility fail the CP survey, and it is judged that adequate CP has not been provided to the UST system. (Complete Sections 7 and 8.)
☐ **Inconclusive**	The remote and the local do not both indicate the same test result on all protected structures (both pass or both fail),or the continuity survey indicates continuous or inconclusive results when compared to non-protected structures, the survey must be evaluated by a corrosion expert. (Corrosion expert to complete Section 6.)

Date CP Test Performed:

Name of Facility	Test Date

6. CORROSION EXPERT'S EVALUATION (if applicable)

A Corrosion Expert is needed to evaluate certain metal structures. See Appendix A at the end of this form for more information.

☐ **Pass** All protected structures at this facility have been judged that adequate CP is provided to the UST system.

☐ **Fail** One or more protected structures at this facility fail the CP survey and it is judged that adequate CP has not been provided to the UST system.

Name of Corrosion Expert	Telephone Number
Name of Corrosion Company	
NACE Int./PE Certification	**NACE Int./PE Certification Number**
Signature of CP Expert	**Date**

7. EVALUATION CRITERIA

Criteria Applicable to Evaluation (check all that apply)

☐ **850 Off** Structure-to-soil potential more negative than -850 mV with the protective current momentarily interrupted. ("Instant Off")

☐ **100 mV** Structure tested exhibits at least 100 mV of cathodic polarization.

8. ACTION REQUIRED

Action Required as a Result of this Evaluation (check only one)

☐ **None** CP is adequate. No further action is necessary at this time. Test again by no later than the date in Section 4.

☐ **Retest** CP may not be adequate. Retest within 30 days to determine if passing results can be achieved. (Retests may occur only if all protected structures are continuous with each other.)

☐ **Repair and Retest** CP is not adequate. Repair/modification is necessary within the next 60 days; or permanently close the tank system.

9. IMPRESSED CURRENT RECTIFIER DATA

Name of Rectifier Manufacturer	Rated DC Output: Volts	Amps
Model	**Rectifier Serial Number**	

Rectifier output as designed or lastly recommended (if available): Volts Amps

Event	Date (mm/dd/yyyy)	Tap Settings		DC Output		Hour Meter	Comments
		Course	Fine	Volts	Amps		
"As Found"							
"As Left"							

Note: *If rectifier output settings are modified, a corrosion expert must be consulted first and approve the modifications by signing Section 6.*

Name of Facility	Test Date

10. IMPRESSED CURRENT POSITIVE AND NEGATIVE CIRCUIT MEASUREMENTS (output amperage)

Complete if the system is designed to allow such measurements (e.g., individual lead wires for each anode are installed and shunts are present).

Circuit	1	2	3	4	5	6	7	8	9	10	Total
Anode (+)											
Tank/Pipe (-)											

11. CP SYSTEM REPAIRS AND/OR MODIFICATION INFORMATION

Date of "Failing" Test	Date of Repair	Name of Repair Company
Name of Lead Repair Technician		Telephone Number
Certification of Repair Technician (check all that apply) ☐ **Steel Tank Institute** ☐ **NACE**		**Note:** submit failing test results with this report

Description of Repairs (check all that apply)

☐ 1. Anodes for an impressed current system were added or replaced

☐ 2. Repair or replacement of anode header cables were needed

☐ 3. Continuity was not established between all protected structures

☐ 4. Rectifier was repaired or replaced

☐ 5. Rectifier output was modified (explain in "remarks/other" below).

Repairs/modifications must be designed by a "corrosion expert". Attach corrosion expert's design specifications.

Retests after repairs/modifications are made must be evaluated by the corrosion expert to assure the system is functioning properly (Section 6 must be signed by expert).

Remarks/Other

12. IMPRESSED CURRENT STRUCTURE TO SOIL POTENTIAL SURVEY

- ***Half Cell Placement (testing) on frozen soil, concrete, asphalt, or other paving materials is not acceptable.***
- The half cell must be placed locally in the soil directly over the structure being tested**. A minimum of three half cell locations per tank, and three half-cell locations per piping run** are required. The three locations must be as evenly distributed over the protected structure, and as far away from any active anode as practical.
- When testing flex connectors in contact with an electrolyte, **one test point is required for each flex connector** with the half cell placed locally in the soil directly over the flex connector being tested.
- Both "ON" and "Instant Off" potential readings are required at each half cell placement. Each half cell location must meet the "Instant Off" potential of-850 mV or more negative, or the 100 mV polarization criterion must be satisfied in order to pass.
- Check polarity (+/-) when taking readings and be sure to record them properly.

Describe Soil Type(s) of Local Reference Cell Placements:

Number 12 continued on next page

Name of Facility	Test Date

Half Cell Site Map Code[1]	Structure Tested[2]	Structure Contact Point[3]	Reference Cell Placement[4]	On Voltage (mV)[5]	Instant off Voltage (mV)[6]	100 mV Polarization		Pass/ Fail/Inc[9]
						Ending Voltage[7]	Voltage Change[8]	
(example) 1	*(example) Tank 1premium)*	*(example) Tank bottom*	*(example) Soil @ Prem STP manway*	*(example) -1070 mV*	*(example) -875 mV*			*(example) Pass*
(example) 2	*(example) Pipe 2 (diesel)*	*(example) Dispenser 7/8*	*(example) Soil @ Diesel dispenser 7/8*	*(example) -810 mV*	*(example) -680 mV*	*(example) -575 mV*	*(example) -105 mV*	*(example) Pass*

Comments:

1. Designate numerically or by code on the site drawing each local reference electrode placement (e.g.,1, 2, 3…, T-1, T-2, P-1, P-2…etc.).
2. Describe the structure that is being tested (e.g., plus tank; diesel piping; flex connector, etc.).
3. Describe where the structure being tested is contacted by the test lead (e.g., plus tank bottom; diesel piping @ dispenser 7/8; etc.)
4. Describe the exact location where the reference electrode is placed for each measurement (e.g., soil @ regular tank STP manway; soil @ dispenser 2, etc.)
5. {Applies to all tests} Record the structure-to-soil potential (voltage) observed with the current applied (e.g., –1070 mV).
6. {Applies to all tests} Record the structure to soil potential (voltage) observed when the current is interrupted (e.g., -680 mV).
7. {Applies to 100 mV polarization test only} Record the voltage observed at the end of the test period (e.g., -575 mV).
8. {Applies to 100 mV polarization test only} Subtract the final voltage from the instant off voltage (e.g., -680 mV minus -575 mV equals -105 mV).
9. Indicate if the tested structure passed or failed one of the two acceptable criteria (-850mV Instant Off or 100 mV polarization) based on your interpretation of data.

Name of Facility	Test Date

13. IMPRESSED CURRENT CONTINUITY SURVEY (POINT-TO-POINTMETHOD)

- This section will be utilized to conduct measurements of continuity on UST systems that are protected by cathodic protection systems.
- Point-to-Point: When conducting this method, **the rectifier must be turned off**, and it is recommended that the negative cable be disconnected from the rectifier. The leads of the volt meter are required to contact the two structures being examined to demonstrate isolation or continuity. A half cell is not used for this test method.
- To interpret continuity data, compare the difference in voltage of the structures evaluated and use the following guidelines: 1 mV or less = continuous, 1-10 mV= inconclusive, greater than 10 mV = isolated.
- For impressed current systems, all metallic structures intended to be protected must be continuous with each other in order to "pass".
- If other approved continuity testing methods are used, alter this form or submit the data on a separate sheet.

Protected Structure[1]	Other Structure [2]	Point-to-Point Voltage Difference[3]	Isolated/ Continuous/ Inconclusive[4]
(example) Tank #1 (premium) tank bottom	*(example) Soil @ Prem STP manway*	*(example) 8 mV*	*(example) Inconclusive*
(example) Rectifier Negative Cable	*(example) Plus Steel Product Line @ STP*	*(example) 11 mV*	*(example) Isolated*

Comments:

1. Structure "A" should always be the Rectifier negative cable after disconnecting from the rectifier
2. Describe the "other" protected structure "B" that you are attempting to demonstrate is continuous (e.g. plus steel product line @ STP, plus tank bottom, plus tank STP, etc.).
3. Record the voltage difference observed between structure "A" and structure "B" when conducting "point-to-point" testing (e.g. 1 mV).
4. Document whether the test indicated the protected structure was continuous (1 -5 mV), inconclusive (6 - 9 mV), or isolated (> 10 mV).

Attach additional sheets as needed.

Name of Facility	Test Date

14. DESCRIPTION OF UST SYSTEM

Tank/ Pipe No.	Product	Capacity (Gallons)	Tank Type[1]	Piping Type[2]	Metal Segments at Tank Sump[3]	Metal Segments at Dispenser[3]
1						
2						
3						
4						
5						
6						
7						
Ex:	*Premium*	*10,000*	*SW Bare Steel*	*SW Fiberglass*	*Bonded to IC System*	*In Containment*

1. Indicate if tank is Double Wall (DW) or Single Wall (SW). Also indicated type (e.g., steel, fiberglass, sti-P3®, composite etc.). Also indicate if tank is compartmental if applicable.
2. Indicate if piping is Double Wall (DW) or Single Wall (SW). Also indicate type (e.g., coated steel, fiberglass, galvanized, flex, etc.).
3. Indicate how metal segments such as flex connectors or metal pipe segments are protected from corrosion (e.g., isolated, booted, bonded, in containment, etc.).

15. UST FACILITY SITE DRAWING

Attach detailed drawing or use the space provided to draw a sketch of the UST and CP systems. At a minimum, you should indicate the following: All tanks, piping and dispensers; Location of anodes and wires if known; All buildings and streets; Location of CP test stations; Each reference cell placement must be indicated by a code (e.g., 1,2, T-1,) corresponding with the appropriate test in Section 12 of this form. If supplemental anodes are added to the tank system, indicate number, size, location and depth of the new anodes. **An evaluation of the CP system is not complete without an acceptable site drawing.**

APPENDIX A - SUPPLEMENTAL GUIDELINES FOR CORROSION PROTECTION

Corrosion Expert's Evaluation

A corrosion expert is anyone who is NACE International certified as a "Corrosion Specialist" or "Cathodic Protection Specialist" or is a Registered Professional Engineer who has certification or licensing that includes education and experience in corrosion control of buried or submerged metal piping systems and metal tanks.

A corrosion survey must be conducted by or evaluated by a corrosion expert when

1. Conducting repairs to metallic structures which are non-factory coated with dielectric material;
2. Adding supplemental anodes to the tanks and/or piping without following accepted industry standards;
3. The local and remote structure-to-soil potential did not result in the same outcome (both pass or both fail);
4. It is known or suspected that a stray current may be affecting the protected structure;
5. Making a repair or adding a supplemental anode to bare steel tanks/piping that is galvanically protected;
6. The metal structure being tested is poorly coated or the coating is damaged;
7. Field installing corrosion protection systems; or
8. Required by the North Dakota Department of Environmental Quality

In addition, for impressed current systems, a corrosion expert is required when

1. Installing an impressed current system;
2. Anodes were added or replaced;
3. Anode header cables are repaired or replaced;
4. Continuity was not established between all protected structures;
5. The rectifier is repaired or replaced;
6. Adjustments to the rectifier current output are made;
7. The rectifier is not working correctly; or
8. The rectifier is not operating in ranges established by a corrosion expert.

Testing Criteria

The -0.85 volt current-on criterion is the most commonly used test method for evaluating coated metal tanks and piping with galvanic corrosion protection. However, it cannot be used on metal structures that are poorly coated or not coated. Poorly coated or bare steel galvanic tank systems must use the -0.85 volt current-off or the 100 millivolt polarization test method and you must complete SFN 60640. If the -0.85 volt current-off or 100 millivolt polarization test method cannot be used for these systems, a corrosion expert will need to evaluate the system.