

# NRC INSPECTION MANUAL

DCI

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## TEMPORARY INSTRUCTION 2515/182

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### REVIEW OF THE IMPLEMENTATION OF THE INDUSTRY INITIATIVE TO CONTROL DEGRADATION OF UNDERGROUND PIPING AND TANKS

CORNERSTONE: INITIATING EVENTS, MITIGATING SYSTEMS AND PUBLIC  
RADIATION SAFETY

APPLICABILITY: This temporary instruction (TI) applies to all holders of operating licenses for nuclear power reactors, except plants that have permanently ceased operations.

#### 2515/182-01 OBJECTIVES

The objective of this TI is to determine whether licensees are implementing the industry initiative on underground piping and tank integrity and to gather information that will enable the staff of the U.S. Nuclear Regulatory Commission (NRC) to assess whether the initiative provides reasonable assurance of the structural and leakage integrity of buried piping and underground piping and tanks. The information collected using this TI will be used to determine the extent of the industry's implementation of the voluntary initiative and to aid in evaluating whether additional NRC regulatory actions are warranted.

#### 2515/182-02 BACKGROUND

Leakage from buried and underground pipes caused by corrosion has resulted in recent ground water contamination incidents. Some of these leaks resulted in groundwater contamination incidents with associated heightened NRC and public interest. The NRC conducted inspections using TI 2515/173, "Review of the Implementation of the Industry Groundwater Protection Voluntary Initiative" to assess licensee response to these incidents and determine the extent of the industry's voluntary groundwater protection initiative. Subsequently, the industry communicated its plan to address buried piping integrity in its November 2009 letter "Industry Initiative on Buried Piping Integrity" (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML093350034 and ML093350035). The scope of the first underground piping initiative only addressed piping that is directly buried in soil. However, because operating experience which revealed that leakage of tritiated water from underground piping in vaults or chases (but not in contact with soil) could also lead to groundwater contamination, the industry expanded the scope of its first initiative to include

underground piping not in direct contact with the soil and selected underground tanks. Its September 2010 letter “Industry Initiative on Underground Piping and Tanks Integrity” (ADAMS Accession No. ML102730367) describes its revised commitments. This second initiative contains all of the requirements and objectives from the first initiative but adds underground piping and tanks that are outside of a building and below the surface of the ground (whether or not they are in direct contact with the soil) if they are safety-related or contain licensed material or are known to be contaminated with licensed material. Also, an owner’s piping located outside the owner controlled area is considered to be within the scope of the underground piping and tanks integrity initiative if it is safety-related or contains licensed material.

The industry issued a guidance document, Nuclear Energy Institute (NEI) 09-14, “Guideline for the Management of Buried Piping Integrity” (ADAMS Accession No. ML1030901420) to describe a licensee’s goals and required actions (commitments made by the licensee) resulting from this underground piping and tank initiative. NEI later issued NEI 09-14, Revision 1, “Guidance for the Management of Underground Piping and Tank Integrity,” on December 31, 2010 (ADAMS Accession No. ML110700122). An Electric Power Research Institute (EPRI) document “Recommendations for an Effective Program to Control the Degradation of Buried and Underground Piping and Tanks” (ADAMS Accession No. ML11075A011) is a guidance document that provides additional details on the buried pipe and tank initiative elements and attributes to incorporate into a licensee’s buried pipes and tanks program. Alternative documents such as those produced by NACE International also provide acceptable guidance. This TI derives some of the inspection attributes from this EPRI guidance document. Under the underground piping and tanks Integrity Initiative, each site is to develop and implement either site-specific or company program for buried piping and underground piping and tanks.

The purpose of this TI is to gather information related to the industry’s implementation of the underground piping and tank integrity initiative. Because the TI has a duration that is shorter than the initiative, not all aspects of the initiative will be inspected at this time. In the future the staff may decide to create an additional TI to address longer term actions.

2515/182-03            INSPECTION REQUIREMENTS AND GUIDANCE

General Guidance:

In Staff Requirements Memorandum (SRM) SECY 11-0019 the Commission approved the staff’s approach to “monitor the effectiveness of the industry initiatives” (Guidance for the Management of Underground Piping and Tank Integrity (NEI 09-14 Rev.1) and Guideline for the Management of Buried Piping Integrity (NEI 09-14 Rev. 0)). In the same SRM the Commission cautions the staff that “the purpose is to monitor these efforts, not to regulate them”. NEI 09-14 Rev. 0 and Rev. 1 constitute voluntary initiatives under the Guideline for the Management of Materials Issues (NEI 03-08). As such, the implementation of these initiatives is not a regulatory requirement and any commitments made in the implementation of the initiatives do not constitute regulatory

requirements as defined in NRC RIS 2000-17 and NEI 99-04. Enforcement action as a result of this TI is not anticipated.

In completing this TI the NRC inspection staff shall assess whether the licensee has successfully completed the commitments described in NEI 09-14 Rev. 1 Sections 3.3 a and b. This assessment will be conducted in two phases. In the first phase the NRC inspection staff will determine if the organization of the licensee's program and due dates contained in the program match the organization and due dates contained in NEI 09-14 Rev. 1. Also in this phase the NRC inspection staff will determine whether the licensee has met applicable due dates. In the second phase NRC inspection staff will review the implementation of the licensee's program in sufficient detail to provide responses to a specific set of questions.

The remainder of this section of the TI is organized as follows. Section 03.01 contains inspection requirements for Phase 1 of this TI. Section 03.02 contains inspection requirements for Phase 2 of this TI. For Sections 03.01 and 03.02, inspectors are only expected to review and document aspects of the program that have been completed as of the date of the inspections. Inspectors are not expected to perform subsequent inspections in order to review all aspects of the programs. Sections 03.03 through 03.07 contain attributes of the two initiatives which MAY be valuable in the execution of this TI. The use of Section 03.03 through 03.07 is not mandatory. Also, inspectors may review aspects of licensee programs that are outside the limited scope described in sections 03.03 through 03.07 with approval of their management.

#### 03.01 Phase 1 Required Inspections

- a. The inspector should review the licensee's programs for buried pipe and underground piping and tanks to ensure that the attributes recommended in NEI 09-14 Rev. 1 are contained in the licensee's program. These attributes are listed in sections 3.3 A and 3.3 B of NEI 09-14 Rev.1 and the headings are listed in Table 1 below.

This inspection requirement is not intended to require the inspector to investigate the probability that each of these aspects of the licensee's program will be successful in ensuring the structural and leaktight integrity of buried piping and underground piping and tanks but rather that the program is organized in a manner consistent with that recommended by NEI 09-14 Rev. 1.

- b. The inspector should review the licensee's programs for buried pipe and underground piping and tanks to ensure that the completion dates recommended in NEI 09-14 Rev. 1 are contained in the licensee's program. These completion dates are listed in sections 3.3 A and 3.3 B of NEI 09-14 Rev.1 and in Table 1.

Table 1

Attribute	Due Date
<u>Buried Piping</u>	
Procedures and Oversight	Jun 30 2010
Risk Ranking	Dec 31 2010
Inspection Plan	Jun 30 2011
Plan Implementation	Start by Jun 30 2012 End by Jun 30 2013
Asset Management Plan	Dec 31 2013
<u>Underground Piping and Tanks</u>	
Procedures and Oversight	Dec 31 2011
Prioritization	Jun 30 2012
Condition Assessment Plan	Dec 31 2012
Plan Implementation	Start by Jun 30 2013 End by Jun 30 2014
Asset Management Plan	Dec 31 2014

- c. The inspector should review the licensee's programs for buried pipe and underground piping and tanks to ensure that activities which correspond to completion dates specified in the program which have passed, have been completed.
- d. The inspector may review any additional aspects of the program that may reveal either good or poor practices in managing buried piping or underground piping and tanks.
- e. Phase 1 of the TI should be completed by June 30, 2013.

#### 03.02 Phase 2 Required Inspections

- a. The inspector should review the licensee's programs for buried pipe and underground piping and tanks to ensure that activities which correspond to completion dates specified in the program which have passed since the Phase 1 inspection was conducted, have been completed.
- b. The inspector should review the licensee's programs in sufficient breadth and depth so as to be able to prepare written responses to the questions contained in <http://portal.nrc.gov/edo/nrr/dirs/irib/Inspection%20Manual%20Forms%20Templates%20Attachments/Forms/AllItems.aspx>.
- c. The inspector may review any additional aspects of the program that, in his or her opinion, may reveal either good or poor practices in managing buried piping or underground piping and tanks.

- d. Phase 2 of the TI should be completed by June 30, 2014.

03.03 Review of Licensee's Procedures and Oversight. The inspector may review the licensee's programs and procedure for the following.

- a. Original Buried Piping Integrity Initiative.

Although the specific elements detailed below for the buried piping integrity program and implementing procedures are not commitments made by the industry to the NRC, the NRC believes that a successful program should contain these elements which are recommended by EPRI in its document "Recommendations for an Effective Program to Control the Degradation of Buried Pipe" (EPRI guidance document). Use of NACE guidance as an alternative is also appropriate.

1. Did the licensee approve and issue buried piping integrity program documents and implementing procedures by June 30, 2010?
2. Has the licensee taken any deviations to initiative actions? If so, has the licensee provided a basis for these deviations?
3. Does the licensee's buried pipe integrity program contain the following elements:
  - (a) objectives for safe and reliable operation of buried pipe systems;
  - (b) list the licensee programs and procedures which address risk ranking, inspection planning, inspection procedures and asset management;
  - (c) defined roles and responsibilities for the program manager; inspection organization; engineering organization for risk ranking and fitness-for-service evaluations; organization for modifications, repairs and preventive maintenance;
  - (d) requirement to have an onsite buried piping program manager (owner) and/or staff;
  - (e) discussion of training requirements or expectations;
  - (f) schedule for completion of major milestones and actions;
  - (g) discussion of any reporting and trending requirements, including requirements to enter any identified deficiencies into the licensee's corrective action program;
  - (h) discussion of how program deficiencies should be corrected;
  - (i) description of any periodic documentation requirements to capture program performance, such as system health reports and performance indicators;
  - (j) Requirement for feedback and continuous improvement (e.g., whether the licensee's program addresses benchmarking and self-assessment)?

4. Does the licensee have an implementing procedure(s) that describe the following areas of the buried pipe program:
  - (a) risk ranking process and methods;
  - (b) inspection techniques, implementation of inspections, scope expansion, fitness-for-service assessment and trending, storage and retrieval of results;
  - (c) fitness-for-service calculation methods and margins;
  - (d) repair options;
  - (e) prevention methods, rehabilitation and leak detection techniques?
5. Does the licensee describe clear roles and responsibilities, including senior level accountability for the buried pipe integrity program, inspection organization, engineering organization for risk ranking and fitness for service evaluations, organizations for modifications, repairs and preventive maintenance in their site procedures?

b. Underground Piping and Tanks Integrity Initiative.

1. Has the licensee approved and issued underground piping and tanks initiative program documents and implementing procedures by December 31, 2011?
2. Has the licensee taken any deviations to initiative actions? If so, has the licensee provided a basis for these deviations?
3. Has the licensee identified piping and tanks that should be added to the initial scope of its buried piping program? Did the licensee revise existing programs and procedures or develop new ones, if needed, to ensure that the scope of the program now includes the structural and leaktight integrity of any newly identified components (piping or tanks)?
4. Has the licensee established clear roles and responsibilities, including senior level accountability for the implementation of the underground piping and tank integrity initiative?
5. Is there a program to ensure chase and vault areas are monitored for, or protected against, accumulation of leakage from underground piping and tanks that contain radioactive or other materials deemed by the licensee to be hazardous?

03.04 Review of Risk Ranking The inspector may review the licensee's process for risk ranking the buried piping segments and tanks for the following:

a. Original Buried Piping Integrity Initiative.

1. Did the licensee complete risk ranking of buried piping segments by December 31, 2010?
2. Does the licensee have a program or procedure to confirm the as-built location of buried and underground piping and tanks at the plant? Does the licensee's program employ a combination of walkdowns, excavations, non-destructive evaluation or other means to confirm as-built locations? Does the licensee's program require that a set of as-built drawings were assembled showing the route of buried pipes, including their locations relative to other buried structures and components and above ground buildings? Does the licensee's program identify any situations in which the licensee excluded buried piping from this initiative because the piping is owned or controlled by companies other than the licensee (e.g., buried natural gas piping)?
3. Did the licensee provide sufficient justification for buried piping segments that were removed from the scope of the buried piping initiative? Were scope exclusions documented and approved at an appropriate management level?
4. Did the licensee collect and compile line-specific data (line specific data is described in Table 2-1 through 2-3 of the EPRI guidance document; licensees who implement NACE guidance many not use alternative methodology for raning and identification.) for use in risk ranking, inspection planning and fitness-for-service assessment? Was piping subdivided into segments of similar characteristics?
5. Does the licensee have a program or procedure in place to monitor the coating integrity or cathodic protection (CP) system functionality for the piping segments credited with corrosion resistant coatings or cathodic protection?
6. Does the licensee have programs or procedure for maintenance, monitoring and surveys of cathodic protection systems and do these procedures require the use of personnel certified by NACE International (NACE) (any level of certification)?
7. Has the licensee conducted periodic over-the-line surveys to help assess the likelihood of external corrosion? Appendix E of the EPRI guidance document describes various over-the-line surveys.
8. Has the licensee evaluated fluid-side corrosion and fouling of buried pipe to determine the likelihood of pipe failure?
9. Did the licensee determine the likelihood of failure (e.g., low, medium, high) for each segment of the buried pipe system?
10. Did the licensee determine the consequence of failure for each pipe segment?

The consequence of failure of a buried pipe should address environmental, and safety and health consequences. The parameters that should be considered in the consequence assessment include the following:

- (a) the failure mode (leak, break, occlusions, mechanical damage);
- (b) the ability to detect the failure (e.g. leak or break) or degradation in a timely manner;
- (c) the ability to isolate or by-pass the failure;
- (d) the consequence in terms of safety, environmental damage and costs;
- (e) direct damage to the buried pipe and collateral damage to nearby structures and components.

11. Did the licensee risk rank each pipe segment using the likelihood and consequence of failure? Were inspections or other failure preventive measures prioritized based on this risk ranking?
12. Does the licensee's program require that risk ranking be periodically reviewed and updated as necessary?
13. Did the licensee estimate the extent (e.g., how many feet) of buried piping ranked in the highest risk ranking category?
14. Has the licensee identified the inspection methods which have or will be used for inspecting buried or underground pipe segments?

b. Underground Piping and Tanks Integrity Initiative.

1. Did the licensee prioritize underground piping and tanks for inspection by June 30, 2012? Given that there is no uniform, industry wide risk ranking process for components other than piping in direct contact with soil, did the licensee follow a formal, documented process to prioritize its underground piping and tanks for inspection and was the objective of this process similar to the risk ranking process for buried piping, i.e., are underground piping and tanks prioritized for inspection based on probability and consequences of failure?

03.05 Review of Inspection Plan/Condition Assessment Plans:

a. Original Buried Piping Integrity Initiative.

1. Did the licensee complete its inspection plan by June 30, 2011? Does the inspection plan have the following key attributes:
  - (a) identification of piping segments to be inspected;
  - (b) potential inspection techniques;
  - (c) inspection schedule for buried piping segments based on risk ranking;

- (d) assessment of cathodic protection, if applicable?
  - 2. Has the licensee performed, or does the licensee plan to perform, excavations to support the inspection of buried piping?
  - 3. Has the licensee performed any major maintenance or modification activities on its cathodic protection systems since January 1, 2009, such as anode and transformer replacements, additions, or retirements?
- b. Underground Piping and Tanks Integrity Initiative.
- 1. Did the licensee develop or identify existing condition assessment plans that will provide reasonable assurance of the integrity of components within the additional scope of the underground piping and tanks integrity initiative by December 31, 2012?
  - 2. Do these plans include the following key attributes:
    - (a) identification of underground piping and tanks to be assessed;
    - (b) potential assessment techniques;
    - (c) assessment schedules that take into account the relative priority of the components. This schedule should be coordinated with the schedule developed for the original Buried Piping Integrity Initiative to ensure that the components with the highest overall priority are addressed first;
    - (d) assessment of cathodic protection, if applicable?

#### 03.06 Review of Plan Implementation

- a. Original Buried Piping Integrity Initiative.
- 1. Has the licensee accomplished scheduled milestones in accordance with their inspection plan?
  - 2. Has the licensee completed, or is the licensee scheduled to complete, condition assessment of buried piping containing radioactive material by June 30, 2013?
  - 3. For piping which was inspected, did the licensee select segments for inspection based on their risk ranking?
  - 4. For pipes or tanks that have been uncovered, has the licensee inspected the coating using an inspector qualified in accordance with the program requirements? Did the licensee document the piping coating condition in photographic records?

5. Does the licensee have a site procedure that addresses the use of guided wave inspection methodology? If so, does the site procedure describe how to properly assess the inspection results?
6. Are annual surveys being conducted for licensees with installed cathodic protection systems? Is the system being annually evaluated by a NACE certified cathodic protection specialist? Is the system being operated in a manner that provides adequate protection to the piping system that is to be protected?
7. For the licensees who do not have fully functional cathodic protection systems installed, has the licensee provided a technical basis for concluding that buried piping integrity (e.g., ASME Code minimum wall or leaktight) can be maintained?
8. Do the licensee's inspection procedures require documentation of the as-found coating condition, cathodic protection, backfill type and other relevant parameters?
9. Did the licensee compile and categorize their inspection results? Has the licensee projected future damage based on current inspection results and the time to the next planned inspection or repair?
10. Does the licensee's inspection procedure or corrective action procedure stipulate what conditions need to be reported in the corrective action process?
11. Does site management review licensee self-assessment reports, nonconformance reports, deficiency reports or system health reports associated with the underground piping program?
12. Did the licensee perform self-assessment of its buried piping program? Has the licensee scheduled any self assessments?

b. Underground Piping and Tanks Integrity Initiative.

1. Did the licensee complete a condition assessment plan for underground piping and tanks by June 30, 2013?
2. Did the licensee complete these condition assessments by June 30, 2014?

03.07 Review of Asset Management

a. Original Buried Piping Integrity Initiative.

1. Did the licensee use the program inspection results as an input to the development of an asset management plan for buried piping?
2. Did the licensee issue an approved asset management plan on or before December 31, 2013?

b. Underground Piping and Tanks Integrity Initiative.

1. Did the licensee use the inspection results as an input to the development of an asset management plan for components within the scope of the underground piping and tanks integrity initiative?
2. Did the licensee issue an approved asset management plan on or before December 31, 2014?

2515/182-04      REPORTING REQUIREMENTS

04.01 Documentation Requirement for Phase I:

- a. Completion of Phase 1 of the TI is to be documented in an inspection report by including one of the following statements:

“The licensee’s buried piping and underground piping and tanks program was inspected in accordance with paragraphs 03.01.a through 03.01.c of the TI and was found to meet all applicable aspects of NEI 09-14 Rev. 1, as set forth in Table 1 of the TI.”

or

“The licensee’s buried piping and underground piping and tanks program was inspected in accordance with paragraphs 03.01.a through 03.01.c of the TI and was found to deviate from the requirements of NEI 09-14 Rev. 1, as set forth in Table 1 of the TI, in the following manner:” (Provide a list of deviations between the licensee’s program and the initiative and describe the basis for the deviations.)

- b. When approved by regional management, additional information may be provided by the inspector either in the inspection report or by direct contact to the headquarters staff (Robert.Hardies@NRC.GOV).

04.02 Documentation Requirement for Phase II:

- a. Document the completion of paragraph 03.02.a of the TI in an inspection report by including one of the following statements:

“The licensee’s buried piping and underground piping and tanks program was inspected in accordance with paragraph 03.02.a of the TI and it was confirmed that activities which correspond to completion dates specified in the program which have passed since the Phase 1 inspection was conducted, have been completed.”

or

“The licensee’s buried piping and underground piping and tanks program was inspected in accordance with paragraph 03.02.a of the TI and it was confirmed that the following activities which correspond to completion dates specified in the program which have passed since the Phase 1 inspection was conducted, have not been completed.” (Provide a list of items which have not been completed and describe the basis for failing to complete these items.)

- b. Document the completion of paragraph 03.02.b of the TI in an inspection report by including the following statement:

“The licensee’s buried piping and underground piping and tanks program was inspected in accordance with paragraph 03.02.b of the TI and responses to specific questions found in <http://portal.nrc.gov/edo/nrr/dirs/irib/Inspection%20Manual%20Forms%20Templates%20Attachments/Forms/AllItems.aspx> were submitted to the NRC headquarters staff.”

- c. Provide answers to the questions contained in:

<http://portal.nrc.gov/edo/nrr/dirs/irib/Inspection%20Manual%20Forms%20Templates%20Attachments/Forms/AllItems.aspx>

to the headquarters staff ([Robert.Hardies@NRC.GOV](mailto:Robert.Hardies@NRC.GOV)). While the level of detail required to respond to each question will vary, it is generally desired that answers of about a paragraph (several sentences) should be provided for each question.

- d. When approved by regional management, additional information may be provided by direct contact with the headquarters staff ([Robert.Hardies@NRC.GOV](mailto:Robert.Hardies@NRC.GOV)).

## 2515/182-05 COMPLETION SCHEDULE

This TI is to be initiated June 30, 2011 and completed by June 30, 2014. Complete as many required inspection items as possible based on allocated inspection resources, inspection scheduling constraints and the licensee’s schedule for accomplishing their commitments. Milestones past June 30, 2014 may be assessed if they are complete.

2515/182-06          EXPIRATION

This TI will remain in effect for about 3 years. This includes a time period between, June 30, 2014 and December 31, 2014 during which regions can document the inspections completed through June 30, 2014. The TI will expire on December 31, 2014.

2515/182-07          CONTACT

Any technical questions regarding this TI should be addressed to Robert Hardies at 301-415-5802 or [robert.hardies@nrc.gov](mailto:robert.hardies@nrc.gov).

2515/182-08          STATISTICAL DATA REPORTING

All direct inspection effort expended on this TI is to be charged to 2515/182 with an IPE code of TI. All indirect inspection effort expended on this TI for preparation and documentation should be attributed to activity codes TIP and TID respectively.

2515/182-09          RESOURCE ESTIMATE

The estimated average time to complete the TI inspection requirements is 32 to 64 hours.

2515/182-10          TRAINING

Specialized training on the Underground Piping and Tanks Integrity Initiative will be provided by DCI prior to implementation of this TI.

END

ATTACHMENT 1

Revision History for TI 2515/182

REVIEW OF THE IMPLEMENTATION OF THE INDUSTRY INITIATIVE ON UNDERGROUND PIPING AND TANKS

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
N/A	11/17/11 CN 11-036 ML11119A167	This is a new document issued for inspections related to the industry initiative on Underground Piping and Tanks Integrity.	Yes	8/25/2011	ML11158A221