PILGRIM WATCH – 148 WASHINGTON STREET – DUXBURY, MA 02332

August 30, 2010

PILGRIM WATCH'S SUPPLEMENTARY COMMENTS REGARDING GALL AMP XI.M41 BURIED AND UNDERGROUND PIPING & TANKS - NRC STAFF DRAFT REVISED AMP M41 (August 11, 2010 VERSION)-Docket: NRC-2010-0180 www.regulations.gov

[Please Note: Comments are inserted, as appropriate in the text – August 24 & 30 comments are identified by "PW Comment" in Italics and Times New Roman font. The Supplementary comments are in blue, noted by an arrow]

XI.M41 BURIED AND UNDERGROUND PIPING AND TANKS

Program Description

This is a comprehensive program designed to manage the aging of the external surfaces of buried and underground piping and tanks and to augment other programs which manage the aging of internal surfaces of buried and underground piping and tanks.

> ***PW Comment 1**:*
> *(1) While corrosion from the outer surface of buried pipes may be the dominant failure mechanism, there have been failures from the inside (supply water system e.g) which simply are not adequately covered by other programs listed in paragraph. It makes no sense of excluding internal corrosion and verification of the effectiveness of alternate programs.*
>
> → ***(2) Comment from Ray Shadis, New England Coalition (NE), Technical Director: Entergy Vermont Yankee's Root Cause Report makes it clear that the failure of the underground AOG piping which recently released radiological contaminated water to the open environment was not the result of external corrosion. In fact, the RCR states, the leaks were not the result of corrosion at all (internal or external) but flow-driven, mechanical (non-corrosion assisted) internal erosion – pipe thinning. If this is really the case, then the unidentified programs which "manage aging of internal surfaces" need more than augmentation by an improved program that is limited to external surfaces. If the high public interest in the leaks at Vermont Yankee provided any contributing motive for the NRC piping and tanks initiative, then the initiative, according to the Entergy VY RCR is entirely unresponsive. The VY License Renewal ASLB is now reconvened on remand from the Commission. NRC Staff has the opportunity and the obligation to bring the matter of Entergy's piping AMP failure before the ASLB. [Root Cause Evaluation Report CR-VTY-2010-00069 says, at page 11-14, A and B Recombiner Steam Trap Drain Lines Leaks:…. The failed piping segment(s) can not be removed for inspection due to their inaccessible location. However, the visual inspections performed, and review of the operating parameters of the steam trap drain lines result in the reasonable conclusion that the failure occurred due to mechanical erosion. Mechanical erosion is caused by accelerated flows, droplet impingement, and two phase flow. Mechanical erosion is more likely to occur immediately downstream of changes in flow direction, such as elbows, where increased flow turbulence occurs….Mechanical erosion differs from Flow Accelerated Corrosion (FAC), which is a chemical induced corrosion/erosion phenomenon.***

It addresses piping and tanks composed of any material, including metallic, polymeric, cementitious and concrete materials. This program manages aging through preventive, mitigative and inspection activities. It manages all applicable aging effects such as loss of material, cracking, and changes in material properties.

Depending on the material, preventive and mitigative techniques include: the material itself, external coatings for external corrosion control, the application of cathodic protection and the quality of backfill utilized. Also, depending on the material, inspection activities include electrochemical verification of the effectiveness of cathodic protection, non-destructive evaluation of pipe or tank wall thicknesses, hydrotesting of the pipe, and visual inspections of the pipe or tank from the exterior as permitted by opportunistic or directed excavations.

> ***PW Comment 2****: Opportunistic inspections should not be credited towards anything, rather they should be used to indicate and classify targeted examination. Absent from list are that there are no required, as there should be, inspections to establish the baseline conditions needed to evaluate the effectiveness of the program in the future.*

With, in some cases, the assistance of this program, management of aging of the internal surfaces of buried and underground piping and tanks is accomplished through the use of other aging management programs (e.g. Open Cycle Cooling Water (AMP XI.M20), Treated Water (AMP XI.M21A), Internal Inspection of Miscellaneous Piping and Ducts (AMP XI.M38), Fuel Oil Chemistry (AMP XI.M30), Fire Water System (AMP XI.M27) or Water Chemistry (AMP XI.M2). Additionally, this program does not address selective leaching. The selective leaching program (AMP XI.M33) is applied in addition to this program for applicable materials and environments.

> ***PW Comment 3****: (1) The water chemistry program is a mitigation program and does not provide detection for aging effects. More frequent complete inspections as part of the overall program are the only effective assurance that defects created by aging components will be uncovered. Tritium leaks at reactors across the country belie the effectiveness of water chemistry alone to prevent leaks. (2) More broadly, the NRC Groundwater Contamination (Tritium) at Nuclear Plants-Task Force – Final Report, Sept 1, 2001 studied radioactive leaks from a variety of sources. The LLTF stated in the Executive Summary ii, that, "The task force did identify that under the existing regulatory requirements the potential exists for unplanned and unmonitored releases of radioactive liquids to migrate offsite into the public domain undetected."*

The terms "buried" and "underground" are fully defined in Chapter IX of the GALL Report. Briefly, buried piping and tanks are in direct contact with soil or concrete (e.g., a wall penetration). Underground piping and tanks are below grade, but are contained within a tunnel or vault such that they are in contact with air and are located where access for inspection is restricted.

> ***PW Comment 4****: "Inaccessible Piping & Tanks" would be a better term*

Evaluation and Technical Basis

1. ***Scope of Program*****:** This program is used to manage the effects of aging for buried and underground piping and tanks constructed of any material including metallic, polymeric, cementitious and concrete materials. The program addresses aging effects such as loss of material, cracking, and changes in material properties. Typical systems in which buried and underground piping and tanks may be found include service water piping and components,

condensate storage transfer lines, fuel oil and lubricating oil lines, fire protection piping and piping components (fire hydrants), and storage tanks. Corrosion of piping system bolting within the scope of this program is managed using this program. Other aging effects associated with piping system bolting are managed through the use of the Bolting Integrity Program (AMP XI.M18).

PW Comment 5: *Add piping related to AOG system*

2. ***Preventive Actions:*** Preventive actions utilized by this program vary with the material of the tank or pipe and the environment (air, soil, or concrete) to which it is exposed. These actions are outlined below:

   a. Preventive Actions, Buried Piping and Tanks

      i. Preventive actions for buried piping and tanks are conducted in accordance with Table 2a and its accompanying footnotes

      ii. Fire mains are installed in accordance with National Fire Protection Association (NFPA) Standard 24. Preventive actions for fire mains beyond those in NFPA 24 need not be provided if the system undergoes a periodic flow test in accordance with NFPA 25 as described in program element 4 of this AMP.

PW Comment 6*: (1)"Periodic flow tests" should not provide a "pass." It cannot detect leakage. (2) Periodic is too loose, need specificity - what precisely does "periodic" mean in terms of months/years?*

Moreover a flow test can indicate that there is not a breach in the piping at the time of the test but it does not indicate the level of corrosion/degradation in the material, wall thickness etc or whether there will be a breach the day after the flow test.

Table 2a, Preventive Actions for **Buried** Piping and Tanks

<u>PW Comment 7</u>*:*

(1) Change to "Preventative Actions for Inaccessible Piping & Tanks
(2) Preventative Action Add Baseline Inspection
(3) Prevention and Detection needed. Add detection capability-monitoring wells in sufficient number and placed according standard design practices, requires among other things recent subsurface hydro-geo analysis of site[1]

[1] A well designed monitoring well system could pick up a leak relatively quickly - approximately within weeks or months after the initiation of a leak, depending on the rates of groundwater flow and other factors. Groundwater monitoring networks are widely used to detect leaks at a variety of nuclear and non-nuclear sites. Well-established protocols exist for proper design of monitoring networks including well and screen placement, sampling frequency and selection of sampled contaminants Sampling the wells is usually done about four times a year

Steps in Monitoring Network Design that NRC should require and evaluate:

a. Determination of all plausible leak locations. This would include consideration of all piping segments and tanks that are placed below the ground surface and are part of system components that are within scope. For purposes of monitoring network design, leaks from any of the plausible locations would be presumed to release water contaminated with radionuclides or oil. This step is similar those recommended in the NEI Guidance Document (Objective 1.2 Site Risk Assessment) where buried piping is described as being a credible mechanism for leaking materials to reach groundwater.

b. Identification of the specific contaminant species that would be present in the leaking water or oil from each of the system components. A set of indicator contaminants should be selected for each system component that can, if detected in groundwater, uniquely identify the component. Particular emphasis should be on those contaminants that are least likely to sorb and thus be most rapidly transported.

c. Consideration of the fate and transport of each indicator contaminant from each of the plausible leak locations.

(1) This analysis would include prediction of subsurface transport pathways from all identified source locations. This prediction would consider vertical migration of leaking water through the unsaturated zone to the water table. It would also account for the direction and rate of groundwater flow. Such predictions must be based upon understanding of groundwater behavior at the site derived from a recently-conducted detailed site characterization as recommended in the NEI Guidance Document (Objective 1.1 Site Hydrology and Geology). This is particularly important at reactors like PNPS where building, paving and changes to storm drainage may significantly affect local flow behavior.

(2) Transport of a particular contaminant along identified transport pathways must be analyzed. For each contaminant it is necessary to account for the initial concentration of the contaminant in the leaking liquid and the effects of dispersion, sorption, radioactive decay or other processes that may affect concentrations of the contaminant at the monitoring well.

(3) The NEI Guidance Document (Objective 1.3 On-Site Groundwater Monitoring) recommends a monitoring system that will “ensure timely detection” of leaks. This will be accomplished with placement of monitoring wells so that all predicted transport pathways are intercepted with a high degree of certainty. The placement of monitoring wells should consider both the areal (plan view) location and also the vertical location of the well screens. A complete monitoring system will also include up-gradient control wells which are intended to provide ambient groundwater conditions and help to confirm groundwater flow directions. Consideration must be given to topography and location of the sources of potential leak sites from a coast line or offsite boundary. For example, at Pilgrim, sources of potential leak sites are located only a short distance from the coast line (assuming that groundwater flow is generally towards the sea), the potential is high for a narrow transport pathway to convey contaminants between monitoring wells unless they are closely spaced. This suggests that a high density of monitoring wells will be needed to detect leaks with adequate assurance.

d. Understanding of the fate and transport of indicator contaminants can be used to determine the appropriate frequency of water sample collection at the monitoring wells and the required detection limits for analysis. In particular, the dilution of contaminated water as it mixes with ambient water during transport must be considered. Detection limits for contaminant analysis should be as low as practical so that dilution of contaminants does not mask the presence of leaks. Radionuclides in addition to Tritium need to be analyzed and reported. All findings must be required to be made public in a timely manner.

Table 2a, Preventive Actions for **Buried** Piping and Tanks

Material[1]	Coating[2]	Cathodic Protection[4]	Backfill Quality
Titanium			
Super Austenitic Stainless[8]			
Stainless Steel	X[3]		X[5, 7]
Steel	X	X	X[5]
Copper	X	X	X[5]
Aluminum	X	X	X[5]
Cementitious or Concrete	X[3]		X[5, 7]
Polymer			X[6]

PW Comment 8:

(1)<u>Titanium</u> needs to be included in preventative measures. Titanium alloys, like other metals, are subject to corrosion in certain environments. The primary forms of corrosion that have been observed on these alloys include general corrosion, crevice corrosion, anodic pitting, hydrogen damage, and SCC.
http://www.keytometals.com/Article24.htm

NUREG/CR 6876 (Brookhaven) titanium subject fouling/biofouling. <u>Why coat titanium</u>? Titanium's corrosion resistance is compromised by exposure to halides such as chlorides or fluorides. Residual chlorides lead to stress corrosion cracking while fluorides readily attack the natural oxide that protects titanium from atmospheric corrosion. In addition, due to titanium's extremely passive nature, when titanium components are in contact with more electrochemically active materials such as aluminum, zinc or copper, where the materials meet there is such a galvanic charge generated due to the dissimilar metal junction, galvanic corrosion is wildly accelerated beyond what either metal by itself would experience.
http://www.finishing.com/Library/titanium.html

⟶ ***(2) Comments from John H. Fitzgerald III, P.E., FNACE***
NACE Certified Corrosion Specialist # 166

Table 2a indicates the writers are unfamiliar with the corrosion of buried stainless steel (SS) facilities. While Stainless Steel (SS) may perform well in loose or fairly well aerated soils, it will corrode like carbon steel in tight or mucky soils. This is because in the absence of oxygen, the protective oxide film will not form on SS. I have encountered this in various places. The writers compound the matter by coating the structures (footnote 3) and then omitting cathodic protection (CP) - more on this late). Left bare, the SS will usually undergo general corrosion over the entire surface, usually leading to eventual failure.

When coated, but without CP, pitting corrosion occurs at breaks (holidays) in the coating. This leads to fairly rapid corrosion and failure. The DOT regulations for gas and flammable liquid pipelines, and the EPA regulations for buried storage tanks, prohibit the use of coating without CP. Nothing less should be accepted for nuclear plants.

Table 2a also includes aluminum. Aluminum is a very poor material for buried use, and we see practically no use of it for that purpose today. Aluminum is a highly active metal and

is anodic to just about any other metal to which it might be connected. CP can be used on aluminum, but great care must be taken. CP causes a rise in pH in the soil around the protected structure, and with a little too much CP, the pH can rise above 8.0, and it that range aluminum will corrode rapidly even under CP.

(2) Polymer: High Density Polyethylene & High Density Polypropylene:We have been advised that there should be reluctance to use polymeric piping in hot service and there is a pressure limitation that depends (like in steel pipe) on the wall thickness; it should never be used either of the materials in organic service (buried diesel or fuel oil lines) even though organic fluids are routinely transported in polyethylene or polypropylene totes; and that there is reason for concern about long term embrittlement (and eventual cracking) if used in buried structures. Another type of problem with buried polymeric pipe is the fact that when digging becomes necessary the polymeric pipe is cut that much more easily. If polymeric pipe(not really plastic pipe) are used for repairs, there are problems in the mating of steel pipes to polymeric ones. Bottom line, we are advised that there is not enough experience available to guarantee an additional 20 years of service.

(3) Cementitious or Concrete requires cathodic protection: The following summarises the international development of cathodic protection of steel in concrete. The technology was developed in Europe and the USA for applications to buried prestressed concrete water pipelines (Refs. 1 & 2) and in California to deal with deicing salt attack of reinforced concrete bridge decks, and has been widely applied throughout North America for that purpose. It has been used and further developed in the UK to deal with a variety of problems ranging from buildings with cast in chlorides to bridge substructures contaminated with deicing salts and to marine structures and tunnels. It is also widely used on buildings and car parks in UK and Northern Europe. In the Middle East, severe corrosion problems caused by high levels of salinity in soils as well as marine conditions have lead to many large projects being carried out. It has also been used extensively in the Far East including Australia, Japan and Hong Kong. http://www.azom.com/details.asp?articleID=1316. There are numerous articles on line.

(4*) What about components within scope NOT made of materials listed, such as monel bronze?*

1. Materials classifications are meant to be broadly interpreted; e.g., all alloys of titanium which are commonly used for buried piping are to be included in the titanium category. Material categories are generally aligned with P numbers as found in the ASME Code, Section IX. Steel is defined in chapter IX of this report. Polymer includes polymeric materials as well as composite materials such as fiberglass.

2. When provided, coatings are in accordance with Table 1 of NACE SP0169-2007 or Section 3.4 of NACE RP0285-2002.

3. Coatings are provided based on environmental conditions (e.g., stainless steel in chloride containing environments). If coatings are not provided, a justification is provided in the LRA.

4. Cathodic protection is in accordance with NACE SP0169-2007 or NACE RP0285-2002. The system monitoring interval discussed in section 10.3 of NACE SP0169-

2007 may not be extended beyond one year. The equipment used to implement cathodic protection need not be 10 CFR 50 Appendix B qualified. [Emphasis added]

PW Comment 9*: Omit "The equipment used to implement cathodic protection need not be 10 CFR 50 Appendix B qualified." Rationale: Unless the rectifier (or any piece of equipment) was explicitly mentioned in the tech specs, its failure would be entered into the corrective action program but would not enter a limiting condition for operation with a deadline for fixing or shutting down*

Cathodic protection need not be provided if:

PW Comment 11PW Comment 10*: No exceptions, require as was original plan in Gall XI M-28 before NRC caved to bogus objections raised by NEI that retrofitting cathodic protection could be dangerous and then provided M34 as an alternative*[2]

Gall XI M-28, focuses on adding cathodic protection. Pertinent portions of it say:

- *Scope of Program: "The program relies on preventative measures, such as coating, wrapping, and cathodic protection, and surveillance, based on NACE Standard RP-0285-95 and NACE Standard RP-0169-96, to manage the effects of corrosion on the intended function of buried tanks and piping respectively."*
- *Preventive Actions: "A cathodic protection system is used to mitigate corrosion where pinholes in the coating allow the piping or components to be in contact with the aggressive soil environment. The cathodic protection imposes a current from an anode onto the pipe or tank to stop from corrosion from occurring at defects of the coating*
- *Detection of Aging Effects: "Coatings and wrappings can be damaged during installation or while in service and the cathodic protection system is relied upon to avoid any corrosion at the damaged locations. Degradation of the coatings and wrappings during service will result in the requirement for more current from the cathodic protection rectifier in order to maintain the proper cathodic protection protect potentials. Any increase in current requirements is an indication of coating and wrapping degradation. A close interval pipe-to-soil potential survey can be used to locate the locations where degradation has occurred."*
- *Acceptance Criteria: "In accordance with accepted industry practice, per NACE Standard RP-0285-95 and NACE RP-0169-96, the assessment of the condition of the coating and cathodic protection system is to be conducted on an annual basis and compared to predetermined values."*
- *Corrective Actions: The site corrective action program, quality assurance (QA) procedures, site review and approval process, and the administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. As discussed in the appendix of this report, the staff finds the requirements of 10 CFR Part 50, Appendix B acceptable to address the corrective actions, confirmation process and administrative controls."*

[2] See: TRANSCRIPT ADJUDICATORY HEARING PILGRIM NUCLEAR POWER STATION'S LICENSE RENEWAL APPLCIATION, April 10, 2008, pgs., 769-770; available NRC Electronic Reading Room (www.nrc.gov); ADAMS accession number "ML081070329"

- *Operating experience: "Corrosion pits from the outside diameter have been discovered in buried piping with far less than 60 years of operation. Buried pipe that is coated and cathodically protected is unaffected after 60 years of service. Accordingly, operating experience from application of the NACE standards on non-nuclear systems demonstrates the effectiveness of this program."*

a. Soil resistivities > 20,000 ohm cm. If this condition is met, inspections in Table 4a are conducted in accordance with Table 4a footnote 2 item C.

PW Comment 11:

→5) Comments from John H. Fitzgerald :

Foot note 4a states that CP need not be provided in soils of resistivity greater than 20,000 ohm cm. This thinking dates back to the 1950s at which time it was believed that in soils of resistivity greater than 10,000 ohm cm corrosion failures were infrequent enough that it was less expensive to fix leaks than to protect the pipelines. That thinking was soon put to rest and by 1960, it was standard practice to provide coating and CP for steel pipelines. Footnote 4a also applies to carbon steel, and now is 60 years out of date.

PW Comment 11*: (1) What does NACE SP0169-*2007 say*? We need a copy of the document. (2) Not knowing, it seems to need qualification regarding if area backfilled, excavated or soil conditions are known to have changed- Entergy's BPTIMP, pg.,11 made this notation*

b. <u>Corrosion rates, based on at least 5 years of data, which indicate that minimum design wall thickness for the buried pipe or tank will not be reached within the period of extended operation</u>. The corrosion rates may be based on measurements taken from actual uncoated pipe or may be approximated for coated piping, which is assumed to contain flaws in the coating, from bare metal coupons of similar material exposed, on site, to soil of similar conditions (e.g., resistivity, ionic content, moisture content, etc). Multiple corrosion measurements are necessary when a length of pipe passes through varying soil types. If this condition is met, inspections in Table 4a are conducted in accordance with Table 4a footnote 2 item D. [Emphasis added]

PW Comment 12*: Omit this exception. The probability of corrosion is not constant with time and therefore cannot be characterized with a number and entered as such into a "Rule", like, if we established a rate based on 5 years of data, we can predict the rate going forward. First, the corrosion rate is* NOT *constant with time*. *Therefore, the <u>probability would have to be adjusted with age</u>, or the <u>risk becomes a function of age.</u> The so-called "Bath-tub curve of degradation" needs to be considered – as the component ages the rate sharply increases- the corrosion rate is not constant over time.*

5. Backfill is consistent with SP0169-2007 section 5.2.3. The staff considers backfill which is located within 6 inches of the pipe that meets ASTM D 448-08 size number 67 to meet the objectives of SP0169-2007. Backfill quality may be demonstrated by plant records or by examining the backfill while conducting the inspections conducted

in program element 4 of this AMP. Backfill not meeting this standard is acceptable if the inspections conducted in program element 4 of this AMP do not reveal evidence of mechanical damage to pipe coatings due to the backfill.

⟶ Comment 13a- Comments from John H. Fitzgerald
Footnote 5 implies that selected backfill is adequate corrosion control for buried facilities. It is not. Even if the backfill is completely uniform it soon assumes the corrosiveness of the surrounding soil. Also, one has little control over some future excavation that may disturb the backfill in one area and replace it with a different backfill; this creates a lack of backfill uniformity, a situation that leads to corrosion.

PW Comment 13b*: (i) Re particle size backfill? What does SP0169-2007 section 5.2.3 say- is max size ½ inch as in previous draft? Crushed concrete of 1/2 inch diameter or less can be quite jagged and do much damage while river bottom pebbles may be harmless. Therefore the type of material as to its smoothness is relevant. Also absent from the discussion on backfill material was the degree to which the material retained moisture. (ii) Omit exception "Backfill not meeting this standard is acceptable if the inspections conducted in program element 4 of this AMP do not reveal evidence of mechanical damage to pipe coatings due to the backfill:" Program element 4 does not provide assurance- see comments below on #4.*

6. Aggregate size for backfill within 6 inches of the pipe must meet ASTM D 448-08 size number 10.

PW Comment 14: *define – data base not available on line*

7. Backfill limits apply only if piping is coated.

PW Comment 15*: Omit exception – for example, abrasion ignored*

8. Super austenitic stainless steel, e.g., Al6XN or 254 SMO. Superaustenitic stainless steels, such as alloy AL-6XN and 254SMO, exhibit great resistance to chloride pitting and crevice corrosion due to high molybdenum content (>6%) and nitrogen additions, and the higher nickel content ensures better resistance to stress-corrosion cracking versus the 300 series.

PW Comment 16: *Omit exception- stray currents ignored, for example*

b. Preventive Actions, **Underground Piping and Tanks**

i. Preventive actions for underground piping and tanks are conducted in accordance with Table 2b and its accompanying footnotes

Table 2b, Preventive Actions for **Underground** Piping and Tanks

Material[1]	Coating Provided[2]
Titanium	
Super Austenitic Stainless[4]	
Stainless Steel	X[3]

Steel	X
Copper	X
Aluminum	X[3]
Cementitious or Concrete	
Polymer	

1. Materials classifications are meant to be broadly interpreted; e.g., all alloys of titanium which are commonly used for buried piping are to be included in the titanium category. Material categories are generally aligned with P numbers as found in the ASME Code, Section IX. Steel is defined in chapter IX of this report. Polymer includes polymeric materials as well as composite materials such as fiberglass.

2. When provided, coatings are in accordance with Table 1 of NACE SP0169-2007 or Section 3.4 of NACE RP0285-2002. A broader range of coatings may be used if justification is provided in the LRA.

3. Coatings are provided based on environmental conditions (e.g., stainless steel in chloride containing environments). If coatings are not provided, a justification is provided in the LRA.

4. Super austenitic stainless steel, e.g., AI6XN or 254 SMO.

   PW Comment: Coating preventative action - MIC may be issue for super austenitic steel AI6XN http://www.alleghenyludlum.com/Ludlum/documents/AL_6XN_SourceBook.pdf

3. ***Parameters Monitored/Inspected:*** The aging effects addressed by this AMP are: changes in material properties of polymeric materials, loss of material due to all forms of corrosion and, potentially, cracking due to stress corrosion cracking. Changes in material properties are monitored by manual examinations. Loss of material is monitored by visual appearance of the exterior of the piping or tank; and wall thickness of the piping or tank. Wall thickness is determined by a non-destructive examination technique such as ultrasonic testing (UT).

   PW Comment 17: *(1) UT not work if piping is multi-layered such as having a CIP liner in the pipe paragraph needs to be qualified for conditions effective; (2) need to state how much of the component needs to be examined and precisely where on the component – some areas more susceptible to degradation – elbows, welds, high flow areas for example.*

   Two additional parameters, the pipe-to-soil potential and the cathodic protection current, are monitored for steel, copper, and aluminum piping and tanks in contact with soil to determine the effectiveness of cathodic protection systems and, thereby, the effectiveness of corrosion mitigation.

   PW Comment 18*: Pipe to soil potential? What about conduits/other containment for the piping if they are degraded, the pipe inside could be sitting in water, for example?*

4. ***Detection of Aging Effects:*** Methods and frequencies used for the detection of aging effects vary with the material and environment of the buried and underground piping and tanks. These methods and frequencies are outlined below.

PW Comment 19: *Need to include additional variables such as age component, flow velocity (FAC-flow accelerated corrosion), repair history*

a. Opportunistic Inspections

  i. All buried and underground piping and tanks, regardless of their material of construction are inspected by visual means whenever they become accessible for any reason. The information in paragraph f of this program element is applied in the event deterioration of piping or tanks is observed.

  PW Comment 20*: (1) Opportunistic typically means that there has been a leak that needs to be repaired. Visual inspection is "stone age technology" There has to be a decision of how much more pipe to excavate and at least conduct some quantitative examinations. (2) What if pipe does not become accessible for any reason?*

b. Directed Inspections – **Buried Pipe**

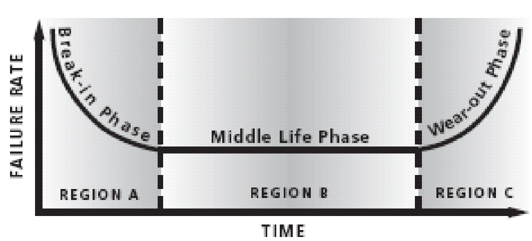
  i. Directed inspections for buried piping are conducted in accordance with Table 4a and its accompanying footnotes.

  PW Comment 21*: see comments on Table 4a's footnotes*

  ii. Unless otherwise indicated, directed inspections as indicated in Table 4a will be conducted during each 10 year period beginning 10 years prior to the entry into the period of extended operation.

PW Comment 22: *What evidence is there to justify a 10 year interval? This is the crux. One simply cannot squeeze all these situations into the same shoe box. 10 years is too infrequent period – especially in license renewal when components may well be entering the "wear-out" stage (Region C) of the Bath Tub Curve of degradation. Inspection frequencies need to be based on age.*

Figure 1 The Bathtub Curve



Source: NASA, 2001.

  iii. Inspection locations are selected based on susceptibility to degradation. Characteristics such as coating type, coating condition, cathodic protection efficacy, backfill characteristics and soil resistivity are considered.

  PW Comment 23*: (1)If in fact there are various degrees of susceptibility, there should also be varying degrees of inspection frequencies.(2) need a more precise and complete listing of locations more susceptible to degradation – absent from list, for example, are age component, flow rate, elbows, welds*

iv. Visual inspections are supplemented with surface and/or volumetric non-destructive testing (NDT) if significant indications are observed.

PW Comment 24: *"Significant" needs to be defined*

v. Opportunistic examinations may be credited toward these direct examinations if the location selection criteria in item iii, above, are met.

PW Comment 25*: Omit - not all factors related to corrosion listed in iii and no specification of length component requiring inspection- if, for example, they had an "opportunity" to inspect a 1 foot section of a pipe's coating it does not mean that the remaining feet of the pipe are in the same condition*

vi. At multi-unit sites, individual inspections of shared piping may be credited for only one unit.

PW Comment 26*: The issue is the quality and frequency of the inspection of the pipe not what unit the pipe(s) belong*

vii. Visual inspections for polymeric materials are augmented with manual examinations to detect hardening, softening or other changes in material properties.

PW Comment 27*: This makes no sense. What does manual examination tell you about the embrittlement of the pipe.*

viii. The use of guided wave ultrasonic or other advanced inspection techniques is encouraged for the purpose of determining those piping locations that should be inspected but may not be substituted for the inspections listed in the table.

ix. For the purpose of this program element, fire mains will be considered to be code class/safety related piping and inspected as such unless they are subjected to a flow test as described in section 7.3 of NFPA 25 at an frequency of at least one test in each six month period.

PW Comment 28*: Flow test not tell degree degradation- wall thickness- it can detect hole at time of test not what will happen an hour or 5 months later. Flow tests will NOT test any leak unless it is >15% above the nominal flow through the pipe.*

x. Inspection as indicated in (A), and (B) below may be performed in lieu of the inspections contained in Table 4a for either code class/safety significant or hazmat piping or both:

PW Comment 29: *"at least 25%" – specifics as to 25% need to be provided so that they are representative age component, configuration etc*

A. At least 25% of the code class/safety related or hazmat piping or both constructed from the material under consideration is hydrostatically tested in accordance with 49 CFR 195 subpart E on an interval not to exceed 5 years.

B. At least 25% of the code class/safety related or hazmat piping or both constructed from the material under consideration is internally inspected by a method capable of precisely determining pipe wall thickness. The inspection method must be capable of detecting both general and pitting corrosion and must be qualified by the applicant and approved by the staff. As of the effective date of this document, guided wave ultrasonic examinations do not meet this paragraph. Internal inspections are to be conducted at an interval not to exceed 5 years. Consideration should be given to NACE SP0169-2007 sections 6.1.2 and 6.3.3

Table 4a, Inspections of **Buried Pipe**

Material[1]	Preventive Actions[2]	Inspections[3]	
		Code Class Safety Related[4]	Hazmat[5]
Titanium			
Super Austenitic Stainless[7]			
Stainless Steel		1[6]	1[6]
HDPE[8]	A B	1[6] 2	1[6] 1%
Other Polymer[9]	A B	1[6] 2	1[6] 1%
Cementitious or Concrete		1[6]	1[6]
Steel	C D E F	1[6] 1 4 8	1[6] 2% 5% 10%
Copper	C D E F	1[6] 1 1 2	1[6] 1% 2% 5%
Aluminum	C D E F	1[6] 1 1 2	1[6] 2% 5% 10%

PW Comment 30*: Monel Bronze is used for some buried comments- is it covered by the program and more broadly what other materials may be not in list?*

1. Materials classifications are meant to be broadly interpreted; e.g., all alloys of titanium which are commonly used for buried piping are to be included in the titanium category. Material categories are generally aligned with P numbers as found in the ASME Code, Section IX. Steel is defined in chapter IX of this report. Polymer includes polymeric materials as well as composite materials such as fiberglass.

2. Preventive actions are categorized as follows:

PW Comment 31*:*

→ (1) Comments from John H. Fitzgerald: It is curious that in various places, the document calls for backfill for non-metallic facilities to be consistent with certain sections of NACE SP0169. This document deals specifically with metallic structures- see the second reference on page 15. Similar references are made to SP0285; this document deals with CP for underground tanks and CP is not applicable to non-metallic facilities. Some non-metallic facilities, particularly fiberglass tanks require pea gravel for backfill, so some consideration must be given to backfill.

(2) NACE SP0 169-2007 needs to be provided in appendix – not available on line to non-member

A Backfill is in accordance with NACE SP0169-2007 and Table 2a.

B Backfill is not in accordance with NACE SP0169-2007 and Table 2a.

C Cathodic protection, coatings, and backfill have been provided in accordance with NACE SP0169-2007 and Table 2a. Each cathodic protection system has been operated in accordance with NACE SP0169-2007 for at least 90% of the time since the piping under consideration was installed or it was inspected in accordance with this program element.

D Cathodic protection, coatings, and backfill have been provided in accordance with NACE SP0169-2007 and Table 2a. Each cathodic protection system has been operated in accordance with NACE SP0169-2007 for at less than 90% of the time since the piping under consideration was installed or it was inspected in accordance with this program element.

E Coatings and backfill are in accordance with NACE SP0169-2007 and Table 2a but cathodic protection is not provided.

F Preventive actions provided do not meet criteria C, D, or E.

3. Inspections are listed as either a discrete number of visual examinations (excavations) or as a percentage of the linear length of piping under consideration. The following **guidance related to the extent of inspections is provided**:

PW Comment 32: Guidance has no enforcement – we need enforceable regulations

PW Comment 33 (3a-3c)*: On what basis can NRC assume that 10 feet inspected, for example, represents the conditions in the remainder of the component? It would make more sense to require more frequent and more comprehensive inspections. Specifically a 100 percent internal visual inspection of all underground pipes must be implemented. The inspection cycle should be such that pipes within scope are inspected every ten years. The Applicant should be required to break the testing interval down such that one sixth of all pipes are inspected during each refueling outage. (This assumes 18 month refueling outages, or six every ten years.) The Applicant should be required to inspect one sixth of the lineal piping,* *one sixth of the elbows and flanges at each outage, even if such inspections lengthen the outage time*

a. Each inspection will examine either the entire length of a run of pipe or a minimum of 10 feet.

b. If the length of pipe to be inspected based on the number of inspections times the minimum inspection length (10 feet) exceeds 10% of the length of the piping under consideration, only 10% need be inspected.

c. If the length of pipe to be inspected based on the total length of pipe under consideration times percentage to be inspected is less than 10 feet, either 10 feet or the total length of pipe present, whichever is less, will be inspected.

4. Code Class and safety related pipe which also meets the definition of hazmat pipe will be inspected as hazmat pipe.

5. Hazmat pipe is pipe which, during normal operation, contains material which, if released, could be detrimental to the environment. This includes chemical substances such as diesel fuel and radioisotopes. To be considered hazmat, the concentration of radioisotopes within the pipe during normal operation must exceed established standards such as EPA drinking water standard. In the absence of such standards, the concentration of the radioisotope must exceed the greater of background or reliable level of detection. For tritium, the EPA drinking water standard (20,000 pCi/L) is used. (This approach for defining hazmat is consistent with that used in classifying fluid services in ASME B31.3 appendix M.)

PW Comment 34, apply throughout document:

⟶ (1) "To be considered hazmat, the concentration of radioisotopes within the pipe during normal operation must exceed established standards such as EPA drinking water standard" makes no sense. The definition is a snapshot of what is in the component at a particular time – it does not account for lower concentrations that leak and over time can be significant. It wrongly ignores the cumulative effect of leakage.
(2) "In the absence of such standards, the concentration of radioisotope must exceed the greater of background or reliable level of detection." Games are typically played with so-called background – such as using the national average - not based on a site specific and site pre-operational determined number. As for "reliable level of detection" Liquid Release Task Force Recommendations Implementation Status as of November 19, 2007[3] stated at 2 that, "The Staff is revising Regulatory Guide 1.21 to incorporate the LLFT recommendation that "The NRC should revise radioactive effluent release program guidance to upgrade the capability and scope of in-plant monitoring system, <u>to include</u> additional monitoring locations and the <u>capability to detect lower radionuclides (i.e., low energy gamma, weak beta emitters, and alpha particle</u>." [Emphasis added]
(3) How are "normal" and "abnormal" defined?
(4) It would make sense to sort the components within scope that fall under this program into those that do/could contain radioactive liquids from those that do/could not.

[3] *Liquid Release Task Force Recommendations Implementation Status as of November 19, 2007, ML073230982*

6. Only 1 inspection is conducted even if both Code Class/safety related and hazmat pipe are present.

   PW Comment 35: Only 1 inspection is insufficient – it appears NRC priorities are reversed – public safety should be the priority not industry convenience.

7. Super austenitic stainless steel, e.g., Al6XN or 254 SMO.

8. High Density Polyethylene (HDPE) pipe includes only HDPE pipe approved for use by the NRC for buried applications.

9. Other polymer piping includes some HDPE pipe, and all other polymeric materials including composite materials such as fiberglass.

c. Directed Inspections – **Underground Pipe**

→ ***PW 35- Comment John Fitzgerald: Selection of locations to inspect appear to depend on a subjective assessment of likely corrosive conditions. I should think the nuclear industry would like to up be to date on how to find the best places to excavate for external inspection on buried pipe. This procedure, known as External Corrosion Direct Assessment (ECDA) and also Internal Corrosion Direct Assessment (ICDA) is practiced in the pipeline industry under the DOT rules for pipeline integrity. These assessments are based on detailed assessments of conditions, electrical and other measurements to locate corroding areas, and the excavations are based on these data. Experience has shown these procedures to be very accurate. To date, these practices have been used only on transmission lines, but similar rules are now coming out for distribution piping. Distribution piping has many resemblances to the piping in generating stations.***

i. Directed inspections for underground piping are conducted in accordance with Table 4b and its accompanying footnotes.

PW Comment 36*: see comments Table 4b and accompanying footnotes*

ii. Unless otherwise indicated, directed inspections as indicated in Table 4b will be conducted during each 10 year period beginning 10 years prior to the entry into the period of extended operation.

PW Comment 37: 10 years too infrequent

iii. Inspection locations are selected based on susceptibility to degradation. Characteristics such as coating type, coating condition, exact external environment, and flow characteristics within the pipe, are considered.

   PW Comment 38: More characteristics need to be listed – such as age, history repair

iv. Underground pipes are inspected visually to detect external corrosion and by a volumetric technique such as UT to detect internal corrosion.

   PW Comment 39*: UT detects both internal and external corrosion – separation is tricky but can be done.*

v. Opportunistic examinations may be credited toward these direct examinations if the location selection criteria in item iii, above, are met.

PW Comment 40*: Omit- explained above*

vi. At multi-unit sites, individual inspections of shared piping may be credited for only one unit.

PW Comment 41*: This makes no sense. Is it the pipe or site?*

vii. Visual inspections for polymeric materials are augmented with manual examinations to detect hardening, softening or other changes in material properties.

PW Comment 42*: This makes no sense. What does manual examination tell you about the embrittlement of the pipe*

viii. The use of guided wave ultrasonic or other advanced inspection techniques is encouraged for the purpose of determining those piping locations that should be inspected but may not be substituted for the inspections listed in the table.

ix. For the purpose of this program element, fire mains will be considered to be code class/safety related piping and inspected as such unless they are subjected to a flow test as described in section 7.3 of NFPA 25 at an frequency of at least one test in each six month period.

PW Comment 43: *Flow test not tell degree degradation- wall thickness- it can detect hole at time of test not what will happen an hour or 5 months later. Piping integrity is the main issue and flow test does nothing to identify integrity.*

x. Inspection as indicated in (A), and (B) below may be performed in lieu of the inspections contained in Table 4a for either code class/safety significant or hazmat piping or both:

PW Comment 44: *"at least 25%" – specifics as to 25% need to be provided so that they are representative age component, configuration etc*

A. At least 25% of the code class/safety related or hazmat piping or both constructed from the material under consideration is hydrostatically tested in accordance with 49 CFR 195 subpart E on an interval not to exceed 5 years.

B. At least 25% of the code class/safety related or hazmat piping or both constructed from the material under consideration is internally inspected by a method capable of precisely determining pipe wall thickness. The inspection method must be capable of detecting both general and pitting corrosion and must be qualified by the applicant and approved by the staff. As of the effective date of this document, guided wave ultrasonic examinations do not meet this paragraph. Internal inspections are to be conducted at an interval not to exceed 5 years. Consideration should be given to SP0169-2007 sections 6.1.2 and 6.3.3

Table 4b, Inspections of **Underground Pipe**

Material[1]	Inspections[2]	
	Code Class Safety Related[3]	Hazmat[4]
Titanium		
Super Austenitic Stainless[6]		
Stainless Steel	1[5]	1[5]
HDPE[7]	1[5]	1[5]
Other Polymer[8]	1[5]	1[5]
Cementitious or Concrete	1[5]	1[5]
Steel	2	5%
Copper	1	2%
Aluminum	1	2%

1. Materials classifications are meant to be broadly interpreted; e.g., all alloys of titanium which are commonly used for buried piping are to be included in the titanium category. Material categories are generally aligned with P numbers as found in the ASME Code, Section IX. Steel is as defined in chapter IX of this report. Polymer includes polymeric materials as well as composite materials such as fiberglass.

2. Inspections are listed as either a discrete number of visual examinations (excavations) or as a percentage of the linear length of piping under consideration. The following guidance related to the extent of inspections is provided:

PW Comment 45*: Where do these numbers come from? Is there any evidence that 2% is statistically the correct number? Provide rationale in footnote.*

   a. Each inspection will examine either the entire length of a run of pipe or a minimum of 10 feet.

   b. If the length of pipe to be inspected based on the number of inspections times the minimum inspection length (10 feet) exceeds 10% of the length of the piping under consideration, only 10% need be inspected.

   c. If the length of pipe to be inspected based on the total length of pipe under consideration times percentage to be inspected is less than 10 feet, either 10 feet or the total length of pipe present, whichever is less, will be inspected.

3. Code Class and safety related pipe which also meets the definition of hazmat pipe will be inspected as hazmat pipe.

4. Hazmat pipe is pipe which, during normal operation, contains material which, if released, could be detrimental to the environment. This includes chemical substances such as diesel fuel and radioisotopes. To be considered hazmat, concentration of radioisotope within the pipe during normal operation must exceed established standards such as EPA drinking water standard. In the absence of such standards, the concentration of the radioisotope must exceed the greater of background or reliable level of detection. For tritium, the EPA drinking water

standard (20,000 pCi/L) is used. (This approach for defining hazmat is consistent with that used in classifying fluid services in ASME B31.3 appendix M)

5. Only 1 inspection is conducted even if both Code Class/safety related and hazmat pipe are present.
6. Super austenitic stainless steel, e.g., Al6XN or 254 SMO.
7. HDPE pipe includes only HDPE pipe approved for use by the NRC for buried applications.
8. Other polymer piping includes some HDPE pipe, and all other polymeric materials including composite materials such as fiberglass.

d. Directed Inspections – Buried Tanks

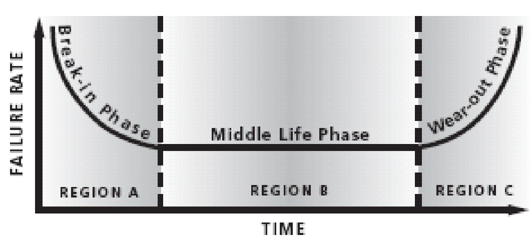
i. Directed inspections for buried tanks are conducted in accordance with Table 4c and its accompanying footnotes.

PW Comment 46*: Tanks must include partially buried tanks such as SFP, CST and the drywell (it is a partially buried tank and the SFP is encased below in concrete); and see comments on Table 4C's footnotes*

ii. Directed inspections as indicated in Table 4c will be conducted during each 10 year period beginning 10 years prior to the entry into the period of extended operation.

PW Comment 47: *What evidence is there to justify a 10 year interval. This is the crux. One simply cannot squeeze all these situations into the same shoe box. 10 years is too infrequent period – especially in license renewal when components may well be entering the "wear-out" stage (Region C) of the Bath Tub Curve of degradation.*

Figure 1 The Bathtub Curve



Source: NASA, 2001.

iii. Each buried tank is examined if it is Code Class/safety related or contains hazardous materials as defined in footnote 5 to Table 4a and is constructed from a material for which an examination is indicated in Table 4c.

iv. Examinations may be conducted from the external surface of the tank using visual techniques or from the internal surface of the tank using volumetric techniques. If the tank is inspected from the external surface a minimum 25% coverage is required. This area must include at least some of both the top and bottom of the tank. If the tank is inspected internally by UT, at least 1 measurement is required per square foot of tank surface. UT measurements are distributed uniformly over the surface of the tank. If the tank is inspected internally by another volumetric technique, at least 90% of the surface of the tank must be inspected.

***PW Comment 4**8: (1) UT can inspect both external and internal (2) inspecting 25% one time in 10 years inadequate; as suggested for buried piping, specifically a 100 percent external visual inspection of tanks within scope must be implemented. The inspection cycle should be such that the whole tank is inspected every ten years. The Applicant should be required to break the testing interval down such that one sixth of the tanks surface is inspected during each refueling outage. (This assumes 18 month refueling outages, or six every ten years.)*

v. Visual inspections for polymeric materials are augmented with manual examinations to detect hardening, softening or other changes in material properties.

***PW Comment 49**: This makes no sense. What does manual examination tell you about the embrittlement .*

vi. Opportunistic examinations may be credited toward these direct examinations.

PW Comment 50**: Opportunistic examinations should not be credited toward anything, rather they should be used to indicate and classify targeted examination**.

Table 4c, Inspections of **Buried Tanks**

Material[1]	Preventive Actions[2]	Inspections
Titanium		
Super Austenitic Stainless[3]		
Stainless Steel		
HDPE[4]	A B	X
Other Polymer[5]	A B	X
Cementitious or Concrete		X
Steel	C D E	X
Copper	C D E	X
Aluminum	C D E	X

1. Materials classifications are meant to be broadly interpreted; e.g., all alloys of titanium which are commonly used for buried piping are to be included in the titanium

category. Material categories are generally aligned with P numbers as found in the ASME Code, Section IX. Steel is defined in chapter IX of this report. Polymer includes polymeric materials as well as composite materials such as fiberglass.

2. Preventive actions are categorized as follows:

***PW Comment 51**: NACE RP0285-2002-provide copy*

A Backfill is in accordance with NACE RP0285-2002 and Table 2a.

B Backfill is not in accordance with NACE RP0285-2002 and Table 2a.

C Cathodic protection, coatings, and backfill have been provided in accordance with NACE RP0285-2002 and Table 2a. Each cathodic protection system has been operated in accordance with NACE RP0285-2002 for at least 90% of the time since the piping under consideration was installed or it was inspected in accordance with this program element.

D Cathodic protection, coatings, and backfill have been provided in accordance with NACE RP0285-2007 and Table 2a. Each cathodic protection system has been operated in accordance with NACE RP0285-2002 for at less than 90% of the time since the piping under consideration was installed or it was inspected in accordance with this program element.

E Cathodic protection is not provided.

3. Super austenitic stainless steel, e.g. Al6XN or 254 SMO.

4. HDPE pipe includes only HDPE pipe approved for use by the NRC for buried applications.

5. Other polymer piping includes some HDPE pipe, and all other polymeric materials including composite materials such as fiberglass.

e. Directed Inspections – Underground Tanks

i. Directed inspections for underground tanks are conducted in accordance with Table 4d and its accompanying footnotes.

ii. Directed inspections as indicated in Table 4d will be conducted during each 10 year period beginning 10 years prior to the entry into the period of extended operation.

iii. Each underground tank which is Code Class/safety related or contains hazardous materials as defined in footnote 5 to Table 4a and is constructed from a material for which an examination is indicated in Table 4d is examined.

iv. Examinations may be conducted from the external surface of the tank using visual techniques or from the internal surface of the tank using volumetric techniques. If the tank is inspected from the external surface a minimum 25% coverage is required. This area must include at least some of both the top and bottom of the tank. If the tank is inspected internally by UT, at least 1 measurement is required per square foot of tank surface. If the tank is inspected internally by another volumetric technique, at least 90% of the surface of the tank must be inspected.

v. Tanks that cannot be examined using volumetric examination techniques are examined visually from the outside.

vi. Visual inspections for polymeric materials are augmented with manual examinations to detect hardening, softening or other changes in material properties.

vii. Opportunistic examinations may be credited toward these direct examinations.

Table 4d, Inspections of **Underground Tanks**

Material[1]	Inspections
Titanium	
Super Austenitic Stainless[2]	
Stainless Steel	
HDPE[3]	
Other Polymer[4]	
Cementitious or concrete	
Steel	X
Copper	
Aluminum	

1. Materials classifications are meant to be broadly interpreted; e.g., all alloys of titanium which are commonly used for buried piping are to be included in the titanium category. Material categories are generally aligned with P numbers as found in the ASME Code, Section IX. Steel is as defined in chapter IX of this report. Polymer includes polymeric materials as well as composite materials such as fiberglass.

2. Super austenitic stainless steel, e.g., Al6XN or 254 SMO.

3. HDPE pipe includes only HDPE pipe approved for use by the NRC for buried applications.

4. Other polymer piping includes some HDPE pipe, and all other polymeric materials including composite materials such as fiberglass.

f. Adverse indications

i. Adverse indications observed during monitoring of cathodic protection systems or during inspections are entered into the plant corrective action program. Adverse indications which are the result of inspections will result in an expansion of sample size as described in item iv, below. Adverse indications which are the result of monitoring of a cathodic protection system may warrant increased monitoring of the cathodic protection system and/or additional inspections. Examples of adverse indications resulting from inspections include leaks, material thickness less than minimum, the presence of coarse backfill with accompanying coating degradation within 6 inches of a coated pipe or tank (see Table 2a Footnotes 5 and 6), and general or local degradation of coatings so as to expose the base material.

ii Adverse indications which fail to meet the acceptance criteria described in program element 6 of this AMP, will result in the repair or replacement of the affected component.

iii. An analysis may be conducted to determine the potential extent of the degradation observed. Expansion of sample size may be limited by the extent of piping or tanks subject to the observed degradation mechanism.

iv. If adverse indications are detected, inspection sample sizes within the affected piping categories are doubled. If adverse indications are found in the expanded sample, the inspection sample size is again doubled. This doubling of the inspection sample size continues as necessary.

5. ***Monitoring and Trending:*** For piping and tanks protected by cathodic protection systems, potential difference and current measurements are trended to identify changes in the effectiveness of the systems and/or coatings as describe in NACE Standards RP0285-2002 and SP0169-2007.

6. ***Acceptance Criteria:*** The principal acceptance criteria associated with the inspections contained with this AMP follow:

a. Criteria for soil-to-pipe potential are listed in NACE RP0285-2002 and SP0169-2007.

b. For coated piping or tanks, there should be either no evidence of coating degradation or the type and extent of coating degradation should be insignificant as evaluated by a NACE certified inspector.

PW Comment 52*: that "no evidence of coating degradation" be determined by a "NACE certified inspector" – inspector's judgment calls vary all over the map, absent specific criteria by NRC this is not an acceptable way to provide reasonable assurance.*

c. If coated or uncoated metallic piping or tanks show evidence of corrosion, the remaining wall thickness in the affected area is determined to ensure that the minimum wall thickness is maintained. This may include different values for large area minimum wall thickness, and local area wall thickness.

d. Cracking or blistering of nonmetallic piping is evaluated.

e. Cementitious or concrete piping may exhibit minor cracking and spalling provided there is no evidence of leakage or exposed rebar or reinforcing "hoop" bands.

PW Comment 53: *The goal is to prevent leakage not wait until leaking to fix.*

f. Backfill is in accordance with specifications described in program element 2 of this AMP.

g. Flow test results for fire mains are in accordance with NFPA 25 section 7.3.

h. For hydrostatic tests, the condition “Without leakage” as required by 49 CFR 195.302 may be met by demonstrating that the test pressure, as adjusted for temperature, does not vary during the test.

7. ***Corrective Actions:*** The site corrective actions program, quality assurance (QA) procedures, site review and approval process, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. The staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the corrective actions, confirmation process, and administrative controls.

PW Comment 54: Looking at the list of outstanding corrective actions at reactors today that NRC has NOT looked at – what assurance is provided?

8. ***Confirmation Process:*** The confirmation process ensures that preventive actions are adequate to manage the aging effects and that appropriate corrective actions have been completed and are effective. The confirmation process for this program is implemented through the site's QA program in accordance with the requirements of 10 CFR Part 50, Appendix B.

9. ***Administrative Controls:*** The administrative controls for this program provide for a formal review and approval of corrective actions. The administrative controls for this program are implemented through the site's QA program in accordance with the requirements of 10 CFR Part 50, Appendix B.

10. Operating Experience: Operating experience shows that buried and underground piping and tanks are subject to corrosion. Corrosion of buried oil, gas, and hazardous materials pipelines have been adequately managed through a combination of inspections and mitigative techniques, such as those prescribed in NACE SP0169-2007 and NACE RP0285-2002. Given the differences in piping and tank configurations between transmission pipelines and those in nuclear facilities, it is necessary for applicants to evaluate both plant-specific and nuclear industry operating experience and to modify its aging management program accordingly. The following industry experience may be of significance to an applicant’s program:

PW Comment 55: Operating experience demonstrates that what is needed are NRC regulations that are enforced; not voluntary industry initiatives and NRC “guidance.”

a. On February 21, 2005, a leak was detected in a 4-inch condensate storage supply line. The cause of the leak was microbiologically influenced corrosion or under deposit corrosion. The leak was repaired in accordance with the American Society of Mechanical Engineers (ASME) Section XI, “Repair/Replacement Plan”.

b. On September 6, 2005, a service water leak was discovered in a buried service water header. The header had been in service for 38 years. The cause of the leak was either failure of the external coating or damage caused by improper backfill. The service water header was relocated above ground.

c. In October 2007, degradation of essential service water piping was reported. The riser pipe leak was caused by a loss of pipe wall thickness due to external corrosion induced by the wet environment surrounding the unprotected carbon steel pipe. The corrosion processes that caused this leak affected all eight similar locations on the essential service water riser pipes within vault enclosures and had occurred over many years

d. In February 2009, a leak was discovered on the return line to the condensate storage tank. The cause of the leak was coating degradation probably due to the installation specification not containing restrictions on the type of backfill allowing rocks in the backfill. The leaking piping was also located close to water table.

e. In April 2009, a leak was discovered in an aluminum pipe where it went through a concrete wall. The piping was for the condensate transfer system. The failure was caused by vibration of the pipe within its steel support system. This vibration led to coating failure and eventual galvanic corrosion between the aluminum pipe and the steel supports.

f. In June 2009, an active leak was discovered in buried piping associated with the condensate storage tank. The leak was discovered because elevated levels of tritium were detected. The cause of the through-wall leaks was determined to be the degradation of the protective moisture barrier wrap which allowed moisture to come in contact with the piping resulting in external corrosion.

→ ***PW Comment 56: Comment John Fitzgerald: I have not studied the XI.M41 document in detail … My review so far indicates to me that this document needs a lot of work to make it consistent with current corrosion control technology.***

Respectfully submitted,

Mary Lampert
Pilgrim Watch, Director
148 Washington Street
Duxbury, MA 02332