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General Comment

Attached are the final industry comments on Draft NUREG-1800, Revision 2. These comments are in addition to those previously submitted.

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Attachments

NRC-2010-0180-DRAFT-0008.1: Comment on FR Doc # 2010-11841
NRC-2010-0180-DRAFT-0008.2: Comment on FR Doc # 2010-11841
NRC-2010-0180-DRAFT-0008.3: Comment on FR Doc # 2010-11841

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XI.M41 BURIED AND UNDERGROUND PIPING AND TANKS (June 18 NRC Draft)

Comment/Basis:

XI.M41 – 1 Program Description, Element 2 item b (Table 2b), Element 4 item c (Table 4b), and element 4 item e. (Table 4d) - Recommend deleting "underground" environment and associated sections in element 2 and element 4. "Underground" environment is defined as below grade, but contained within a tunnel or vault such that they are in contact with air and are located where access for inspection is restricted. Detection of aging effects for underground components exposed to air environments is managed by AMP XI.M36 External Surfaces Monitoring of Mechanical Components (see element 4) which requires that surfaces that are not readily visible during plant operations are inspected when they are made accessible and at such intervals that would ensure the components intended function is maintained. The external surfaces program is the appropriate program due to the relatively benign environment of air. XI.M41 is not appropriate since it is primarily directed at components in a soil environment and the corresponding inspections are overly restrictive and the preventive actions regarding coating, cathodic protection and backfill are not appropriate. Clarification to be added to XI.M36 that requires the identification of the underground components, their materials, coatings and inspection amount and frequencies to ensure intended functions are maintained. NOTE: Due to the changes required to incorporate this comment it is not shown in AMP markup

XI.M41 – 2 Program Description – 3rd paragraph:
Add XI.M30 Fuel Oil Chemistry to the list of AMPs that manage aging inside the pipe/tank.

XI.M41 - 3 Element 1
Recommend deleting the sentence identifying typical systems. The buried piping and tanks program manages aging of components in a soil environment. Identification of systems for this type of AMP is unnecessary and not consistent with other GALL AMPs. Also delete the sentence: "Any system may contain buried and underground piping and tanks" as it does not contribute to an understanding of the scope of the AMP and is redundant to the first sentence of the paragraph.

XI.M41 – 4 Element 1 – the last sentence states that aging of bolting associated with piping systems within the scope of this program is also managed by this program. However there are no line items for bolting that credit this AMP. Recommend adding steel bolting line items for loss of material (managed by Buried Piping and Tanks) and loss of preload (managed by Bolting Integrity AMP) in a soil environment in GALL Chapter VIII.H and VII.I, External Surfaces of Miscellaneous Components and Bolting.

XI.M41 – 5 Element 2 Table 2a and Element 4 Table 4a and associated notes – HDPE should be listed in Element 2 item a as a material that does not require aging management in a soil environment and be deleted from the tables and associated footnotes in Element 2 and Element 4.

Cracking can be caused by chemical aging. PE molecular chains may be broken down by temperature plus exposure to ozone, ultraviolet radiation, or oxidative chemicals. Carbon black is added to HDPE for protection from ultraviolet radiation. Ultraviolet radiation exposure is not an issue for buried HDPE pipe. Piping system design temperatures are well below the oxidation induction temperature requirement of 220C.

Slow crack growth is the predominant failure mode for HDPE. This failure mode is addressed by material testing required by ASTM D-3350, *Standard Specification for Polyethylene Plastics Pipe and Fittings Materials*. PENT Testing performed under ASTM D-3350 measures resistance of HDPE to slow crack growth and test results can be correlated to material service life. HDPE materials used in nuclear safety class applications are required to as a minimum meet ASTM classification 445574C. PENT testing for materials assures that slow crack growth is not a failure mode during the design life of the piping. Crack growth occurs at a very slow rate and this condition cannot be observed by field inspection.

HDPE does not absorb water according to Plastic Pipe Institute technical report PPI TR-19, *Chemical Resistance of Thermoplastic Piping Materials* based on testing performed at temperatures up to 140 degrees F. HDPE is not subject to water absorption and subsequent osmotic blistering that can occur with other polymeric materials. There is no color change in response to water absorption with HDPE.

XI.M41 – 6 Element 2 Table 2a footnote 2 and Table 2b footnote 2 – Revise footnote2 to reference Table 1 of NACE Standard Practice SP0169-2007. For consistency with Table 2b footnote2, also include the following sentence in Table 2a footnote2: "Other coatings may be used if justification is provided in the LRA."

XI.M41 – 7 Element 2 Table 2a footnote 4 – Revise this footnote to be consistent with the referenced NACE standards for operation and maintenance of the cathodic protection system and maintenance rule performance monitoring considerations. Specifically the effectiveness of the cathodic protection system should be monitored by:

- Inspection of applicable impressed current protection facilities to minimize in-service failures once per refueling cycle.
- Functional check of impressed current sources for evidence of proper functioning (e.g. current output, normal power consumption, or signal indicating normal power operation) once every two months.
- Evaluation, as applicable, of isolating fittings, continuity bonds, and casing isolation once per refueling cycle

XI.M41 – 8 Element 2 Table 2a footnote 6 - The size of particles in structural backfill and the potential coating impact varies and depends on the type of coating used and backfill/placement/compaction. Recommend deleting 49 CFR 195.252 (applicable to petroleum or anhydrous ammonia pipelines) and revising to allow structural backfill consistent with backfill and compaction methods that existed when the plants were constructed. Typical site specifications for structural backfill require backfill to be well graded, dense, and consisting of sound durable material capable of achieving the required degree of compaction. Typical

compaction characteristics such as those in ASTM D1557 apply to soils that have 30% or less by mass of their particles retained on a ¾ inch sieve. Typical structural backfill for opportunistic and directed inspections should have 30% or less of its particles retained on a ¾ inch sieve or demonstrate that the backfill material and placement/compaction methods will not result in exposure of piping metallic surfaces. Piping systems without backfill documentation or that cannot demonstrate backfill and associated placement/compaction will minimize expose of piping metallic surfaces shall be considered as candidates for inspection locations. Backfill installed after buried component inspections shall have the maximum aggregate size or other material within six inches of the pipe with 30% or less of its particles retained on a ¾ inch sieve. Backfill requirements do not apply to piping systems that are backfilled with a cementitious material (e.g. fillcrete) that provides a passivating layer.
NOTE: Due to the changes required to incorporate this comment it is not shown in AMP markup

XI.M41 – 9 Element 2 Table 2a footnote7 - The size of particles in structural backfill and the potential impact on polymer materials varies and depends on the type of material used for the piping system and the backfill/placement/compaction methods. Recommend adding an additional line on Table 2a for HDPE material to be consistent with Table 4a. Backfill requirements for other polymeric materials such as Fiberglass Reinforced Plastic (FRP) or similar thermoplastic materials should be consistent with revisions proposed to footnote 6.

XI.M41 – 10 Element 2 Table 2a and Table 2b and Element 4 Table 4a and Table 4b – Revise cement material to identify cementitious materials (asbestos cement, reinforced concrete, etc.)

XI.M41 – 11 Element 3 – Revise the last sentence to indicate that cathodic protection system parameters apply to steel, copper, or aluminum materials in a soil environment.

XI.M41 - 12 Element 4 item b.vi and item c.vi – This requirement should be deleted. Not crediting shared/common piping systems for multiple unit sites will penalize multiple unit sites with additional inspections that are not required by a single unit site. For example, 14,000 feet of buried FRP common fire protection piping (1% of length for other polymer piping) at a 3 unit site will require 420 feet of pipe to be inspected rather than 140 feet at a single unit site.

XI.M41 – 13 Element 4 item b.viii – Revise this requirement allow volumetric techniques that are accepted by the industry as qualified techniques for detection of degradation.

XI.M41 – 14 Element 4 – Item ix (new) – Retain the requirement from the prior draft that allows for the substitution of volumetric techniques from the inside of the piping in lieu of visual examinations. Volumetric exams provide a very accurate indication of piping condition and would allow detection of degradation in areas not excavated for visual exams. This will be consistent with the volumetric internal inspection instead of excavation for an external inspection of buried tanks.

XI.M41 – 15 Element 4 Table 4a and Table 4d – The percentage of linear length of piping required for inspection is excessive for ASME Code Class 3 pipe, hazardous material pipe, and other piping categories. Inspection of these pipe categories should be consistent with the industry Buried Pipe Initiative NEI 09-14. Direct or indirect inspection methods should be used and are based on providing reasonable assurance of the integrity of 100% of the high risk buried piping (where risk is determined by methods consistent with NEI 09-14). Minimum inspection quantities would apply if there is no high risk piping identified for a buried pipe material. NOTE: Due to the changes required to incorporate this comment it is not shown in AMP markup.

XI.M41 – 16 Element 4 – Table 4a footnote 2 – Numerical visual inspection requirements specified by Table 4a footnote 2 are overly prescriptive and do not consider:

- Sample requirements of element 4 item b.iii. will focus inspections on piping segments based on the susceptibility to degradation
- Graded approach to inspection locations based on the safety significance of ASME Code Class pipe or the environmental impacts of Hazardous Material Pipe.
- Other than the degradation susceptibility considerations noted in element 4 item b.iii, aging of a specific material of piping in a soil environment is not expected to yield different aging results.

Based on these considerations, recommend that the numerical visual inspection requirements of Table 4a footnote 2 be revised to:

- Specify minimum inspection requirements
- Substitute ASME Code Class Pipe or Hazardous Material Pipe inspections for Other Pipe category inspections

XI.M41 – 17 Element 4 – Table 4a footnote 3 and footnote 4 also Table 4b footnote 2 and footnote 3 – Clarify each footnote to define "radioactive" consistent with NEI 07-07 (Groundwater Protection Initiative). Treat radioactive systems with a tritium concentration of >20,000 pico-curies/liter as Hazardous Materials for purposes of the Buried Piping and Tanks AMP.

XI.M41 – 18 Element 4 – Table 4a footnote 6 – Revise operation and maintenance requirements of the cathodic protection system to be consistent with NACE SP 0169-2007 section 10. Federal requirements (40 CFR 280 Subpart C) for underground storage tanks (UST) also have similar requirements. Documentation may not be available to prove that the cathodic protection system has been operating 90% of the time since the pipe was originally installed even though the system has been adequately protecting the piping. Operation and maintenance performance of the cathodic protection system should be determined based on the recommend changes to Table 2a footnote4.

XI.M41 – 19 – Element 4 Table 4a footnote 6 – Replace the requirement for 90% operability since the pipe was originally installed or was visually inspected with a reference to the proposed revision to element 2 Table 2a footnote 4.

XI.M41 – 20 – Element 4 item c.iv. and Table 2b footnote 1 – Revise consistent with comment XI.M41 – 16. Also, volumetric inspection requirements, as applicable, for AMPs that manage internal environments should be used to manage aging of internal surfaces. Recommend revising Table 4b footnote 1 to require volumetric inspections to detect internal corrosion consistent with AMPs that manage aging of internal environments.

XI.M41 – 21 – Element 4 item d.v. and item e.iv. – If the tank is volumetrically inspected internally, the required number of inspection locations of the tank surface area should be limited to 22 rather than requiring 90% of the surface of the tank. Inspecting 22 locations will provide a 90/90 assurance level (reference NUREG 1475 Table T-8).

XI.M41 – 22 – Element 4 item f – This item is redundant to element 6 (acceptance criteria) and element 7 (corrective actions) and should be deleted after incorporation of applicable requirements. Recommend including each adverse finding as noted below:

- Item f.i. – Entering of cathodic protection system adverse indications into the corrective action program should be incorporated into element 6 item a. Through-wall leakage, wall thickness less than minimum, or degraded coating that exposes the piping material surface will require evaluation and sample size to be increased. This requirement should be included as element 6 item g. Repair or replacement corrective actions for through-wall leakage, wall thickness less than minimum, or coating degradation that exposes the piping material surface should be incorporated into element 7. Backfill requirements have been recommended to be covered by Table 2a footnote 6.
- Item f.ii – Include repair or replacement requirements in element 7 corrective actions. Through-wall leakage, wall thickness less than minimum, or coating degradation that exposes the piping material surface will require repair or replacement.
- Item f.iii. – Evaluation of the degradation and expansion of the sample size are recommended to be incorporated into element 6 item g.
- Item f.iv. - Evaluation of the degradation and expansion of the sample size are recommended to be incorporated into element 6 item g. Doubling of the sample size may not be possible in many cases and in some cases doubling may not be enough.

XI.M41 – 23 – Element 5 – The first sentence of element 5 requires trending to determine the condition of the coating system and the effectiveness of the cathodic protection system. Trending of visual inspection results to estimate remaining life is redundant to element 6 requirements to determine wall thickness in the affected area and determine if the minimum wall thickness will be maintained. Recommend deleting remaining life calculations since element 6 requires minimum wall evaluations.

XI.M41 – 24 – Element 6 item b. - Revise coating damage acceptance criteria to require repair of any coating damage that directly exposes the piping or tank to the soil environment. Requiring repair of any coating degradation is overly restrictive. Minor coating degradation can occur that does not cause aging effects that result in loss of intended function of the piping or tank.

XI.M41 – 25 – Element 6 item f – Backfill requirements are now specified in element 2. Recommend deleting item f from element 6 acceptance criteria since backfill requirements are site specific and depend on the type of coating used and backfill/placement/compaction.

XI.M41 – 26 – Element 10 – Operating experience associated with item d (rupture related to Tropical Storm Fay) is an event driven failure, is not age related, and should be deleted from the operating experience list. Item e (February 2009 CST leak), item g (diesel leak), and item h (June 2009) CST leak should be revised to identify the age related failure and its associated cause (e.g. coating degradation) or be deleted from the operating experience list. Corrective action descriptions add little value to the OE discussion. OE listed without identifying causes is also of questionable value.

XI.M41 BURIED AND UNDERGROUND PIPING AND TANKS (June 18 NRC Draft)

Program Description

This is a comprehensive program designed to manage the aging of the external surfaces of buried and underground piping and tanks. It addresses piping and tanks composed of any material, including metallic, polymeric and cementitious 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, corrosion resistant coatings, and the application of cathodic protection. 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, and visual inspections of the pipe or tank from the exterior as permitted by opportunistic or directed excavations.

Although this program considers the fluid inside the pipe or tank, and certain aspects of the program may be carried out from the inside of the pipe or tank, this program is designed to address only the degradation occurring on the outside of the pipe or tank. Aging of the inside of the pipe or tank is managed by another program (e.g. Open Cycle Cooling Water (AMP XI.M20), Treated Water (XIM.21A), Fuel Oil Chemistry (XI.M30) Internal Inspection of Miscellaneous Piping and Ducts XI.M~~XX~~38) or Water Chemistry (XI.M2). Additionally, this program does not address selective leaching. The selective leaching program (Chapter XI.M33) is applied in addition to this program for applicable materials and environments.

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. Underground piping is managed by the external surfaces monitoring of mechanical components program (Chapter XI. M36).

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 and cementitious materials. The program addresses aging effects such as loss of material, cracking, and changes in material properties. ~~Any system may contain buried and underground piping or tanks. Typical systems 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.~~ The aging of bolting associated with piping systems within the scope of this program is also managed by this program.

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

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

Material[1]	Coating[2]			Cathodic Protection[4]	Backfill		
	None Reqd.	May be Reqd.[3]	Reqd.		No Limit[5]	High Quality[6]	Fine[7]
Titanium	X				X		
Super Austenitic Stainless[9]	X				X		
Stainless Steel		X				X[8]	
Steel			X	X		X	
Copper			X	X		X	
Aluminum			X	X		X	
~~Cement~~ Cementitious		X				X[8]	
~~Polymer~~ HDPE	X						X
Other Polymer	X					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. Steel is as 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 RP0285-2002. Other coatings may be used if justification is provided in the LRA.

3. Requirement for coating depends on environmental conditions. If coatings are not provided, a justification is provided in the LRA

4. Operation and maintenance of the cathodic protection system is in accordance with NACE SP0169-2007 or RP0285-2002 and is based on:
   - Assessment of the cathodic protection system by a detailed (close-interval) potential survey

- Inspection of applicable impressed current protection facilities to minimize in-service failures once per refueling cycle.
- Functional check of impressed current sources for evidence of proper functioning (e.g. current output, normal power consumption, or signal indicating normal power operation) once every two months.
- Evaluation, as applicable, of isolating fittings, continuity bonds, and casing isolation once per refueling cycle

Attempts to demonstrate that cathodic protection is not required as discussed in Sections 1.2 and 3 of SP0169-2007 will not be considered.

5. No limits are placed on backfill quality

6. ~~Backfill is consistent with 49 CFR 195.252. Maximum size of aggregate or other material within 6 inches of pipe is ½ inch in diameter or less.~~ Typical structural backfill should have 30% or less of its particles retained on a ¾ inch sieve or demonstrate that the backfill material and placement/compaction methods will not result in exposure of piping metallic surfaces. Piping systems without backfill documentation or that cannot demonstrate backfill and associated placement/compaction will minimize exposure of piping metallic surfaces shall be included as candidates for inspection locations. Backfill installed after buried component inspections shall have the maximum aggregate size or other material within six inches of the pipe is based on 30% or less of its particles retained on a ¾ inch sieve. Backfill requirements do not apply to piping systems that are backfilled with a cementitious material (e.g. fillcrete) that provides a passivating layer.

7. Particle size for backfill within 6 inches of the pipe must not exceed that of sand grains

8. Backfill limits apply only if piping is coated.

9. e.g. Al6XN or 254 SMO

b. Preventive Actions, Underground Piping and Tanks
(NOTE comment XI.M41 – 1 requests deletion of this section)

   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[2]		
	None Reqd.	May be Reqd.[3]	Reqd.
Titanium	X		
Super Austenitic Stainless[4]	X		
Stainless Steel		X	
Steel			X

Copper	X		
Aluminum		X	
~~Cement~~ Cementitious			
Polymer	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. Steel is as 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 RP0285-2002. ~~A broader range of~~Other coatings may be used if justification is provided in the LRA.

3. Requirement for coating depends on environmental conditions. If coatings are not provided, a justification is provided in the LRA

4. e.g. Al6XN or 254 SMO

3. ***Parameters Monitored/Inspected:*** The aging effects addressed by this AMP are loss of material due to all forms of corrosion and, potentially, cracking due to stress corrosion cracking. Two parameters are monitored to detect and manage these aging effects: visual appearance of the exterior of the piping or tank; and wall thickness of the piping or tank, generally as determined by a non-destructive examination technique such as ultrasonic testing (UT). Two additional parameters, the pipe-to-soil potential and the cathodic protection current, are monitored to determine the effectiveness of cathodic protection systems and, thereby, the effectiveness of corrosion mitigation for steel, copper or aluminum materials in a soil environment.

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.

   a. Opportunistic Inspections

      i. All buried and underground piping and tanks, regardless of their material of construction are opportunistically inspected by visual means whenever they 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

ii. 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.

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

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

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

~~vi. At multi-unit sites, individual inspections of shared piping may not be credited for more than one unit.~~

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

viii. The use of guided wave ultrasonics 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 those inspections until such time that these techniques are improved and accepted by the industry as qualified techniques for detection of degradation..

ix. Direct, volumetric, (e.g. ultrasonic) examination of the wall thickness of piping conducted from the inside of the pipe may be substituted for the excavations and visual examinations described above.

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

Material	CP Survey[1]	Visual Inspections[2]			Minimum Inspections[5]
		ASME Code Class Pipe	Haz Mat Pipe[3]	Other Pipe[4]	
Titanium					
Super Austenitic Stainless[10]					
Stainless Steel		~~2%~~ N/A[2]	~~2%~~ N/A[2]	~~1%~~ N/A[2]	1
Steel	X	10%[6]	5%[6]	1%[6]	2
Copper	X	2%[6]	2%[6]	1%[6]	1
Aluminum	X	5%[6]	2%[6]	1%[6]	1
~~Cement~~		N/A[7]	N/A[7]	~~1%~~ N/A[2]	1

Cementitious					
HDPE[8]		1%[11]	1%[11]		1
Other Polymer[9]		~~2%~~ N/A[2]	~~2%~~ N/A[2]	~~1%~~ N/A[2]	1

1. Cathodic protection survey in accordance with NACE SP0169-2007

2. Numerical values under the visual inspection heading indicate the percentage in linear feet of piping of the category indicated which is to be either excavated and visually inspected or examined using other NDE techniques that can detect wall loss due to corrosion such as internal volumetric inspections. Minimum inspection requirements apply to each visual inspection heading (i.e. ASME Code Class, Hazardous Material Pipe, and Other Pipe). If visual inspections are performed for ASME Code Class Pipe or Hazardous Material Pipe categories , then visual inspections for the Other Pipe category are not required. ~~i.e.~~For example, if ~~stainless~~ steel piping is present in each of the three categories of piping, a minimum of ~~3~~ 4 excavations are required, ~~one~~ two ~~for each piping category~~ or more excavations are conducted to inspect at least 10% the ASME Code Class Pipe category and two or more excavations to inspect at least 5% of the Hazardous Material Pipe category. ~~One or more excavations are conducted to inspect at least 2% of the code class piping; one or more excavations are conducted to inspect at least 2% of the Haz Mat piping; and one or more excavations are conducted to inspect at least 1% of the "other" piping.~~ ~~**Alternatively**, the entire length of stainless steel piping present in all three piping categories may be considered to be code class piping and inspected accordingly, i.e., one or more excavations are conducted to inspect at least 2% of the total length of stainless steel piping present.~~

3. Haz Mat pipe is pipe within the scope of license renewal which, during normal operation, contains radioactive water ~~contaminated with radioisotopes at levels greater than background~~ or fluids other than water which, if released, would be detrimental to the environment e.g., diesel fuel. Radioactive is defined consistent with NEI 07-07 (Groundwater Protection Initiative).

4. Other pipe is pipe which is not code class pipe and ~~which, during normal operations, contains only water which is not contaminated with radioisotopes at levels in excess of background.~~ does not contain hazardous materials as noted in footnote 3 e.g. fire water or domestic water piping.

5. Minimum inspections identify the minimum number of separate excavations which are required for each piping material. The minimum length for each excavation is 10 feet

6. Inspection of the prescribed length of piping may be eliminated when the installed cathodic protection system has been ~~operating in accordance with NACE SP0169-2007 for 90% of the time since the pipe was originally installed or was visually inspected~~ operated and maintained consistent with Table 2a footnote 4. The

prescribed minimum number of visual inspections must still be met. Visual inspection as used here means visually inspecting a length of pipe equal to the amount indicated in the table, i.e., in order to eliminate the requirement to inspect 10% of buried steel code class piping, the installed cathodic protections system must have ~~operated 90% of the time since that piping was installed or since 10% of it was visually inspected~~ operated and maintained consistent with Table 2a footnote 4.

7. The use of ~~cement~~ cementitious piping in ASME code class and Haz Mat applications is not expected. If ~~cement~~ cementitious piping is used in these applications an inspection program is to be provided and justified in the LRA

8. 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

10. e.g. Al6XN or 254 SMO

11. Refers to the percentage of welds (not linear length of pipe) which must be inspected. These inspections may be omitted if the pipe was volumetrically inspected when installed and no indications were noted and if the operating temperature of the pipe does not exceed 100° F

c. Directed Inspections – Underground Pipe

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

   ii. 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

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

   iv. Underground pipes are inspected visually to detect external corrosion. ~~and by UT to detect internal corrosion.~~

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

   ~~vi. At multi-unit sites, individual inspections of shared piping may not be credited for more than one unit.~~

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

viii. The use of guided wave ultrasonics 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 those inspections.

Table 4b, Inspections of **Underground Pipe**
(NOTE comment XI.M41 – 1 requests deletion of this section)

Material	Visual and UT Inspections[1]			Minimum Inspections[4]
	ASME Code Class Pipe	Haz Mat Pipe[2]	Other Pipe[3]	
Titanium				
Super Austenitic Stainless[7]				
Stainless Steel	2%	2%	1%	1
Steel	10%	5%	1%	2
Copper	2%	2%	1%	1
Aluminum	5%	2%	1%	1
~~Cement~~ Cementitious	N/A[5]	N/A[5]	NA[5]	1
Polymer[6]	2%	2%	1%	1

1. Numerical values under the visual inspection heading indicate the percentage in linear feet of piping of the category indicated which is to be inspected using visual and ultrasonic techniques. Minimum inspection requirements apply to each visual inspection heading (i.e. ASME Code Class, Hazardous Material Pipe, and Other Pipe). If visual inspections are performed for ASME Code Class Pipe or Hazardous Material Pipe categories , then visual inspections for the Other Pipe category are not required. ~~i.e.~~For example, if ~~stainless~~ steel piping is present in each of the three categories of piping a minimum of ~~3~~ 4 inspections are conducted, ~~one~~ two ~~for each piping category~~ or more excavations are conducted to inspect at least 10% the ASME Code Class Pipe category and two or more excavations to inspect at least 5% of the Hazardous Material Pipe category.one for each piping category. ~~One or more inspections are conducted to inspect at least 2% of the code class piping; one or more inspections are conducted to inspect at least 2% of the Haz Mat piping; and one or more inspections are conducted to inspect at least 1% of the "other" piping. **Alternatively**, the entire length of stainless steel piping present in all three piping categories may be considered to be code class piping and inspected accordingly, i.e., one or more inspections are conducted to inspect at least 2% of the total length of stainless steel piping present.~~ All piping which is visually inspected to detect external

corrosion is ~~ultrasonically~~ volumetrically inspected ~~to detect internal corrosion~~ consistent with the AMP for the internal environment or if surface degradation indicates the potential for minimum wall degradation. ~~UT inspection intervals will not exceed one foot. Particular attention is paid to elbows and the adjacent piping.~~

2. Haz Mat pipe is pipe within the scope of license renewal which, during normal operation, contains radioactive water ~~contaminated with radioisotopes at levels greater than background~~ or fluids other than water which, if released, would be detrimental to the environment e.g., diesel fuel. Radioactive is defined consistent with NEI 07-07 (Groundwater Protection Initiative).

3. Other pipe is pipe which is not code class pipe and ~~which, during normal operations, contains only water which is not contaminated with radioisotopes at levels in excess of background.~~ does not contain hazardous materials as noted in footnote 2 e.g. fire water or domestic water piping.

4. Minimum inspections identify the minimum number of separate inspection locations which are required for each piping material. The minimum length for each inspection is 10 feet

5. The use of cement piping in ASME code class and Haz Mat applications is not expected. If cement piping is used in these applications an inspection program is to be provided and justified in the LRA

6. All polymeric materials including composite materials such as fiberglass. No distinction is drawn for underground piping between high density polyethylene approved for use by the NRC in buried applications and other polymeric piping materials.

7. e.g. Al6XN or 254 SMO

d. Directed Inspections – Buried Tanks

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

   iii. Each buried tank constructed from a material for which an examination requirement is contained in Table 4c is examined

   iv. Cathodic protection surveys are in accordance with NACE RP0285-2002

v. 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~~ examinations are performed using qualified volumetric methods, preferably ultrasonic, for the portion of the tank in contact with the soil environment. When internal volumetric tank examinations are conducted, one thickness measurement per square foot of tank surface for tanks with up to 22 square feet of surface area is perfroemed. For tanks with greater than 22 square feet of surface area, the tank should be subdivided into a minimum of 22 equal surface areas and one thickness measurement should be made of each subdivided area.

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

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

viii. Opportunistic examinations may be credited toward these direct examinations

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

Material	CP Survey	Visual/Volumetric Inspection
Titanium		
Super Austenitic Stainless[3]		
Stainless Steel		X
Steel	X	X
Copper	X	X
Aluminum	X	X
Polymers[1, 2]		X

1. All polymeric materials including composite materials such as fiberglass. No distinction is drawn for underground piping between high density polyethylene approved for use by the NRC in buried applications and other polymeric piping materials.

2. Volumetric Inspection not required for polymeric materials

3. e.g. Al6XN or 254 SMO

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 constructed from a material for which an examination requirement is contained 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~~ <u>examinations are performed using qualified volumetric methods, preferably ultrasonic, for the portion of the tank in contact with the soil environment. When internal volumetric tank examinations are conducted, one thickness measurement per square foot of tank surface for tanks with up to 22 square feet of surface area is performed. For tanks with greater than 22 square feet of surface area, the tank should be subdivided into a minimum of 22 equal surface areas and one thickness measurement should be made of each subdivided area.</u>

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**
(NOTE comment XI.M41 – 1 requests deletion of this section)

Material	Visual/Volumetric Inspection

Titanium	
Super Austenitic Stainless[3]	
Stainless Steel	X
Steel	X
Copper	X
Aluminum	X
Polymers[1, 2]	X

1. All polymeric materials including composite materials such as fiberglass. No distinction is drawn for underground piping between high density polyethylene approved for use by the NRC in buried applications and other polymeric piping materials.

2. Volumetric Inspection not required for polymeric materials

3. e.g. Al6XN or 254 SMO

~~f. Adverse findings~~

~~i. Adverse indications observed during monitoring of cathodic protection systems or during inspections are entered into the plant corrective action program. Adverse indications will result in an expansion of sample size. At a minimum, leaks, material thickness less than minimum, the presence of coarse backfill within 6 inches of a coated pipe or tank (see Table 2A Footnote 6), and general or local degradation of coatings so as to expose the base material are considered adverse indications.~~

~~ii Adverse indications which fail to meet the acceptance criteria described in element 6 below, 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, sample sizes within the affected piping categories are doubled. If adverse indications are found in the expanded sample, the sample size is again doubled. This doubling of 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. ~~Numerical measurements obtained from any inspections are trended to monitor corrosion rates and estimate the remaining life of piping and tanks.~~

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

   a. Criteria for soil-to-pipe potential are listed in NACE Standards RP0285-2002 and SP0169-2007. Adverse indications are entered into the corrective action program.

   b. ~~For coated piping or tanks, there should be no evidence of coating degradation.~~ If coating degradation is observed that directly exposes the piping or tank to the environment, the coating shall be repaired. An evaluation is conducted to determine the cause of coating degradation and whether additional inspections are needed.

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

   ~~f. Backfill is in accordance with specifications described in element 4 (above) of this AMP.~~

   g. Through wall leakage, wall thickness less than minimum, or degraded coating that exposes the piping material surface requires evaluation and expansion of the sample size. Expansion of the sample size may be limited by the extent of piping or tanks subject to the observed degradation.

7. ***Corrective Actions:*** Through wall leakage, wall thickness less than minimum, or degraded coating that exposes the piping material surface requires repair or replacement. 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.

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 modify its aging management program accordingly. The following industry experience may be of significance to an applicant's program:

    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. This led to an NRC special inspection in February 2008. The Institute of Nuclear Power Operations issued a significant operating event report discussing the degradation of the essential service water piping and concluded the degradation was caused by exposure to extreme conditions (including being buried).

    ~~d. On August 19, 2008, a flexible PVC pipe ruptured in the service water system. The rupture was related to Tropical Storm Fay, which washed away the soil where the piping was buried and washed additional soil away beneath the piping. This caused the PVC piping to sag and break free at the connecting joints. This section of piping was repaired.~~

    e. In February 2009, a leak was discovered on the return line to a CST

    f. 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.

    g. In May 2009, diesel/fuel oil odor was identified in the ground water near the diesel generator building. The area was excavated to find the source of the leak.

h. In June 2009, an active leak was discovered in underground piping associated with a condensate storage tank (CST). The leak was discovered because elevated levels of tritium were detected. There were similar leaks in buried piping in 2004 and 2006, and those sections of piping were replaced.

References

10 CFR Part 50, Appendix B, *Quality Assurance Criteria for Nuclear Power Plants*, Office of the Federal Register, National Archives and Records Administration, 2009.

NACE Standard SP0169-2007, *Control of External Corrosion on Underground or Submerged Metallic Piping Systems*, 2007.

NACE Standard RP0285-2002, *Standard Recommended Practice Corrosion Control of Underground Storage Tank Systems by Cathodic Protection,* revised April 2002.

NEI comments on GALL Mechanical Sections of NUREG 1801 (GALL) & NUREG 1800 (SRP), Rev. 2			
#	Document, Page #, Section #	Recommended changes (Deletions - ~~Strikethrough~~, Additions – <u>Underline</u>)	Justifications
1	GALL	The AMR tables inconsistently refer to XI.M2 as: • Chapter XI.M2, "Water Chemistry" • Chapter XI.M2, "Water Chemistry" for BWR water • Chapter XI.M2, "Water Chemistry" for PWR primary water • Chapter XI.M2, "Water Chemistry" for PWR secondary water Revise the AMR tables to simply refer to Chapter XI.M2, "Water Chemistry."	AMP XI.M2 applies to all the environments for which a qualifier was added. Therefore, the qualifier is redundant.
2	GALL	The AMR Tables inconsistently add Chapter XI.M32, "One-Time Inspection" to the Chapter XI.M2, "Water Chemistry" AMP. For example, see page V.A-5, Items V.A.EP-41 and V.A.E-12 and page VIII.A-3, items VIII.A.SP-44, VIII.A.SP-46, and VIII.A.SP-43 Revise the AMR tables to consistently apply the grouped programs.	See AMP combination throughout the GALL.
3	GALL, IV.A1-6, IV.A1.RP-227	~~Yes, plant specific or integrated surveillance program~~, <u>No</u>	The use of an AMP consistent with GALL should not require further evaluation.
4	GALL, IV.A2-5, IV.A2.RP-228	~~Yes, plant specific or integrated surveillance program~~, <u>No</u>	The use of an AMP consistent with GALL should not require further evaluation.
5	GALL, IV.A2-8, IV.A2.RP-229	~~Yes, plant specific or integrated surveillance program~~, <u>No</u>	The use of an AMP consistent with GALL should not require further evaluation.
6	GALL, IV.B2-40, IV.B2.RP-301	Delete reference to "no expansion components"	In MRP-227 there are no expansion components associated with existing program components. This is a generic comment for other "existing program component" AMR lines that reference "no expansion components".
7	GALL Section IV.B2	Revise AMR lines that reference AMP XI.M16 based on the aging effects identified by MRP-227 Table 3-3 and the management of relevant mechanisms by MRP-227 Table 4-3 (primary components), MRP-227 Table 4-6 (expansion components), and MRP-227 Table 4-9 (existing program components).	Consistency of AMR lines with MRP-227 Table 4-3 (primary components), MRP-227 Table 4-6 (expansion components), and MRP-227 Table 4-9 (existing program components).
8	GALL, IV.B2-11, IV.B2.RP-268	This AMR line is not required and should be deleted. "Reactor vessel internal components (inaccessible locations)" are and should be handled programmatically by the Chapter XI.M16A, "PWR Vessel Internals" AMP.	The NRC staff review of MRP-227 should address this issue and provide guidance in the SE that is to be issued.

<table>
<tr><th colspan="4">NEI comments on GALL Mechanical Sections of NUREG 1801 (GALL) & NUREG 1800 (SRP), Rev. 2</th></tr>
<tr><th>#</th><th>Document, Page #, Section #</th><th>Recommended changes (Deletions - <s>Strikethrough</s>, Additions – <u>Underline</u>)</th><th>Justifications</th></tr>
<tr><td>9</td><td>GALL, IV.B2-12, IV.B2.RP-269</td><td>This AMR line is not required and should be deleted. “Reactor vessel internal components (inaccessible locations)” are and should be handled programmatically by the Chapter XI.M16A, “PWR Vessel Internals” AMP.</td><td>The NRC staff review of MRP-227 should address this issue and provide guidance in the SE that is to be issued.</td></tr>
<tr><td>10</td><td>GALL, IV.B3-15, IV.B3.RP-309</td><td>This AMR line is not required and should be deleted. “Reactor vessel internal components (inaccessible locations)” are and should be handled programmatically by the Chapter XI.M16A, “PWR Vessel Internals” AMP.</td><td>The NRC staff review of MRP-227 should address this issue and provide guidance in the SE that is to be issued.</td></tr>
<tr><td>11</td><td>GALL, IV.B3-16, IV.B3.RP-311</td><td>This AMR line is not required and should be deleted. “Reactor vessel internal components (inaccessible locations)” are and should be handled programmatically by the Chapter XI.M16A, “PWR Vessel Internals” AMP.</td><td>The NRC staff review of MRP-227 should address this issue and provide guidance in the SE that is to be issued.</td></tr>
<tr><td>12</td><td>GALL, IV.B4-11, IV.B4.RP-238</td><td>This AMR line is not required and should be deleted. “Reactor vessel internal components (inaccessible locations)” are and should be handled programmatically by the Chapter XI.M16A, “PWR Vessel Internals” AMP.</td><td>The NRC staff review of MRP-227 should address this issue and provide guidance in the SE that is to be issued.</td></tr>
<tr><td>13</td><td>GALL, IV.B4-12, IV.B4.RP-239</td><td>This AMR line is not required and should be deleted. “Reactor vessel internal components (inaccessible locations)” are and should be handled programmatically by the Chapter XI.M16A, “PWR Vessel Internals” AMP.</td><td>The NRC staff review of MRP-227 should address this issue and provide guidance in the SE that is to be issued.</td></tr>
<tr><td>14</td><td>GALL, IV.C1-3, IV.C1.RP-43</td><td>The environment should be “Air <u>with reactor coolant leakage</u>.”</td><td>See AMR line IV.C1.RP-42 on page IV.C1-3 directly beneath.</td></tr>
<tr><td>15</td><td>GALL, IV.C2-7, IV.C1.RP-231</td><td>Add a new AMR line for “Pressurizer relief tank: tank shell and heads; flanges; nozzles” that are outside of ASME Section XI ISI boundaries. It is suggested that the AMPs used be Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection.”
<table><tr><td>IV.C2.RP-XXX</td><td></td><td>Pressurizer relief tank: tank shell and heads; flanges; nozzles</td><td>Stainless steel; steel with stainless steel cladding</td><td>Treated borated water >60°C (>140°F)</td><td>Cracking due to stress corrosion cracking</td><td>Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection</td><td>No</td></tr></table></td><td>The pressurizer spray head is also a non-ASME Section XI component that is managed by the same AMPs (see page IV.C2-8, AMR line IV.C2.RP-41) for the same aging effect.</td></tr>
<tr><td>16</td><td>GALL, IV.D1-3, IV.D1.RP-367</td><td>The AMR line is missing the plant-specific AMP referenced in SRP Section 3.1.2.2.11. Revise the AMP to Chapter XI.M2, “Water Chemistry” <u>and plant-specific aging management program to address SG divider plate cracking</u>.</td><td>The AMR line is inconsistent with the SRP requirement in Section 3.1.2.2.11.</td></tr>
<tr><td>17</td><td>GALL, IV.D1-7, IV.D1.R-44</td><td>The AMPs refer to “secondary water” when the environment is “Reactor coolant.” This is considered to be a typographical error. However, it should be coordinated with Comment 1.</td><td>Editorial.</td></tr>
</table>

<table>
<tr><th colspan="4">NEI comments on GALL Mechanical Sections of NUREG 1801 (GALL) & NUREG 1800 (SRP), Rev. 2</th></tr>
<tr><th>#</th><th>Document, Page #, Section #</th><th>Recommended changes (Deletions - <s>Strikethrough</s>, Additions – Underline)</th><th>Justifications</th></tr>
<tr><td>18</td><td>GALL, IV.D1-8, IV.D1.RP-XXX</td><td>This line is a duplicate of IV.D1.RP-372 on page IV.D1-3.</td><td>See Item IV.D1.RP-372 on page IV.D1-3.</td></tr>
<tr><td>19</td><td>GALL, V B-3, V.B.EP-103</td><td><s>Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for ASME Code components or </s>Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components" for non-ASME Code components</td><td>There is a lack of operating experience to support aging effects associated with the described material-environment and ISI is not adequate to manage component external surfaces. This is a generic comment applicable to Chapters VII and VIII.</td></tr>
<tr><td>20</td><td>GALL, V B-3, V.B.EP-107</td><td><s>Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for ASME Code components or </s>Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components" for non-ASME Code components</td><td>There is a lack of operating experience to support aging effects associated with the described material-environment and ISI is not adequate to manage component external surfaces. This is a generic comment applicable to Chapters VII and VIII.</td></tr>
<tr><td>21</td><td>GALL, V B-3, V.B.EP-103 and V.B.EP-107</td><td>A new AMR line item is needed for the situation where the evaluated environmental conditions (as addressed in the corresponding SRP sections) have been determined to be benign to stainless steel.
<table><tr><td>V.B.EP-XXX</td><td></td><td>Piping, piping components, and piping elements; tanks</td><td>Stainless steel</td><td>Air – outdoor</td><td>None</td><td>None</td><td>Yes, environmental conditions need to be evaluated</td></tr></table></td><td>If the evaluation performed to address FER 3.2.2.2.6 determines that the conditions described are not applicable then a corresponding AMR line is required. This is a generic comment applicable to Chapters VII and VIII</td></tr>
<tr><td>22</td><td>GALL, V B-9 (E-42), V.B.EP111</td><td>Revise the material to be consistent with GALL Rev.1
Steel (with or without coating or wrapping)</td><td>AMP XI.M41 manages loss of material fro steel piping with or without coatings/wrappings. This is a generic comment applicable to Chapters VII and VIII</td></tr>
<tr><td>23</td><td>GALL, VII.A2-3(A-89), VII.A2.AP-236</td><td>Include other neutron absorbing materials.
Materials: Boral, boron steel, carborondum, metamic</td><td>Inclusion of other neutron absorbing materials is consistent with LR-ISG-2009-01 and AMP XI.M40</td></tr>
<tr><td>24</td><td>GALL, VII.A2-5(A-88), VII.A2.AP-235</td><td>Include other neutron absorbing materials.
Materials: Boral, boron steel, carborondum, metamic</td><td>Inclusion of other neutron absorbing materials is consistent with LR-ISG-2009-01 and AMP XI.M40</td></tr>
<tr><td>25</td><td>GALL, VII.C1.AAP-178</td><td>In addition to concrete and concrete cylinder piping, need to add a MEAP for asbestos cement piping. See new MEAP comments</td><td>See new MEAP comments</td></tr>
</table>

NEI comments on GALL Mechanical Sections of NUREG 1801 (GALL) & NUREG 1800 (SRP), Rev. 2			
#	Document, Page #, Section #	Recommended changes (Deletions - ~~Strikethrough~~, Additions – <u>Underline</u>)	Justifications
26	GALL, VII.C1.AP-176	A new GALL line is needed to address cracking of fiberglass piping in a raw water environment that is managed by AMP XI.M38 Internal Surfaces	Complimentary MEAP for Open cycle cooling water fiberglass piping in a soil environment.
27	GALL, VII.C1.AP-175	A new GALL line is needed to address cracking of HDPE piping in a raw water environment that is managed by AMP XI.M38 Internal Surfaces	Complimentary MEAP for Open cycle cooling water HDPE piping in a soil environment.
28	GALL, VII.C1.AP-174	Revise the material to read copper alloy to be consistent with other copper alloy lines: Material: copper <u>alloy</u>	Revise the material to read copper alloy to be consistent with other copper alloy lines.
29	GALL, VII.D	A new GALL line is needed to address loss of material due to general, pitting, and crevice corrosion for copper alloy piping/tubing in a condensation environment that is managed by XI.M24 Compressed Air Monitoring	A new GALL line is needed to address copper alloy piping/tubing in compressed air systems
30	GALL, VII.F1-5 (A-73), VII.F1.AP-113	The AMP for this GALL line should be XI.M36 External Surfaces AMP to agree with the material environment combination being managed: that is air-indoor, uncontrolled (external)	AMP XI.M38 (internal surfaces) is inconsistent with the environment managed (external surfaces). This is a generic comment for Sections V, VII, and VIII when an external environment is specified to be managed by AMP XI.M38 Internal Surfaces AMP.
31	GALL, F1-7 (A-17), VII.F1.AP-102	The AMP for this GALL line should be XI.M36 External Surfaces AMP to agree with the material environment combination being managed: that is air-indoor, uncontrolled (internal/external)	AMP XI.M38 (internal surfaces) is inconsistent with the environment managed (external surfaces). This is a generic comment for Sections V, VII, and VIII when an internal/external environment is specified to be managed. AMP XI.M36 (External Surfaces AMP) can manage the external <u>and</u> external surfaces (see element 1).
32	GALL, F1.AP-14 (AP-74), VII.F1.AP-142	Add (internal) to the environment for this GALL line to agree with the AMP XI.M38 (Internal Surfaces AMP): Condensation <u>(internal)</u>	Add (internal) to the environment for this GALL line to agree with the AMP XI.M38 (Internal Surfaces AMP). This is a generic comment for Sections V, VII, and VIII when an condensation environment is specified to be managed by AMP XI.M38 Internal Surfaces AMP. See GALL VII.F1.A-08 for consistency.

NEI comments on GALL Mechanical Sections of NUREG 1801 (GALL) & NUREG 1800 (SRP), Rev. 2			
#	Document, Page #, Section #	Recommended changes (Deletions - ~~Strikethrough~~, Additions – Underline)	Justifications
33	GALL, VIII.E-1 (S-01), VIII.E-S-01	Delete "buried" from the component name. ~~Buried~~ piping, piping components, piping elements, tanks	Delete buried to be consistent with the other Structure/Component names for piping components in a soil environment.
34	GALL VIII.I.SP-67	Line GALL VIII.I.SP-67 duplicates line VIII.I.SP-105. Delete one of the lines	Editorial correction
35	GALL VIII.I.SP-69	Line GALL VIII.I.SP-69 duplicates line VIII.I.SP-112	Editorial correction
36	GALL IX Definitions Struc. & Comp. Piping	Revise this definition consistent with the resolution of the scope of the buried components AMP. Recommend deleting the buried component definition as it describes an environmental condition. Also recommend deleting limited-access and below grade components consistent with the AMP M41 scope definition – the environment for these components will be "air - indoor".	Revise this definition consistent with the resolution of the scope of the buried components AMP.
37	GALL IX Definitions Materials Born, Boron steel	Expand this definition to include other neutron absorbers (metamic & carborondum steel)	Consistency with LR-ISG-2009-01
38	GALL IX Definitions Environments Treated Water	Based on GALL Rev 2 AMR line usage, the second part of the treated water definition will apply primary or secondary chemistry controls to HVAC systems, aux boiler, or diesel cooling systems that are currently managed by closed cycle cooling water programs. For PWR Auxiliary Systems and Steam and Power Conversion Systems, either expand the treated water AMR lines which are managed by AMP XI.M21 (Treated Water AMP) or create a secondary water (condensate/feedwater) environment and associated PWR AMR lines that rely on secondary water chemistry.	Resolve inconsistent usage of PWR secondary water AMP XI.M2 for Auxiliary Systems (HVAC systems, Aux boilers, diesel cooling). Depending on the resolution create additional GALL AMR lines for treated water rather than closed cycle environments for systems with demineralized water and demineralized water with corrosion inhibitors.
39	SRP, 3.1-3, 3.1.2.2.3	Based on Comments 3, 4, and 5 this section should be eliminated.	The use of an AMP consistent with GALL should not require further evaluation.
40	SRP, 3.1-5, 3.1.2.2.9	Based on Comments 6, 8, and 10, this section should be eliminated.	The NRC staff review of MRP-227 should address this issue and provide guidance in the SE that is to be issued.
41	SRP, 3.1-5, 3.1.2.2.10	Based on Comments 7, 9, and 11, this section should be eliminated.	The NRC staff review of MRP-227 should address this issue and provide guidance in the SE that is to be issued.

#	Document, Page #, Section #	Recommended changes (Deletions - ~~Strikethrough~~, Additions – Underline)	Justifications
42	SRP, 3.1-11, 3.1.3.2.9	Delete this section.	There are no FER items that refer to this section. It is a duplicate of Section 3.1.2.2.9.
43	SRP, 3.1-5, 3.1.3.2.10	Delete this section.	There are no FER items that refer to this section. It is a duplicate of Section 3.1.2.2.10.
44	SRP, 3.1-21, ID 14	See Comments 3, 4, 5, and 21. ~~Yes, plant-specific (See subsection 3.1.2.2.3.2)~~, No	The use of an AMP consistent with GALL should not require further evaluation.
45	SRP, 3.1-25, ID 69	See Comment 13. To accommodate the "Pressurizer relief tank: tank shell and heads; flanges; nozzles" managed by "Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection," add "IV.C2.RP-XXX" to the Rev2 Item Column.	The pressurizer spray head is also a non-ASME Section XI component that is managed by the same AMPs (see page IV.C2-8, AMR line IV.C2.RP-41) for the same aging effect .
46	SRP, 3.2-7, 3.2.3.2.6	Delete this section.	There are no FER items that refer to this section. It is a duplicate of Section 3.2.2.2.6.
47	SRP, 3.2-12, ID 7	See Comments 18, 19, and 20. Revise the roll up line as follows: (see table below)	There is a lack of operating experience to support aging effects associated with the described material-environment and ISI is not adequate to manage component external surfaces. This is a generic comment applicable to Chapters VII and VIII. If the evaluation performed to address FER 3.2.2.2.6 determines that the conditions described are not applicable then a corresponding AMR line is required.

7	BWR/PWR	Stainless steel Piping, piping components, and piping elements; tanks exposed to Air – outdoor	Cracking due to stress corrosion cracking or None	~~Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for ASME Code components or~~ Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components" for non-ASME Code components or None	Yes, environmental conditions need to be evaluated (See subsection 3.2.2.2.6)	V.B.EP-103 V.C.EP-103 V.D1.EP-103 V.D2.EP-103 V.B.EP-XXX	N/A N/A N/A N/A N/A

New AMR Line-items based on new 'MEAP' combinations:

- Aluminum/concrete/none/none
- Aluminum/closed cycle-cooling water/loss of material/XI.M21A
- Aluminum/air-outdoor/loss of material/XI.M36
- Aluminum/treated water/loss of material/ XI.M2 and XI.M32
- Asbestos cement, reinforced concrete/raw water/cracking, loss of material, changes in material properties/XI.M20
- Asbestos cement, reinforced concrete/air-indoor/ cracking, loss of material, changes in material properties/XI.M36
- Asbestos cement, reinforced concrete/soil/ cracking, loss of material, changes in material properties/XI.M36
- Bolting Preload/various materials/various environments/loss of preload/XI.M18
- Copper alloy, stainless steel, steel/potable water/loss of material/XI.M38
- Elastomers/closed cycle cooling water/hardening and loss of strength/XI.M38
- HDPE/soil - buried/none/none
- Nickel Alloys/air with borated water leakage/none/none
- PVC/air-indoor uncontrolled or condensation/none/none
- Waste Water environments – see attached Waste Water Systems Sections

New AMR Line-items based on new 'MEAP' combinations relevant to Mechanical Systems ("IV" for Reactor Coolant, "V" for Engineered Safety Features, "VII" for Auxiliary, and "VIII" for Steam and Power Conversion)						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Precedent and Technical Basis for New Line-Item**
VII.K-x	Piping, piping components, and piping elements	Copper alloy, stainless steel, steel	Potable water	Loss of material/ general (steel only), pitting, and crevice corrosion	Chapter XI.M38, "inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Potable water is water treated for drinking or other personnel uses. This additional AMR line-item is created to consider the aging of steel, stainless steel or copper alloy piping components in a potable water environment. Aging of stainless steel or copper alloy in a potable water environment is consistent with aging in other treated water environments such as demineralized water. The aging effect is also consistent with several recent industry precedents for aging of stainless steel or copper alloys in a potable water environment. AMP XI.M38 was developed to provide for proper management of the aging effects for this MEAP combination. This program provides an acceptable means of managing aging of these components. The implementation of this program provides reasonable assurance that the component's intended functions will be maintained within the CLB for the period of extended operation.
VII.C1-x	Piping, piping components, and piping elements	Asbestos cement, reinforced concrete,	Raw Water	Cracking/settling, Loss of material/abrasion, cavitation, aggressive chemical attack, and leaching, Changes in material properties due to aggressive chemical attack	Chapter X1.M20, "Open-Cycle Cooling Water System	Reinforced concrete and asbestos cement pipe/components are mechanical components in raw water have the same aging effects as structural concrete. An approved precedent exists for adding this material, environment, aging effect, and program combination to the GALL Report. As shown in Harris SER page 3-560, the staff accepted the position that cracking, loss of material and changes in material properties for reinforced concrete and asbestos cement pipe/components in a raw water environment can be managed with the Open Cycle Cooling Water AMP (XI.M20). AMP XI.M20 was developed to provide for proper management of the aging effects for this MEAP combination. Ref: ASTM C296, Standard Specification for Asbestos-Cement Pipe

New AMR Line-items based on new 'MEAP' combinations relevant to Mechanical Systems ("IV" for Reactor Coolant, "V" for Engineered Safety Features, "VII" for Auxiliary, and "VIII" for Steam and Power Conversion)						
Item	***Structure* and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Precedent and Technical Basis for New Line-Item**
VII.C1-x	Piping, piping components, and piping elements	Asbestos cement, reinforced concrete,	Air - outdoor	Cracking/settling, Loss of material/ aggressive chemical attack, and leaching, Changes in material properties due to aggressive chemical attack	Chapter XI.M36, "External Surfaces Monitoring"	Reinforced concrete and asbestos cement pipe/components are mechanical components in an outdoor air environment have the same aging effects as structural concrete. An approved precedent exists for adding this material, environment, aging effect, and program combination to the GALL Report. As shown in Harris SER page 3-560, the staff accepted the position that cracking, loss of material and changes in material properties for reinforced concrete and asbestos cement pipe/components in an outdoor air environment can be managed with the External Surfaces AMP (XI.M36). AMP XI.M36 was developed to provide for proper management of the aging effects for this MEAP combination. Ref: ASTM C296, Standard Specification for Asbestos-Cement Pipe
VII.C2-x VII.H2-x	Piping, piping components, and piping elements	Aluminum	Closed-cycle cooling water	Loss of material/pitting and crevice corrosion	XI.M21A2 Closed Treated Water Systems	Closed-cycle cooling water environment is similar to treated water environments in GALL Rev. 2. GALL Rev 2 Chapter IX definitions acknowledge that closed-cycle cooling water is a subset of second category of treated water. Aluminum is subject to crevice corrosion due to the dependence of Al_2O_3 film oxide for protection (Ref. Corrosion Engineering by Fontana). Aluminum is also prone to pitting in treated water systems (Metals Handbook)

New AMR Line-items based on new 'MEAP' combinations relevant to Mechanical Systems ("IV" for Reactor Coolant, "V" for Engineered Safety Features, "VII" for Auxiliary, and "VIII" for Steam and Power Conversion)						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Precedent and Technical Basis for New Line-Item**
VII.C1-x	Piping, piping components, and piping elements	Reinforced concrete, asbestos cement	soil	Cracking/settling, Loss of material/ aggressive chemical attack, and leaching, Changes in material properties due to aggressive chemical attack	Chapter XI.M34, "Buried Piping and Tanks Inspection"	Reinforced concrete and asbestos cement pipe/components are mechanical components buried in a soil environment have the same aging effects as structural concrete. An approved precedent exists for adding this material, environment, and aging effect combination to the GALL Report. As shown in Harris SER page 3-560, the staff accepted the position that cracking, loss of material and changes in material properties are appropriate aging effects for reinforced concrete and asbestos cement pipe/components buried in a soil environment. AMP XI.M34 was developed to provide for proper management of the aging effects for this MEAP combination. This program provides an acceptable means of managing aging of these components. The implementation of this program provides reasonable assurance that the component's intended functions will be maintained within the CLB for the period of extended operation. Ref: ASTM C296, Standard Specification for Asbestos-Cement Pipe
V.E-x VII.I-x VIII.H-x	Piping, piping components, and piping elements	Aluminum	Air-outdoor	Loss of material/pitting and crevice corrosion	XI.M36 External Surfaces Monitoring	Consistent with GALL Rev 1 for aluminum in an air-outdoor environment for : - Supports (aluminum, air-outdoor) III.B2-7
VII.C2-x VII.H2-x VIII.E-x	Piping, piping components, and piping elements	Aluminum	Treated Water	Loss of material/pitting and crevice corrosion	XI.M2 Water chemistry and XI.M32 One-Time Inspection	Consistent with GALL Rev. 1 for BWR treated water environments: - Piping (aluminum, treated water) VII.E4-4 - Piping (aluminum, treated water) VII.E3-7

New AMR Line-items based on new 'MEAP' combinations relevant to Mechanical Systems ("IV" for Reactor Coolant, "V" for Engineered Safety Features, "VII" for Auxiliary, and "VIII" for Steam and Power Conversion)						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Precedent and Technical Basis for New Line-Item**
VII.C1-x	Piping, piping components, and piping elements	HDPE	Soil	None	None	HDPE in a soil environment is not expected to age. Carbon black is added to HDPE for protection from ultraviolet exposure and ultraviolet exposure is not an issue for buried HDPE pipe. Piping system design temperatures are well below the oxidation induction temperature requirement of 220C. Slow crack growth is the predominant failure mode for HDPE. This failure mode is addressed by material testing required by ASTM D-3350, *Standard Specification for Polyethylene Plastics Pipe and Fittings Materials*. PENT Testing performed under ASTM D-3350 measures resistance of HDPE to slow crack growth and test results can be correlated to material service life. HDPE materials used in nuclear safety class applications are required to as a minimum meet ASTM classification 445574C. PENT testing for materials assures that slow crack growth is not a failure mode during the design life of the piping. Slow crack growth occurs at a very slow rate and this condition cannot be observed by field inspection. HDPE does not absorb water according to Plastic Pipe Institute technical report PPI TR-19, *Chemical Resistance of Thermoplastic Piping Materials* based on testing performed at temperatures up to 140 degrees F. HDPE is not subject to water absorption and subsequent osmotic blistering that can occur with other polymeric materials. There is no color change in response to water absorption with HDPE.
VII.C2-x	Elastomer Seals and Components	Elastomer	Closed Cycle Cooling Water	Hardening and loss of strength due to elastomer degradation	Chapter XI.M38, "inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Consistent with GALL Rev 1 for elastomers in : - Treated water (Spent Fuel Pool Cooling & Cleanup) VII.A4-1 - Raw water (Open Cycle Cooling Water) VII.C1-1 In general if the temperature is above 95F, then thermal aging may be considered significant.

New AMR Line-items based on new 'MEAP' combinations relevant to Mechanical Systems ("IV" for Reactor Coolant, "V" for Engineered Safety Features, "VII" for Auxiliary, and "VIII" for Steam and Power Conversion)						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Precedent and Technical Basis for New Line-Item**
IV.E-x V.F-x VII.J-x VIII I-x	Piping, piping components, and piping elements	Nickel Alloys	Air with borated water leakage	None	None	The American Welding Society (AWS) "Welding Handbook," (Seventh Edition, Volume 4, 1982, Library of Congress) identifies that nickel chromium alloy materials that are alloyed with iron, molybdenum, tungsten, cobalt or copper in various combinations have improved corrosion resistance. The Staff's evaluation in the Beaver Valley SER concluded that nickel-alloy components exposed to an external air with borated water leakage environment are resistant to the phenomena of corrosion and oxidation.
V.E-x, VII.I-x, VIII.H-x	Bolting	Copper alloy, nickel alloy	Air – indoor (external)	Loss of preload/ thermal effects, gasket creep, and self-loosening	Chapter XI.M18, Bolting Integrity	GALL addresses loss of preload for steel closure bolting in an air-indoor (external) environment (V.E-5, VII.I-5 and VIII. H-5) but does not address nickel alloy, or copper alloy bolting. GALL AMP XI.M18 provides for management of loss of pre-load, so this program can also be applied here.
V.E-x, VII.I-x, VIII.H-x	Bolting	Carbon steel, Stainless steel	Air – outdoor (external)	Loss of preload/ thermal effects, gasket creep, and self-loosening	Chapter XI.M18, Bolting Integrity	GALL addresses loss of preload for steel closure bolting in an air-indoor (external) environment (V.E-5, VII.I-5 and VIII. H-5) but does not address stainless steel bolting or an air-outdoor (external) environment. GALL AMP XI.M18 provides for management of loss of pre-load, so this program can also be applied here.

New AMR Line-items based on new 'MEAP' combinations relevant to Mechanical Systems ("IV" for Reactor Coolant, "V" for Engineered Safety Features, "VII" for Auxiliary, and "VIII" for Steam and Power Conversion)						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Precedent and Technical Basis for New Line-Item**
V.E-x, VII.I-x	Bolting	Nickel Alloy	Air with Borated water leakage	Loss of preload/ thermal effects, gasket creep, and self-loosening	Chapter XI.M18, Bolting Integrity	GALL addresses loss of preload for steel closure bolting in an air-indoor (external) environment (V.E-5, VII.I-5 and VIII. H-5) but does not address other materials and environments. GALL AMP XI.M18 provides for management of loss of pre-load, so this program can also be applied here.
V.E-x, VII.I-x	Bolting	Stainless steel	Raw water			
V.E-x, VII.I-x	Bolting	Stainless steel	Treated borated water			
V.E-x, VII.I-x	Bolting	Steel	Fuel oil			
V.E-x, VII.I-x	Bolting	Steel	Raw Water			
VII.C1-x, VII.F2-x, VIII.G-x	Piping, piping components, and piping elements	PVC	Air-indoor uncontrolled Or condensation (internal)	None	None	As identified in "Engineering Materials Handbook – Engineering Plastics," PVC is unaffected by water, concentrated alkalis, non-oxidizing acids, oils, ozone, sunlight, or humidity changes. Unlike metals, thermoplastics do not display corrosion rates, and rather than depend on an oxide layer for protection, they depend on chemical resistance to the environments to which they are exposed. Plastic is an impervious material and once selected for the environment will not have any significant age related degradation. No age related industry experience has been identified for plastic material in air-indoor or condensation (internal) environments. The staff's review in the TMI SER (NUREG-1928) found that air-indoor environments on PVC materials will not result in aging effects that will be of concern during the period of extended operation.

New AMR Line-items based on new 'MEAP' combinations relevant to Mechanical Systems ("IV" for Reactor Coolant, "V" for Engineered Safety Features, "VII" for Auxiliary, and "VIII" for Steam and Power Conversion)						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Precedent and Technical Basis for New Line-Item**
III.B2-x	Conduit	Aluminum	Concrete	None	None	GALL addresses stainless steel embedded in concrete (VII.J-17 & VIII.I-11). An approved precedent exists for adding this material, environment, aging effect, and program combination to the GALL Report. As shown in Browns Ferry SER page 3-322, the staff accepted the position that aluminum alloy embedded or encased in concrete has no aging effect that requires aging management. Aluminum has an excellent resistance to corrosion. On a surface freshly abraded and then exposed to air, the oxide film is only 5 to 10 nanometer thick but is highly effective in protecting the aluminum from corrosion (Hollingsworth and Hunsicker 1979). Aluminum that is embedded/encased within concrete, loss of material is not considered an applicable aging effect. The concrete would first have to be degraded by other aging effects, which reduce the protective cover and potentially allow for the intrusion of aggressive ions causing a reduction in concrete pH. Aging management of concrete aging effects will manage the corrosion of the embedded/encased aluminum protective oxide layer. Concrete structures and components are designed in accordance with ACI standards and constructed using materials conforming to ACI and ASTM standards which provide foe a good quality, dense, well cured, and low permeability concrete. Cracking is controlled through arrangement and distribution of reinforcing bars.
VII.J-x	Piping, piping components, and piping elements					

Other NUREG-1801 Changes:

- Addition of new section for Waste Water Systems
- Chapter IX new or revised definitions for:
  - Environments: Potable Water, Raw Water, and Waste Water

E5. WASTE WATER SYSTEM

Systems, Structures, and Components

This section discusses liquid waste systems such as liquid radioactive waste systems, oily waste systems, floor drainage systems, chemical waste water systems, and secondary waste water systems. Plants may include portions of waste water systems within the scope of license renewal based on the criterion of 10CFR 54.4.(a)(2).

Based on Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," radioactive-waste-containing portions of waste water systems are classified as Group C Quality Standards, with the exception of those forming part of the containment pressure boundary which are classified as Group B. Waste water systems that do not contain radioactive waste of form a part of the containment pressure boundary are classified as Group D.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration. They are also subject to replacement based on qualified life or specified time period. Pursuant to 10 CFR 54.21(a)(1), therefore, they are not subject to an aging management review.

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. Common miscellaneous material/environment combinations where aging effects are not expected to degrade the ability of the structure or component to perform its intended function for the extended period of operation are included in VII.J.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

Various other systems discussed in this report may interface with waste water systems.

VII. E5	AUXILIARY SYSTEMS Waste Water Systems							
Item	**Structure and/or Component**	**GALL Rev. 1 Item Number**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**	**Basis for Change**
TBD	Piping, piping components, and piping elements	VII.E5-1	Copper	Waste Water	Loss of Material/ pitting, crevice, and microbiological influenced corrosion	Chapter XI.M38, "inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	See Note 1
TBD	Piping, piping components, piping elements, and tanks	VII.E5-2	Stainless Steel; nickel alloys	Condensation (internal)	Loss of Material/ pitting, crevice, and microbiological influenced corrosion	Chapter XI.M38, "inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	See Note 1
TBD	Heat Exchanger Components	VII.E5-2	Stainless Steel; nickel alloys	Waste Water	Loss of Material/ pitting, crevice, and microbiological influenced corrosion	Chapter XI.M38, "inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	See Note 1
TBD	Piping, piping components, and piping elements	VII.E5-1	Glass	Waste Water	None	None	No	See Note1
TBD	Piping, piping components, piping elements, and tanks	VII.E5-2	Stainless Steel; nickel alloys	Waste Water	Loss of Material/ pitting, crevice, and microbiological influenced corrosion	Chapter XI.M38, "inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	See Note 1

TBD	Piping, piping components, piping elements, and tanks	VII.E5-2	Steel	Condensation (internal)	Loss of Material/ pitting, crevice, and microbiological influenced corrosion	Chapter XI.M38, "inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	See Note 1
TBD	Piping, piping components, piping elements, and tanks	VII.E5-3	Steel	Waste Water	Loss of Material/ general, pitting, crevice, and microbiological influenced corrosion	Chapter XI.M38, "inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	See Note 1
TBD	Valves	VII.E5-2	Stainless Steel; nickel alloys	Waste Water	Loss of Material/ pitting, crevice, and microbiological influenced corrosion	Chapter XI.M38, "inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	See Note 1
TBD	Valves	VII.E5-2	Stainless Steel; nickel alloys	Waste Water	Loss of Material/ pitting, crevice, and microbiological influenced corrosion	Chapter XI.M38, "inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	See Note 1
TBD	Valves	VII.E5-3	Steel	Waste Water	Loss of Material/ general, pitting, crevice, and microbiological influenced corrosion	Chapter XI.M38, "inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	See Note 1

Note 1. New lines are proposed to be added to NUREG-1801 for aging management review of waste water systems. AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components", is proposed for inspections of internal surfaces of metal components that are not covered by other aging management programs. Glass is managed consistent with existing GALL lines for glass in raw water in the Common Miscellaneous Material/Environment section of GALL.

Chapter IX New and Revised Definitions

Section IX. D. Environments

Term	Definition as used in this document
Potable Water (new)	Water that is treated for dinking or other personnel uses.
Raw Water (revised)	Raw, untreated fresh, salt, or ground water. Water for use in open-cycle cooling water systems. ~~Floor drains and reactor buildings and auxiliary building sumps may be exposed to a variety of untreated water that is thus classified as raw water, for the determination of aging effects.~~ ~~Raw water may contain contaminants, including oil and boric acid, depending on the location, as well as originally treated water that is not monitored by a chemistry program.~~
Waste Water (new)	Radioactive, potentially radioactive, or non-radioactive waters that are collected from equipment and floor drains. Waste waters may contain contaminants, including oil and boric acid, depending on location, as well as originally treated water that is not monitored by a chemistry program