Entergy

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Anthony J. Vitale
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PNP 2013-029

April 25, 2013

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Relief Request Number RR 4-16, Proposed Alternative, Alternate Leak Repair Addition of Safety Injection and Refueling Water Tank Bottom Liner, Fourth 10-Year Inservice Inspection Interval

Palisades Nuclear Plant
Docket 50-255
License No. DPR-20

Dear Sir or Madam:

Pursuant to 10 CFR 50.55a(a)(3)(i), Entergy Nuclear Operations, Inc. (ENO) hereby requests NRC approval of Request for Relief Number RR 4-16 for a Proposed Alternative for the Palisades Nuclear Plant (PNP). This alternative is for the current fourth 10-year inservice inspection interval.

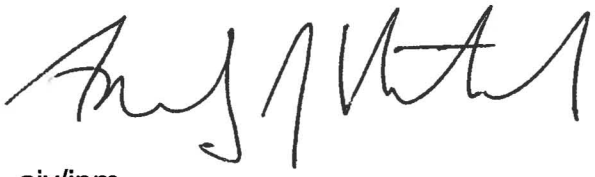
The request is associated with the use of an alternative to the requirements of the ASME Section XI, Article IWA-4000, "Repair/Replacement Activities," specifically IWA-4221, "Construction Code and Owner's Requirements." ENO proposes to install a fiberglass-reinforced vinyl ester liner on the bottom of the safety injection and refueling water tank (SIRWT), as an alternative design equivalent to a code repair or replacement of the bottom of the SIRWT.

To support installation of the SIRWT liner during the PNP 2013 fall refueling outage, ENO requests approval of this alternative by September 30, 2013.

Summary of Commitments

This letter identifies one new commitment, as described in enclosure 2, and no revised commitments.

Sincerely,



ajv/jpm

Enclosures: 1. Proposed Alternative
2. Description of Commitment

cc: Administrator, Region III, USNRC
Project Manager, Palisades, USNRC
Resident Inspector, Palisades, USNRC

ENCLOSURE 1

ENTERGY NUCLEAR OPERATIONS, INC.
PALISADES NUCLEAR PLANT
Relief Request Number RR 4-16 Proposed Alternative
in Accordance with 10 CFR 50.55a (a)(3)(i)
Alternative Provides Acceptable Level of Quality and Safety

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1. ASME CODE COMPONENT(S) AFFECTED / APPLICABLE CODE EDITION

Components / Numbers:	Safety Injection and Refueling Water Tank (SIRWT) / T-58
Code of Record:	American Society of Mechanical Engineers (ASME) "Boiler and Pressure Vessel Code", Section XI, "Rules for In-service Inspection of Nuclear Power Plant Components," 2001 Edition through 2003 Addenda. America Standards Association (ASA) B96.1-1967, "Specification for Welded Aluminum-Alloy Field-Erected Storage Tanks," ASME Code Case N-705, "Evaluation Criteria for Temporary Acceptance of Degradation in Moderate Energy Class 2 or 3 Vessels and Tanks," October 12, 2006
Description:	Above Ground Atmospheric Storage Tank
Unit / Inspection Interval:	Palisades Nuclear Plant (PNP) / Fourth 10-Year Interval

The SIRWT is a welded 5454-0 aluminum atmospheric vertical storage tank with discharge nozzles located in the bottom of the tank (see Attachment 1 for tank drawing). The tank is located on the catacomb roof of the PNP auxiliary building, directly above the control room. The tank was designed and erected in accordance with ASA B96.1-1967 (also known as United States of America Standard (USAS) B96.1-1967). The tank bottom is lap welded with fillet welds and sits on a sand base with a roof support center post. Overall, the tank shell and sand base are supported by a concrete foundation with a concrete grout ring, and is anchored directly to the concrete foundation. The nozzle-to-bottom joints have been modified with reinforcement plates around the nozzles. The tank provides the PNP technical specification 3.5.4, "Safety Injection Refueling Water Tank (SIRWT)," surveillance requirement SR 3.5.4.2 required volume of 250,000 gallons of water containing boron in the range of 1,720 ppm to 2,500 ppm. This assures adequate volume is available for injection during emergency

core cooling. In addition, the tank provides water for filling the refueling cavity during refueling activities.

2. APPLICABLE CODE REQUIREMENTS

PNP current in-service code requirements are ASME Boiler and Pressure Vessel Code, Section XI, 2001 Edition through 2003 Addenda.

The tank examination requirements covered by this proposed alternative is classified as described below:

Section XI Table IWC-2500-1, "Examination Categories"

Examination Category:	C-H
Item Number:	C7.10
Test Requirement:	System Leakage
Examination Method:	Visual VT-2
Examination Extent:	Pressure Retaining Boundary
Examination Frequency:	Each Inspection Period

3. REASON FOR REQUEST

Entergy Nuclear Operations, Inc. (ENO) is requesting a proposed alternative design to ASME Section XI, 2001 Edition through 2003 Addenda, for its SIRWT due to continued tank leakage after several repair attempts. ENO is specifically requesting an alternative design that would add a fiberglass-reinforced vinyl ester liner to the tank bottom and to a portion of the tank wall in lieu of identifying the location of the thru-wall leak(s) and performing code compliant repairs. ENO considers this installation to be an alternative design equivalent to a code repair or replacement of the SIRWT bottom. Pursuant to 10CFR50.55a (a)(3)(i) relief is requested from the repair and/or replacement requirements of ASME Section XI, Article IWA-4000, "Repair/Replacement Activities," specifically IWA-4221, "Construction Code and Owner's Requirements."

Leakage from the bottom of the SIRWT has been observed and several unsuccessful attempts have been made to identify the source of the leakage and to perform weld repairs to eliminate the leakage and achieve the required leak free boundary. A root cause evaluation was performed under PNP condition report CR-PLP-2012-04451, "Safety Injection Refueling Water Tank Leak and Subsequent Plant Outage for Tank Repair." The evaluation attributed the tank leakage to flexing of the tank bottom during fill and drain operations. While oil canning (i.e., a moderate deformation or buckling of sheet material, particularly common with flat sheet metal surfaces) is common for large flat bottom vertical

tanks, flexing of the SIRWT bottom was exacerbated by voids in the sand base, located beneath the tank. The flexing created especially high stresses in the vicinity of the SIRWT nozzles. Repeated flexing resulted in cracking of the nozzle to SIRWT bottom welds. A contributing cause was the design of the nozzle to bottom welds. Specifically, the absence of nozzle reinforcement in the original design contributed to the welds being susceptible to high stress and resultant fatigue related failure of the aluminum material. These causes have been addressed in the various repair activities that have been performed to date. These activities included localized sand base restoration, addition of welded nozzle reinforcement plates, replacement of selected nozzles, and weld repairs. In addition, pipe restraints were modified to remove external forces from selected nozzles. Tank inspection activities to date have included ultrasonic, liquid penetrant, vacuum box, acoustic emissions, balanced field electromagnetic testing, and visual inspections.

Despite these repair and inspection activities, minor leakage has continued. Currently, the leakage is considered acceptable per ASME Code Case N-705. In accordance with this code case, the structural condition of the tank has been evaluated as satisfactory based on a calculated allowable flaw length of 0.73 inches and a critical flaw length of 2.64 inches [Reference 10]. The current leak rate is stable without an increasing trend which suggests that the current through wall flaws have self-relieved the initiating stresses, are not growing, and remain well below the calculated allowable flaw length. This is consistent with previously identified through wall flaws in the SIRWT, none of which, upon inspection, propagated beyond the affected weld area. Leakage continues to be monitored to ensure that the calculated allowable flaw length is not exceeded. The calculated leakage limit is 38 gallons per day. When leakage exceeds 34 gallons per day, ENO plans to declare the SIRWT inoperable and enter a one hour action statement to correct the condition or begin a unit shutdown. The actual leakage currently observed is significantly below the 34 gallon per day limit.

4. PROPOSED ALTERNATIVE AND BASIS FOR USE

Proposed Alternative

ENO proposes to install a fiberglass-reinforced vinyl ester resin liner (Dudick Inc. Protecto-Line 800 System) on the SIRWT bottom as a permanent alternative design which will allow the SIRWT to remain capable of performing its required safety functions. This lining is scheduled to be installed during the PNP fall 2013 refueling outage. This proposed alternative will provide containment of the tank contents and, in combination with the current tank bottom, will become the new leakage barrier equivalent to the original aluminum-only tank bottom. This lining system, after installation and curing will form a uniform system across the bottom

of the tank. It will cover the tank bottom, the tank shell wall plates to a height of approximately 24 inches, any internal sparger support connections to the tank bottom, and the outer surface of each of the bottom nozzles inside the tank. The Protecto-Line 800 lining system manufactured by Dudick Inc. consists of a primer coat, a trowel applied base coat approximately 1/16" thick, a woven fiberglass roving reinforcement, and top coat approximately 1/16" thick. The overall lining thickness is approximately 1/8" (125 mils) and will be installed in accordance with the manufacturer's recommendations. This same system was installed in the Florida Power and Light (FPL), St. Lucie Station, refueling water tank (RWT). FPL subjected the system to specific testing or evaluation as detailed in the St. Lucie Unit 1 relief request [Reference 6], for the following:

- Adhesion
- "Bridging" ability
- Specific gravity
- Ability to accommodate "oil canning"
- Radiation resistance
- Boric acid resistance
- Compressive strength
- Coefficient of thermal expansion
- Chemical properties
- Water vapor transmission

This material was selected for the PNP application based on the test results and evaluation documented in the relief request documentation.

Alternative Provides Acceptable Level of Quality and Safety

The installation of the proposed lining system will not reduce the capability of the SIRWT to perform its required safety functions. It will eliminate tank bottom leakage by forming a leak tight membrane on the tank bottom, isolating leak pathways. It will provide the required containment of the tank contents in lieu of relying on the existing aluminum tank bottom for this function. Further degradation of the welds in the current aluminum boundary is not expected based on ENO's understanding of the cause of the leakage and the repairs that have been performed. If any further weld degradation were to occur, the degradation will not affect the lining since the lining will be a distinct and independent material. While bonded to the surface of the existing tank, the physical properties of the liner will prevent potential future weld degradation, if it were to occur, from propagating into and through the liner. These properties include adhesion strength, "bridging" ability, and ability to accommodate "oil canning." The liner will flex along with the welded aluminum structure and will not be impacted by any potential future aluminum weld fatigue issues. Some bottom flexing is normal for large flat bottom vertical tanks such as the SIRWT. Future

bottom flexing is not expected to result in significant nozzle stresses due to the repairs that have been made, in which the nozzles were reinforced and the sand base was restored. Welds in the vicinity of nozzle reinforcement plates installed in 1988 have shown no indication of failure in the subsequent inspections performed, which indicates that this repair method has been successful in addressing the cause of the past failures. In the unlikely event that a significant through-wall weld failure were to occur as a result of high stress in a nozzle to reinforcing plate weld, the stress would be expected to self-relieve at the point of the weld failure and the failure would not propagate around the entire circumference of the nozzle. This postulation is supported by tank bottom leakage evaluation performed in accordance with ASME code case N-705. The liner will continue to provide its leakage barrier function due to its adhesion strength, "bridging" ability, and ability to accommodate "oil canning."

The liner is a chemically resistant material designed for water tank lining immersion applications and is resistant to the tank content chemicals and tank radiation levels. It has suitable thermal expansion properties in relation to the aluminum base material. The liner material has been confirmed to have the required chemical and physical properties to perform the function of a leakage barrier for the SIRWT based on the FPL St. Lucie Unit 1 Relief Request [Reference 6]. Moreover, subsequent inspections at St. Lucie did not reveal any observable degradation of the liner.

Due to the liner material properties and operating experience at St. Lucie, loose liner material is considered to be very unlikely. In the improbable event that any loose material occurred, it would be very limited and inconsequential. Any loose material at PNP would be observed during remote inspections (as discussed below), documented under the ENO corrective action process, and evaluated for impact to supported component operability.

Per ASA B96.1, the flat bottom of the tank is not subject to specific design rules for calculating minimum thickness, and allowable stresses are not given for the tank bottom. The primary function of the bottom plate is to provide a barrier between the tank fluid and the underlying sand base material and concrete foundation. Pressure stress loads are carried by the sand base, concrete grout ring, and concrete foundation beneath the tank bottom. Therefore, the tank bottom may be considered to functionally be a liner.

The proposed liner will be installed as part of a safety related engineering design change package, prepared in accordance with ENO procedures, to assure proper preparation and installation.

Inspection Plan

ENO plans, prior to installation of the lining system, to visually inspect for crack like indications all bottom lap welds, patch plate welds, nozzle and associated reinforcement plate welds, and side wall welds in the area of the tank bottom to be covered by the lining system. Dye penetrant inspections will also be performed on all nozzle welds, including nozzle to reinforcement plate welds and nozzle reinforcement plates to bottom welds. The inspections will be tracked and documented via the ENO work management process.

ENO also plans, after installation but prior to refilling the SIRWT, to perform a direct visual inspection on the newly installed lining. After refilling the SIRWT, a remote visual inspection of the lining system will be performed prior to unit start-up. These inspections will be tracked and documented via the ENO work management process.

After the SIRWT is returned to service, in addition to implementing the requirements of ASME Section XI, Table IWC-2500-1, Category C-H examination requirements each inspection period, the lining will be remote visually inspected during each future refueling outage to verify the integrity of the lining system. This will include remote visual inspection of the lining system before draining the SIRWT to fill the refueling cavity and after refilling the SIRWT prior to unit start-up. This will verify liner integrity through the drain/fill cycles of the SIRWT. If this visual inspection identifies degradation or aging effects, additional visual or direct manual inspections will be performed. PNP's fourth 10 year interval inservice inspection master plan will be revised to include these inspections.

Installation Plan

The lining will be installed in the same manner as the FPL St. Lucie Unit 1 lining. Unlike the PNP SIRWT, the St. Lucie Unit 1 RWT does not have bottom nozzles and is installed at grade, however, the liner installation details are the same. Existing nozzle to tank bottom welds are acceptable due to the previous installation of nozzle reinforcement plates. This will be confirmed by pre and post liner installation inspections.

Prior to application of the liner material, the SIRWT aluminum surfaces subjected to coating will be prepared to develop the manufacturer recommended rough surface profile. The surface will be inspected to ensure proper preparation prior to application of the lining. The lining material will be applied in accordance with the manufacturer's requirements and under the ENO quality assurance program as a service level III coating. As part of this program, the environmental conditions and application will be monitored during installation in order to assure

compliance with manufacturer's requirements. After the tank is returned to service, continued monitoring of the SIRWT for indications of leakage will continue until after a successful VT-2 examination is performed. Visual inspection of the liner will be performed during each refueling outage.

Basis for Use

The NRC has previously reviewed and approved this liner system, which has been installed since 1994 in the FPL St. Lucie Unit 1 RWT [Reference 8 and 12]. This tank is similar to the PNP SIRWT in that it is an above ground welded atmospheric aluminum storage tank on a sand bed, supported by a concrete foundation, and was constructed to the same code (ANSI B96.1-1967, which is synonymous with ASA or USAS B96.1-1967). Leakage from the FPL St. Lucie Unit 1 RWT was identified in 1993 during the 2nd ISI interval, and was determined to be the result of through wall corrosion of the tank bottom plate material. Relief was requested and approved for a temporary "non-code" repair that installed an aluminum plate bonded with epoxy over the leak location pending installation of a permanent code repair. Subsequently, the condition of the tank bottom due to corrosion was found to prevent an acceptable welded code repair. As an alternative to the required code repair, a fiberglass reinforced vinyl ester lining was applied to the tank bottom and approximately 24" up the side of the tank shell. Relief was granted as a temporary repair that would be removed and the RWT bottom replaced during a planned steam generator outage. Specific inspections and examinations were required for each refueling outage after installation, and were performed as required.

Subsequently, relief was requested and granted for the 3rd and 4th ISI intervals to continue use of the reinforced vinyl ester lining as an alternative to replacing the tank bottom. The associated inspections and examinations were, and continue to be, performed. The lining system continues to perform acceptably as an alternative leak free barrier in lieu of the degraded tank bottom. No degradation has been identified in the liner material which could affect its ability to perform its safety function or the ability of other components to perform their safety functions. Additionally, the installation and inspections proposed for this liner system are consistent with the guidance provided in LR-ISG-2012-02, "Aging Management of Internal Surfaces, Service Level III And Other Coatings, Atmospheric Storage Tanks, and Corrosion Under Insulation" [Reference 11]. Therefore based on the FPL St. Lucie Unit 1 application and operating experience, the lining system has been proven to meet the construction standard of record and ASME ISI requirements for a leak free barrier [Reference 6].

PNP SIRWT bottom examination results and repairs support liner installation. Specifically, the PNP SIRWT bottom has been volumetrically examined using ultrasonic and balanced field electromagnetic techniques and has been found to

retain the nominal thickness. Bottom lap welds were examined by nondestructive methods and were found to be structurally sound. In 2012, sections of the tank bottom plates were removed at 18 locations in order to facilitate sand base restoration. The removed plate sections were inspected and no general corrosion was noted. These sections had welded patch plates installed. The tank bottom, nozzle to bottom, and bottom to shell welds have been nondestructively examined. Identified rejectable weld defects have been repaired and reinforcing plates have been installed around the nozzles. These repairs have addressed the identified cause of nozzle leakage and further degradation of the nozzle to bottom welds is not expected. This will be confirmed by the pre-installation inspections.

The SIRWT bottom design supports liner installation because the bottom plates will retain their required structural integrity for load transfer and the proposed liner will be a leak free barrier that provides containment of the tank contents. The primary function of the bottom is to provide a barrier between the tank fluid and the underlying sand base material. Pressure stress loads are carried by the sand base, concrete grout ring, and concrete foundation beneath the tank bottom. Addition of the liner is a functionally equivalent design to the SIRWT construction standard of record, ASA B96.1-1967, because the flat bottom of the tank is not subject to specific design rules for calculating minimum thickness and allowable stresses are not given for the tank bottom. Also, addition of the bottom liner will ensure construction standard leakage criteria and ISI code leakage criteria are met. Per ASA B96.1 Section 1.2, "Purpose," the purpose of the tank is for "...the containment of fluids stored..." Regarding leak tightness, Section 6.5, "Testing and Repairs," provides for the leak testing of the tank bottom. Additionally, the in-service inspection provisions of Section XI require that the tank be free of through wall leaks. The proposed lining system (Dudick Inc. Protecto-Line 800 System) will provide the required leakage barrier function of the tank bottom.

5. DURATION OF PROPOSED ALTERNATIVE

The duration of the proposed alternative for the tank bottom leakage barrier is through the end of the current fourth 10 year ASME Section XI interval which ends in December 12, 2015.

6. PRECEDENT

This relief request is similar in nature to the following relief requests authorized by the NRC:

1. NRC Safety Evaluation, "St. Lucie Plant, Unit 1 – Evaluation of Request No. 7A Regarding the Visual Inspection Frequency of the Refueling Water Tank Liner for the Third 10-Year Inservice Inspection Interval (TAC No. MB0324)," February 27, 2001, ADAMS Accession No. ML010580501

2. NRC Corrected Safety Evaluation, "St. Lucie Plant, Unit 1 – Requested Correction/Clarification to Safety Evaluation RE: Relief Request 7A (TAC No. MB0324)," June 22, 2001, ADAMS Accession No. ML011710149

3. NRC Safety Evaluation, "St. Lucie Plant, Unit 1 – Relief Request No. 3, Request for Alternative to ASME Code, Section XI Repair Requirements for Refueling Water Tank Bottom (TAC No. MD9268)," February 12, 2009, ADAMS Accession No. ML090410362

7. REFERENCES

1. 10 CFR 50.55a, "NRC Regulations, Title 10, Code of Federal Regulations, Part 50 – Domestic Licensing Of Production And Utilization Facilities, 50.55a - Codes and Standards"

2. ASME Section XI, "Rules for In-service Inspection of Nuclear Power Plant Components", 2001 Edition with Addenda through 2003 Addenda

3. UAS (ASA) B96.1-1967, "USA Standard Specification for Welded Aluminum-Alloy Field-Erected Storage Tanks," February 21, 1967

4. ENO PNP Root Cause Evaluation Report CR-PLP-2012-04451, "Safety Injection Refueling Water Tank Leak and Subsequent Plant Outage for Tank Repair," February 25, 2013

5. Florida Power & Light Company, Letter L-2000-211, St. Lucie Unit 1, "Inservice Inspection Plan, Unit 1 Revised Relief Request 7A," October 18, 2000, ADAMS Accession No. ML003762390.

6. Florida Power & Light Company, Letter L-2008-079, St. Lucie Unit 1, "Inservice Inspection Plan, Fourth Ten-Year Interval Unit 1 Relief Request 3," April 9, 2008, ADAMS Accession No. ML081120115

7. NRC Corrected Safety Evaluation, "St. Lucie Plant, Unit 1 – Requested Correction/Clarification To Safety Evaluation RE: Relief Request 7A (TAC No. MB0324)," June 22, 2001, ADAMS Accession No. ML011710149

8. NRC Safety Evaluation, "St. Lucie Plant, Unit 1 – Evaluation Of Request No. 7A Regarding The visual Inspection Frequency Of The Refueling Water Tank Liner For The Third 10-Year Inservice Inspection Interval (TAC No. MB0324)," February 27, 2001, ADAMS Accession No. ML010580501

9. ASME Section XI, Division 1, Code Case N-705, "Evaluation Criteria for Temporary Acceptance of Degradation in Moderate Energy Class 2 or 3 Vessels and Tanks"

10. PNP Engineering Change EC-38628, "Issue Engineering Report PLP-RPT-12-00102, Revision 0," "Evaluation of SIRW Tank T-58"

11. NRC Draft License Renewal Interim Staff Guidance, LR-ISG-2012-02, "Aging Management Of Internal Surfaces, Service Level III And Other Coatings, Atmospheric Storage tanks, And Corrosion Under Insulation," April 4, 2013.

12. NRC Safety Evaluation, "St. Lucie Plant, Unit 1 – Relief Request No. 3, Request For Alternative To ASME Code, Section XI Repair Requirements For Refueling Water Tank Bottom (TAC No. MD9268)," February 12, 2009, ADAMS Accession No. ML090410362

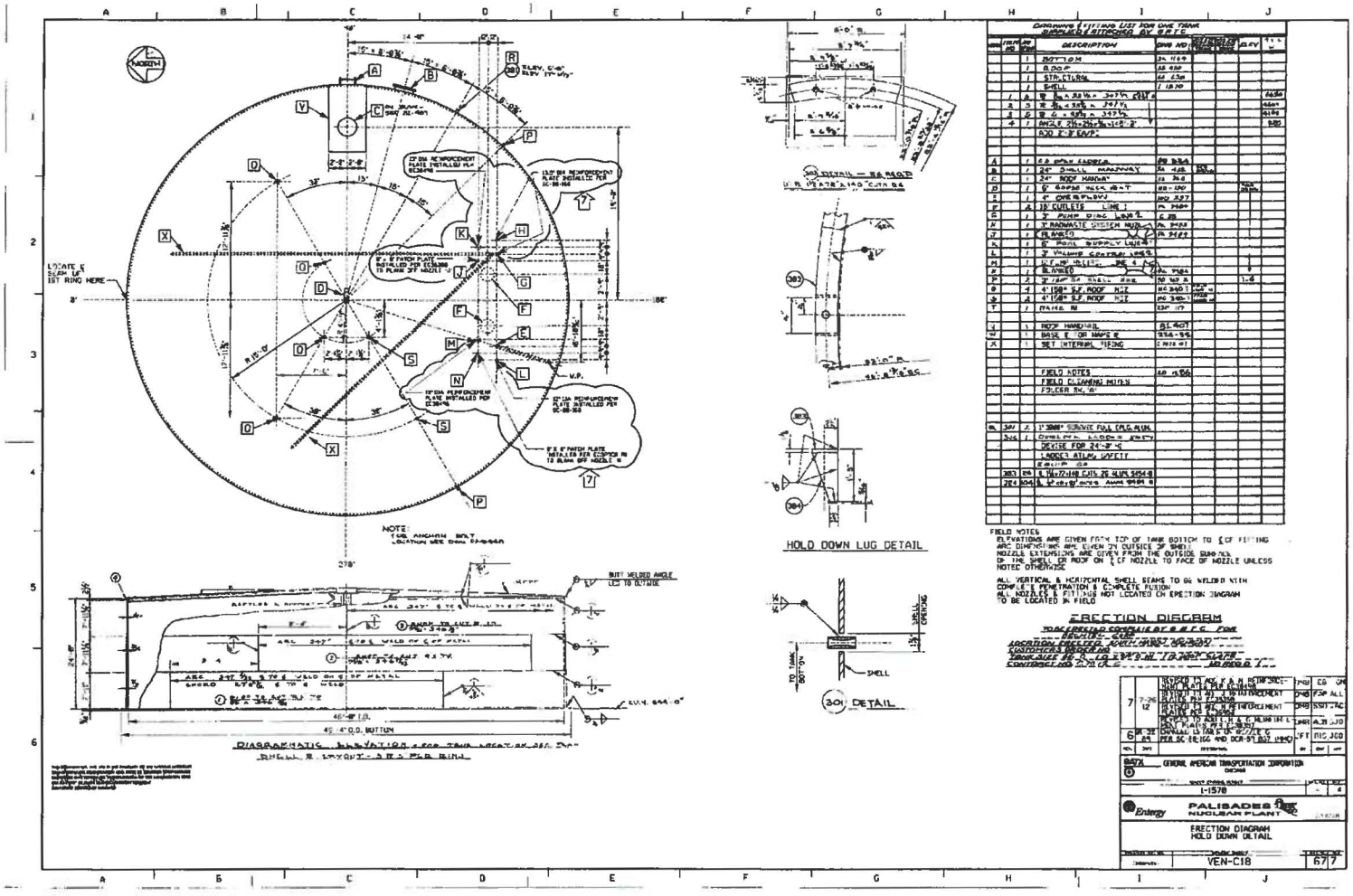
8. ATTACHMENTS

1. PNP Drawing VEN-C18, Sheet 67, Revision 7, "Erection Diagram Hold Down Detail," July 26, 2012

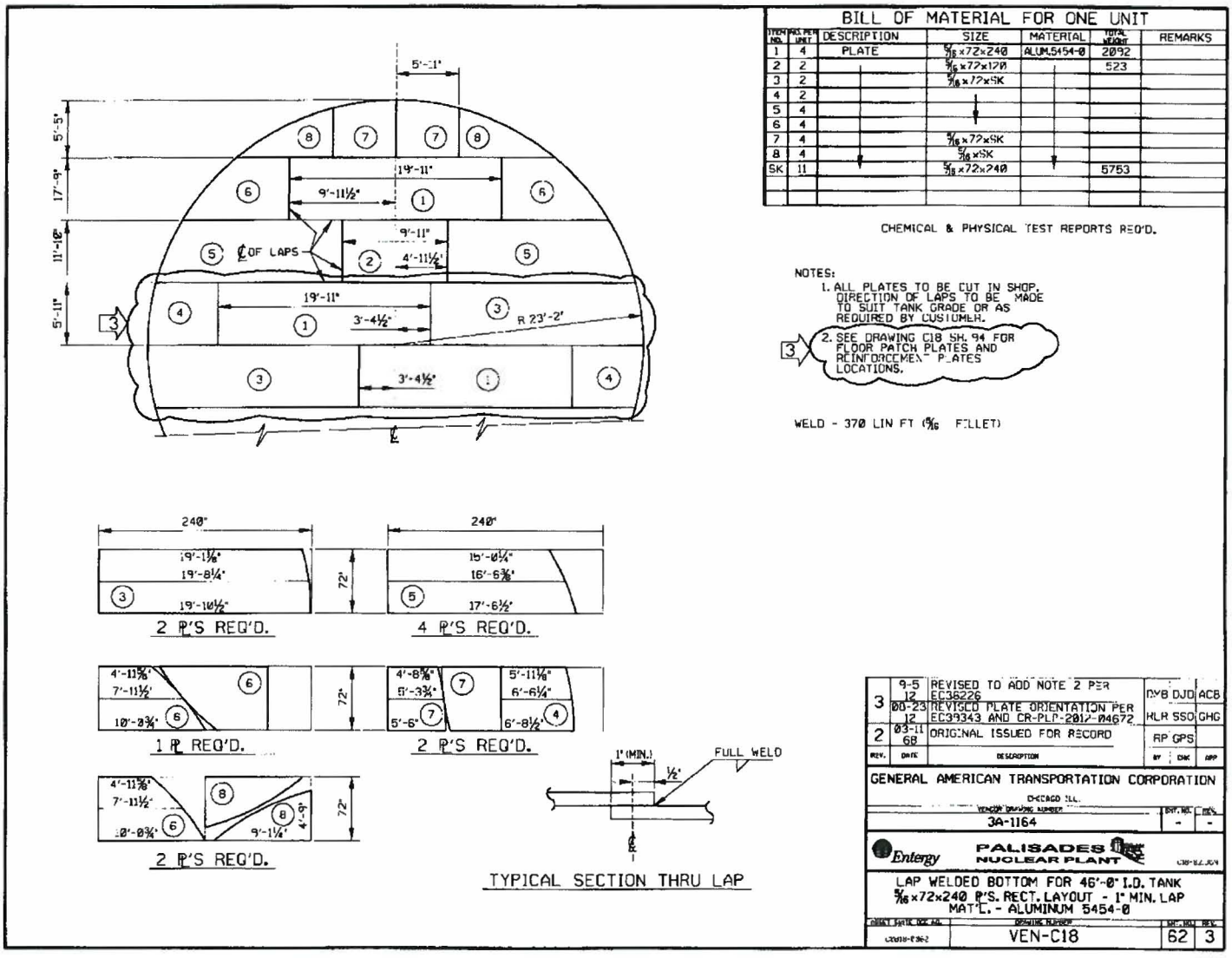
2. PNP Drawing VEN-C18, Sheet 62, Revision 3, "Lap Welded Bottom for 46'-0" I.D. Tank," September 5, 2012

3. PNP Drawing VEN-C18, Sheet 94, Revision 0, "SIRW Tank (T-58) Floor Plate Patch Configuration"

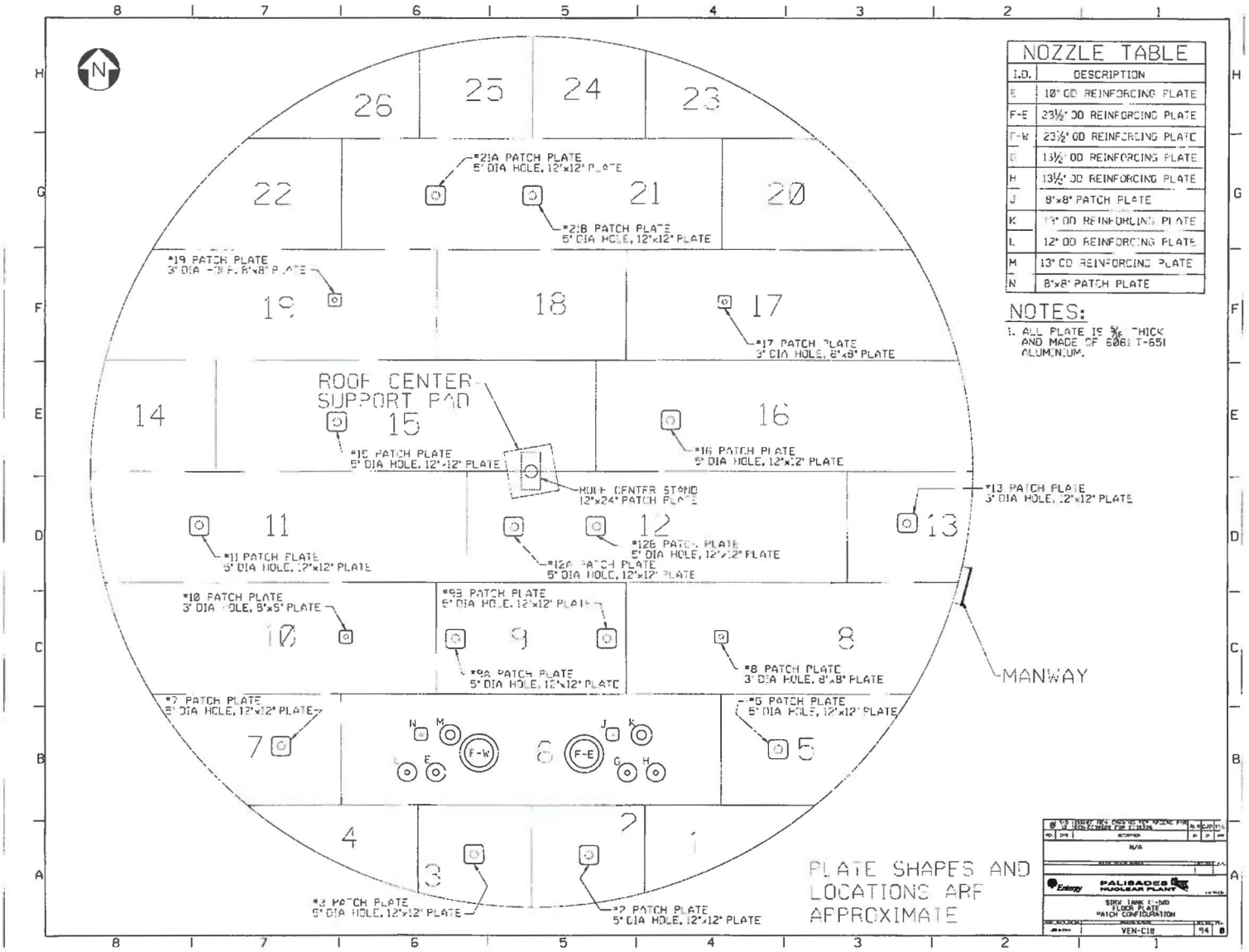
Attachment 1 - PNP Drawing VEN-C18 Sheet 67 Revision 7, "Erection Diagram Hold Down Detail,"



Attachment 2 - PNP Drawing VEN-C18 Sheet 62 Revision 3, "Lap Welded Bottom for 46'-0" I.D. Tank,"



Attachment 3 - PNP Drawing VEN-C18 Sheet 94 Revision 0, SIRW Tank (T-58) "Floor Plate Patch Configuration



ENCLOSURE 2

ENTERGY NUCLEAR OPERATIONS, INC.
PALISADES NUCLEAR PLANT
Relief Request Number RR 4-16

Description of Commitment

This table identifies actions discussed in this letter for which Entergy Nuclear Operations, Inc. commits to perform. Any other actions discussed in this submittal are described for information only and are not commitments.

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
Entergy Nuclear Operations, Inc. will perform remote visual inspections of the safety injection and refueling water tank (SIRWT) lining during each remaining refueling outage in the 4th interval following liner installation in 1R23, scheduled in fall of 2013. Remote visual inspections will be performed before draining the SIRWT to fill the refueling cavity and after refilling the SIRWT prior to unit start-up to verify the integrity of the lining system.		X	December 12, 2015