

CHANGE NO: 80101382 REVISION NO.: 2

**FORM 1  
CONFIGURATION CHANGE COVER SHEET**

CHANGE PACKAGE TYPE:  Document Change (DCR)  Equivalent  Design  Commercial

**IF DCR**, SPECIFY TYPE:  Administrative  Equivalent  Design  Commercial

**IF NOT DCR**, IS THIS AN ADVANCE WORK AUTHORIZATION (REVISION 0 OR GREATER)? YES  NO

TITLE: Salem Unit 1 12/14 AF Piping Reroute

STATION/ UNIT:  Hope Creek  Salem 1  Salem 2  Salem 3  Salem Common  
 Salem/Hope Creek  Other Owner facility

CLASSIFICATIONS: Important-to-Safety: YES  NO  N/A

[Salem] Q-Listed YES  NO  N/A

[Hope Creek] Q  Qs  Qsh  F  R  N/A

**PREPARER**

RESPONSIBLE ENGINEER/PREPARER (Print Name) Matthew J. Griffiths	COMPANY Sargent & Lundy LLC	PHONE (Include Area Code) 302-778-6656
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**REVIEWERS/APPROVERS:** (Type **ONLY** an SAP Operation Number (if "N/A", leave blank) below each reviewer/approver task corresponding to its SAP Final Confirmation (electronic signature) for completion of that Operation.)

PEER REVIEWER	INDEP. DESIGN REVIEWER 0119	INDEPENDENT COLLEGIAL/CHALLENGE REVIEW BOARD LEAD or DESIGN REVIEW BOARD LEAD	
DESIGN ENG'G MGR. (DEM) APPROVAL (Internal packages only)	EXTERNAL PACKAGE CONTRACTOR APPROVAL (External packages only)	OWNER'S NUCLEAR FINAL ACCEPTANCE REVIEW (External packages only)	
		DESIGN ENG'G MGR 0130	LEAD RESP. ENGR (LRE) 0125
INDEP. 3 <sup>RD</sup> PARTY REVIEW	PORC CHAIRMAN	PORC MEETING NUMBER	PLANT MGR. APPROVAL

**DEPARTMENT/SPECIALTY INTERFACE** (type dept OR specialty and Op number only)

Penetration Seal - 0061	Planning - 0060
Operations - 0051	Plant Engineering - 0052
Buried Pipe / Flow Accelerated Corrosion - 0053	In-Service Inspection - 0054
Coatings - 0055	License Renewal - 0056
Mechanical Maintenance - 0057	Maintenance Planning - 0058
Environmental Licensing - 0059	Security - 0009
WCM - 0064	Seismic I - 0065
Pipe Stress - 0066	Code Testing Determination - 0370

J-5

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AFFECTED DOCUMENT (AD) PREPARERS/REVIEWERS/EXTERNAL DESIGN ANALYSIS OWNERS ACCEPTANCE			
DISCIPLINE	PREPARER (Op number only. If "N/A", Leave Blank.)	REVIEWER (Op number only. If "N/A", Leave Blank.)	EXTERNAL DESIGN ANALYSIS OWNERS ACCEPTANCE REVIEW
Civil/ Structural (S)	0105	0106	0107
Digital (K)			
Electrical (E)			
Instrument & Controls (I)			
Mechanical (M)	0108	0109	0110
Pipe Stress/ Supports (H)	0111	0112	0113
Programmatic (P)			

**FORM 2  
CONFIGURATION CHANGE TABLE OF CONTENTS**

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<u>10CFR50.59 Forms Attachment</u>	<u>Attachment</u>
(Attach Forms that apply as separate file – do not page number with package)	YES <input checked="" type="checkbox"/>
(Include completed 10CFR50.59 Forms for Design Changes and Design Change DCRs. Revise independently from package, if needed)	NO <input type="checkbox"/>

**LIST ANY SUPPLEMENTAL RECORDS SUBMITTED FOR SCANNING:**

- SUP01 – 80101382 AWA #1 FORM 8 (Issued by Rev. 0)

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- SUP02 – Existing 12/14 Steam Generator AF Supply Piping Demolition and Abandonment (Issued by Rev. 0)

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- SUP03 – Penetration Seal Work Releases (Issued by Rev. 0)

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- SUP04 – 80101382 AWA #2 FORM 8 (Issued by Rev. 1)

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- SUP05 – 12/14 Steam Generator AF Supply Piping Isometric Sketch (Issued by Rev. 1)

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- SUP06 – 12/14 Steam Generator AF Supply Piping Arrangement Sketch (Issued by Rev. 1)

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- SUP07 – 12/14 Steam Generator AF Supply Piping Weld Maps (Issued by Rev. 1)

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- SUP08 – 12/14 Steam Generator AF Supply Piping Support Location Sketch (Issued by Rev. 1)

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- SUP09 – 12/14 Steam Generator AF Supply Piping Support Details (Issued by Rev. 1)

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- SUP10 – 12/14 Steam Generator AF Supply Piping Support Weld Maps (Issued by Rev. 1)

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SUP11 – Preliminary Pipe Stress and Support Calculations

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SUP12 – Label Requests

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SUP13 – FTTA Roof Missile Protection Layout

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SUP14 – Potential Missile Angles

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SUP15 – FTTA Missile Protection Computations (DRAFT)

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SUP16 – Encrete WS Product Description

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SUP17 – Vertical Missile Shields

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**FORM 3  
SUMMARY****Revision History**

This Design Change Package (DCP) documents the installation of the rerouted No. 12 and 14 Auxiliary Feedwater (AFW) supply headers located in the Salem Unit 1 Fuel Transfer Tube Area (FTTA). The following revision summary explains the sequence of events for the installation of this modification.

**Revision 2 – OWDs Issuance, Testing, and Turnover to Operations**

This revision documents the engineering basis for rerouting the No. 12 and 14 AFW supply headers located in the Salem Unit 1 FTFA. This revision represents the complete DCP with issuance of all necessary Operations Working Documents (OWDs) and testing requirements for turnover to Operations.

**Revision 1 – AWA #2 Piping Reroute Details and New Piping Support Details**

This AWA provides details for the following:

- rerouting the 12 Steam Generator AFW supply piping in the Salem Unit 1 Auxiliary Building Mechanical Penetration Area, El. 78'-0" and in the Salem Unit 1 FTFA to mate with the piping replaced per Equivalent Change Package (ECP) 80101381.
- fabrication and installation of associated 12 Steam Generator AFW supply piping supports
- installation of penetration seal S-15437-012 (reference 80101382 - P01)
- rerouting the 14 Steam Generator AFW supply piping in the Salem Unit 1 Auxiliary Building Mechanical Penetration Area, El. 78'-0" and in the Salem Unit 1 FTFA to mate with the piping replaced per ECP 80101381.
- fabrication and installation of associated 14 Steam Generator AFW supply piping supports
- installation of penetration seal S-15437-011 (reference 80101382 - P01)

**Revision 0 – AWA #1 Core Bore Locations Through Wall S-15437 and Cutting, Demolition and Abandonment of Existing 12/14 Steam Generator AFW Supply Piping**

This AWA provides details for two new 6" core bores from the Salem Unit 1 FTFA through wall S-15437 into the Salem Unit 1 Auxiliary Building Mechanical Penetration Area, Elevation 78'-0". The AWA also provides details for cutting, demolition and abandonment of existing 12 and 14 Steam Generator AFW supply piping.

**I.(a.) Description of Change (Problem that the Change was intended to address):**

Guided wave and ultrasonic testing inspections of the buried 4" diameter No. 12 and 14 Auxiliary Feedwater (AFW) piping between the Salem Unit 1 Inner Mechanical Piping Penetration Area and Fuel Transfer Tube Area (FTTA) revealed general corrosion and pipe wall thinning below code allowable wall thickness. The results of the guided wave and ultrasonic testing inspections are documented in Notifications 20456999, 20457262, 20457854, 20458568, 20459204, and 20459691, amongst others. As such, this DCP provides the engineering justification for replacement and rerouting of the piping in the Salem Unit 1 Inner Mechanical Piping Penetration Area and rerouting of the piping above ground in the FTTA.

**I.(b.) Design Margin Impact (provide brief description. Identify Design Analyses impacted):**

Mechanical

S-C-AF-MDC-1789, Salem Auxiliary Feedwater Thermal Hydraulic Flow Model

A minor revision to calculation S-C-AF-MDC-1789 reflects the rerouted piping in the Salem Unit 1 Inner Mechanical Piping Penetration Area and FTFA. This revision also reflects the use of elbows and mitered pipe joints instead of 5D pipe bends in the replacement piping immediately downstream as documented in ECP 80101381.

This calculation revision documents an insignificant net increase in hydraulic resistance compared to the total resistance of the system. The impact on design margin in this calculation is negligible.

Structural

6S0-1889, Design Basis Evaluation of Critical Auxiliary Building Walls

A minor revision to calculation 6S0-1889 reflects two new 6" diameter core bores through the S-15437 wall between the Salem Unit 1 Auxiliary Building Mechanical Penetration Area, El. 78'-0" and the FTFA, El. 100'-0". For conservatism, an 8" diameter core bore is analyzed in the revision. The analysis determined that cutting two rebar in each face in each direction of the wall is acceptable without compromising available design margin. Cutting embedded steel is also acceptable.

Pipe Stress / Pipe Supports

Revised pipe stress calculations reflecting loads from new pipe routes:

267274D

267274D\_Sim

These pipe stress calculations analyze the re-routed piping with the ME101 pipe stress program for deadweight, thermal, and seismic loads. All re-routed piping meets all code allowables. There is significant margin in all stresses (the maximum stress ratio is .424).

Revised pipe support calculations reflecting loads from new pipe routes:

1P-12AFWA-0029

1P-14AFWA-0029  
1P-12AFWH-0030  
1P-14AFWH-0030  
1P-12AFWA-0031  
1P-14AFWA-0031

New pipe support calculations reflecting new supports:

1P-12AFWG-4626  
1P-14AFWG-4626  
1P-12AFWG-4627  
1P-14AFWG-4627  
1P-12AFWG-4628  
1P-14AFWG-4628  
1P-12AFWG-4629  
1P-14AFWG-4629  
1P-12AFWG-4630  
1P-14AFWG-4630  
1P-12AFWG-4631  
1P-14AFWG-4631  
1P-12AFWG-4632  
1P-14AFWG-4632  
1P-12AFWG-4633  
1P-14AFWG-4633  
1P-12AFWG-4634  
1P-14AFWG-4634

All the supports (both re-analyzed and new) meet the current design criteria for the loading developed.

There are five different support designs for the rerouted / replacement piping. The bounding loads for each of the five different supports have been analyzed and found acceptable (refer to SUP11). In addition, the pipe stress runs have been reviewed and found acceptable prior to approval of Revision 2 of this DCP (refer to SUP11). A separated calculation for each pipe support will be issued following issuance of the DCP.

SAP Operation 80101382-0240 track the approval of these calculations.

## II. Scope of Change:

This is an emergent DCP due to discovery of unacceptable conditions of sections of the Unit 1 AFW piping as documented in Notifications 20456999, 20457262, 20457854, 20458568, 20459204, and 20459691, amongst others.

The scope of this DCP is the replacement and rerouting of a section of buried 4" diameter Steam Generator Auxiliary Feedwater supply piping and installation of new pipe supports at Salem Unit 1.

The following provides the overall scope of the DCP:

- Cut, cap and abandon in-place, the existing buried 4" diameter No. 12 and 14 Steam Generator Auxiliary Feedwater supply piping from the Salem Unit 1 Mechanical Penetration Area through the FTFA.
- Reroute the existing buried No. 12 and 14 Steam Generator AFW supply piping above grade from the Salem Unit 1 Mechanical Penetration Area, El. 78'-0" through the Salem Unit 1 FTFA at El. 100'-0".
- Install one new high point vent valve on each AFW header in the FTFA.
- Relocate the 12/14AF123 low point drain valves on the respective AFW header in the FTFA.
- Install two 6" inch diameter through-wall penetrations in wall S-15437 between the Salem Unit 1 Mechanical Penetration Area and Salem Unit 1 FTFA to route the new piping.
- Install penetration seals at new wall penetrations S1FLB-S-15437-0011 and S1FLB-S-15437-0012.
- Install tornado missile shields at the vertical seismic gap between Salem Unit 1 Fuel Handling Building and Unit 1 Containment Building as well as over the roof drain on the Salem Unit 1 FTFA roof (El. 115'-0").

Note: The replaced piping addressed in this DCP will tie-in to the buried AFW piping replaced in-kind which is addressed in ECP 80101381.

Due to the emergent nature of this DCP, final updates of non-P1/P2 drawings will be performed by revising the applicable ADs. SAP operation 80101382-0240 tracks this activity.

### III. Screenings

- (a.) For Commercial Changes, was the screening criteria of CC-AA-103 Attachment F satisfied? YES  NO  N/A   
[If Attachment F is not satisfied, another change type is required.]

The screening criteria of CC-AA-103 Attachment F is not satisfied; at a minimum question #5 is a "Yes" answer (the portion of the AFW piping replaced by this DCP is Safety Related, Nuclear Class 3), thus a Commercial Change is not the appropriate Configuration Change type.

- (b.) For Equivalent Changes, was the screening criteria of CC-AA-103 Attachment G satisfied? YES  NO  N/A   
[If Attachment G is not satisfied, another change type is required.]

The screening criteria of CC-AA-103 Attachment G is not satisfied; at a minimum question #5 is a "Yes" answer (the addition of one new high point vent valve on each AFW header in the FTFA), thus an Equivalent Change is not the appropriate Configuration Change type.

**HU-AA-1212 Review**

A review per procedure HU-AA-1212, Technical Task Risk/Rigor Assessment, Pre-Job Brief, was performed for this DCP. A single Consequence Risk Factor (C.14 "Adverse Impact on Outage) was determined to apply to this DCP. Since this Risk Factor has a "Low Severity Level," the Risk Rank is "1" and existing process reviews can be used.

**FORM 4**  
**SOLUTION / TECHNICAL EVALUATION**

Section	Design Change Attribute
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4.1.4.1. IDENTIFY Basic SSC Functions

Auxiliary Feedwater (AFW) System

Per UFSAR Section 10.4.7.2, the AFW System serves as a backup system for supplying feedwater to secondary side of the steam generators at times when the Main Feedwater System is not available. The AFW System is relied upon to prevent core damage and system overpressurization in the event of accidents such as a loss of normal feedwater or a secondary system pipe rupture, and to provide a means for plant cooldown. The AFW System is capable of functioning for extended periods, allowing time either to restore normal feedwater flow or to proceed with an orderly cooldown of the plant to design temperature of the Residual Heat Removal (RHR) System. The AFW System flow and the water supply capacity is sufficient to remove core decay heat, reactor coolant pump heat, and sensible heat during the plant cooldown.

Provisions are made to limit or terminate auxiliary feedwater flow to the affected loop 1) in the case of feedwater line break to ensure adequate flow to the effective steam generators and 2) in the case of a steam line break inside containment, to also limit the containment pressure.

Plant conditions which form the basis for AFW System performance requirements are the following:

1. Loss of main feedwater transient (with and without offsite power)
2. Feedline rupture
3. Steamline rupture
4. Loss of all ac power
5. Loss-of-coolant accident (LOCA)
6. Plant cooldown

The rerouted/replacement piping addressed in this DCP does not affect the design basis functions defined for the AFW system.

Salem Unit 1 Auxiliary Building

The Auxiliary Building is a Category I structure that contains both safety and non-safety related equipment. It is located between the two Containment Buildings, the Fuel Handling Buildings and the Turbine Building.

The equipment in the Auxiliary Building is associated with the Emergency Core Cooling Systems and other supporting equipment for the reactor.

The rerouted/replacement piping addressed in this DCP is in part, supported by the Auxiliary Building. This does not affect the design basis functions defined for the Auxiliary Building.

Section	Design Change Attribute
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New Penetration Seals S-15437-011 and S-15437-012

Penetration seals S-15437-011 and S-15437-012 ensure water cannot enter the Salem Unit 1 Auxiliary Building Mechanical Penetration Area El. 78'-0" from the FTTA during normal conditions or under the static flood loading from flooding as defined in 3.4 of the Salem UFSAR. These seals are installed in accordance with procedures SH.MD-SP.FBR-0012 and SH.MD-SP.FBR-0014 and VTD 311694.

Salem Unit 1 Fuel Handling Building

The Salem Unit 1 Fuel Handling Building (FHB) is a Category I structure and it is located directly West of Salem Unit 1 Containment structure. The main function of the FHB is to receive new fuel, store both new and spent fuel, and place spent fuel in dry cast storage containers. Plant components in the FHB include the FHB Overhead crane, new fuel storage racks, new fuel elevator, Spent Fuel Pool and Spent Fuel Pool components such as heat exchangers, cooling pumps, and a skimmer system.

The rerouted/replacement piping addressed in this DCP is in part, supported by the FHB. This does not affect the design basis functions defined for the FHB.

Salem Unit 1 Containment

The Salem Unit 1 Containment structure is the primary Category I structure at the plant. The majority of the Nuclear Steam Supply System (NSSS) systems are located in it.

The Salem Unit 1 Containment structure consists of a concrete structure reinforced with steel tendons on the sides and the dome. The reinforcement provides the necessary structural strength to withstand the internal pressure of the worst case loss of coolant accident.

In order to prevent air leakage from containment to the outside atmosphere, there is an internal 1/4" carbon steel liner. The liner is the actual air barrier while the concrete walls provide support to the liner.

In order to ensure that the containment liner remains intact under all conditions, a missile barrier shields the containment liner. The purpose of the missile barrier is to prevent damage to containment liners and to the Emergency Core Cooling Systems if a failure occurs in a high energy level Reactor Coolant System component. This physically divides the center of containment into two separate areas; Inside Missile Barrier and Outside Missile Barrier. There are many penetrations through the containment walls. Two of the largest of these penetrations are the Equipment Hatch and the Personal Airlock. In addition, there is a penetration for moving fuel in and out of containment as well as penetrations for piping and electrical cables.

Containment is required to be capable of performing its design function when the plant is in Modes 1, 2, 3, and 4. This translates into any time the Reactor Coolant System is greater than 200°F.

The existing/ abandoned piping which is addressed in this DCP is in part, supported by the Salem Unit 1 Containment structure. This does not affect the design basis functions defined for the Salem Unit 1 Containment structure.

Section	Design Change Attribute
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4.1.4.2. IDENTIFY Configuration Change safety classification.

The subject AFW piping and associated components are classified as safety related, Nuclear Class 3 per P&ID 205236, sht 001.

Penetration Seal S1FLB-S-15437-011 and S1FLB-S-15437-012 are non-safety related per SAP.

The Salem Unit 1 Auxiliary and Fuel Handling Buildings along with the Containment structure are safety related (ref UFSAR Section 3.2).

4.1.4.3. IDENTIFY Seismic Classification of the SSC.

The subject AFW piping and associated components are classified as safety related, Nuclear Class 3, Seismic Class 1 per P&ID 205236, sht 001.

Penetration seals S1FLB-S-15437-011 and S1FLB-S-15437-012 are both Seismic Class 2 per SAP.

The Salem Unit 1 Auxiliary and Fuel Handling Buildings along with the Containment structure are Seismic Class 1 (ref UFSAR Section 3.2).

4.1.5. PROVIDE the performance requirements and design conditions of the SSC needed to evaluate the change from the existing to the modified systems, structures, or components.

Piping Replacement:

Per Salem Piping Specification S-C-MPOO-MGS-0001 Schedule SPS54 Group E, the AFW system piping is A106 Gr. B, sch. 80, seamless carbon steel. The normal and maximum operating conditions of the portions of piping address by this DCP are as follows:

Operating Conditions	
Normal Pressure (psig)	1195
Max. Pressure (psig)	1950
Normal Temperature (°F)	140
Max. Temperature (°F)	140

The rerouted/replacement piping addressed in this DCP meets all requirements of S-C-MPOO-MGS-0001 Schedule SPS54E.

Pipe Stress and Supports:

The new rerouted/ replacement piping and piping supports are designed to withstand the Maximum Probable Hurricane Flooding level as defined in Section 3.4 of the Salem UFSAR. Wave run up is not a factor because the piping is within a structure (the Unit 1 FTTA) and therefore protected from wave run up. The new rerouted/ replacement piping is Seismic Category I and the supports are designed to withstand the necessary loads.

Section	Design Change Attribute
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New Penetration Seals S1FLB-S-15437-011 and S1FLB-S-15437-012:

Penetration seals S1FLB-S-15437-011 and S1FLB-S-15437-012 need to withstand the Maximum Probable Hurricane Flooding level as defined in Section 3.4 of the Salem UFSAR. Wave run up is not a factor because the penetrations are within a structure (the Unit 1 FTFA and Unit 1 Auxiliary Building) and therefore protected from wave run up. The new penetration seals are Seismic Category II and are designed to withstand the necessary loads.

- 4.1.6. DETERMINE the design requirements necessary to facilitate periodic surveillance testing and acceptance testing that is necessary for the Configuration Change being considered.

The following acceptance testing is required on the AF system piping for this replacement:

- Perform Non-Destructive Evaluation (NDE) of welds in accordance with CC-AA-501, Welding/Brazing Manual.
- Perform cleanliness verification of piping in accordance with NC.CH-AP.ZZ-0021(Q), System Cleanliness Program.
- ASME Section XI only requires a system leakage test at normal operating pressure (NOP) and normal operating temperature (NOT).  
**Note:** To expedite backfill of the pipe trench, a system pressure test IAW SC.MD-GP.ZZ-0035(Q) may be performed on the piping that mates up to the piping being replaced on ECP 80101381 in lieu of the in service leak test at NOP/NOT. Acceptance test criteria shall be in accordance with procedure SC.MD-GP.ZZ-0035(Q) and ECP 80101381.
- A system pressure test IAW SC.MD-GP.ZZ-0035(Q) may be performed on in lieu of the in service leak test at NOP/NOT.
- Perform holiday testing of pipe coating in accordance with ASTM D 5162.

- 4.1.7. DETERMINE the Codes, Standards, and Regulatory Requirements applicable to the Configuration Change.

The AF piping replaced by this DCP is designed to Salem Piping Schedule SPS54 Group E, Seismic Class 1, Nuclear Class 3. In accordance with Technical Standard ND.DE-TS.ZZ-3005, the piping shall be fabricated, installed and inspected to the requirements of ANSI B31.7, Nuclear Power Piping Code, 1969.

- 4.1.8 IDENTIFY PWR Sump GL 2004-02 Program (Generic Safety Issue 191) impacts.  
(Salem ONLY)

N/A

- 4.1.9. DETERMINE changes required to existing Design Analysis or new parameters that require new calculations or calculation revisions that are used to assess the acceptability of a system or a component function in meeting various physical requirements.

Section	Design Change Attribute
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Mechanical

S-C-AF-MDC-1789, Salem Auxiliary Feedwater Thermal Hydraulic Flow Model

A minor revision to calculation S-C-AF-MDC-1789 reflects the rerouted piping in the Salem Unit 1 Inner Mechanical Piping Penetration Area and FTFA. This revision also reflects the use of elbows and mitered pipe joints instead of 5D pipe bends in the replacement piping immediately downstream as documented in ECP 80101381.

Comparison of the replacement AFW piping for 12 and 14 Steam Generators with the current piping in the AFW hydraulic model was performed. There is a net addition of 8-9 feet and four 90° elbows along with a net reduction of three 45° elbows. The net increase in hydraulic resistance ( $K \sim 1$  based on a friction factor of 0.02) is insignificant compared to the total resistance of the system. The length of pipe alone from the AFW pumps to the Outer Penetration Area is estimated to be approximately 350 ft (this estimated does not include the length of pipe from the AFWST to the pumps or the other valves and fittings).

The impact on design margin in this calculation is negligible.

Structural

6S0-1889, Design Basis Evaluation of Critical Auxiliary Building Walls

A minor revision to calculation 6S0-1889 reflects two new 6" diameter core bores through the S-15437 wall between the Salem Unit 1 Auxiliary Building Mechanical Penetration Area, El. 78'-0" and the FTFA, El. 100'-0". For conservatism, an 8" diameter core bore is analyzed in the revision. The analysis determined that cutting two vertical rebar in the South face of the wall (which is provided with #11 rebar on 6" centers) and two rebars in the North face of the wall (which is provided with #11 rebar on 12" centers) along with cutting one horizontal rebar on each face for the two core bores is acceptable without compromising available design margin.

Boring through embedded plates is acceptable (reference 60089798-0040-0010).

Pipe Stress / Pipe Supports

Revised calculations reflecting loads from new pipe routes:

267274D  
267274D\_Sim  
1P-12AFWA-0029  
1P-14AFWA-0029  
1P-12AFWH-0030  
1P-14AFWH-0030  
1P-12AFWA-0031  
1P-14AFWA-0031

New calculations reflecting new supports:

1P-12AFWG-4626  
1P-14AFWG-4626

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- 1P-12AFWG-4627
- 1P-14AFWG-4627
- 1P-12AFWG-4628
- 1P-14AFWG-4628
- 1P-12AFWG-4629
- 1P-14AFWG-4629
- 1P-12AFWG-4630
- 1P-14AFWG-4630
- 1P-12AFWG-4631
- 1P-14AFWG-4631
- 1P-12AFWG-4632
- 1P-14AFWG-4632
- 1P-12AFWG-4633
- 1P-14AFWG-4633
- 1P-12AFWG-4634
- 1P-14AFWG-4634

4.1.10. If Redundancy, Diversity and Separation requirements are identified or affected, then REVIEW the original design basis as well as any subsequent modifications.

N/A

4.1.11. IDENTIFY any Failure Effects requirements.

N/A

4.1.12. IDENTIFY Fire Protection and Appendix R Safe Shutdown requirements, by using the "Screening for Approved Fire Protection Program (AFPP) Impact", CC-AA-102, Attachment 2.

N/A – CC-AA-102, Attachment 2 was reviewed for this CP and did not provided any "yes" answers. Therefore there are no Fire Protection and Appendix R requirements impacted by this modification.

4.1.13. DETERMINE any Material requirements, such as material grade, product form, compatibility with existing or other new materials, galvanic interaction between dissimilar metals, special welding material requirements, critical properties, performance characteristics, alternative materials as well as any Material Suitability requirements such as compatibility, electrical insulation properties, protective coating, corrosion resistance, mechanical insulation etc. necessary for the Configuration Change.

All material quantities and material masters required for implementation are provided in Form 7 of this DCP.

Section	Design Change Attribute
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Piping Material

The piping materials used for replacement must comply with PSEG specification S-C-MPOO-MGS-0001 piping schedule SPS54 Group E. The piping group reference is found on P&ID 205236 sht. 001.

Welded Joints

Joints for the replacement must comply with PSEG specification S-C-MPOO-MGS-0001 piping schedule SPS54 group E.

Heat treatment, welding and brazing shall be in accordance with CC-AA-501, Welding/Brazing Manual.

Pipe Coating

All piping up to El. 100'-0" must be coated PRIOR to system restoration to prevent piping corrosion. The coating types available for this application as well as vendor suggested prep methods are provided in SUP16. The coating has been used in various other systems such as service water at Hope Creek and Salem.

The CICIPs for the available coating types are as follows:

- CICP 200-1969
- CICP 200-2046

The piping that is above El. 100'-0" should, as a minimum, be painted/coated to prevent corrosion. These sections of the piping shall be coated in accordance with NC.MD-AP.ZZ-0001, Station Coatings Program.

Containment Wall Coating

Prior to reburial of the piping, the containment wall should be coated with Enecrete WS. See SUP16 for product description and vendor suggested application methods. The CICIP for Enecrete WS concrete sealant is 200-1948. See Section 4.1.38.

4.1.14. Determine environmental conditions and impacts.

N/A – There are no environmental conditions or impacts because the AFW system piping rerouted/replaced is inside the FTTA. Furthermore the process fluid is demin water, only.

**Note:** This package revision installs the aux feed piping in the FTTA which is not environmentally controlled. SAP operation 80101382-0380 has been assigned to track the review of potential environmental controls for this area. This is to take place prior to cold weather. This review will be documented and implemented (if required) in a future revision and does not currently impact the system.

4.1.15. DETERMINE if Environmental Qualification (EQ) of equipment is affected. (Use Attachment 3 of CC-AA-102 to determine impact)

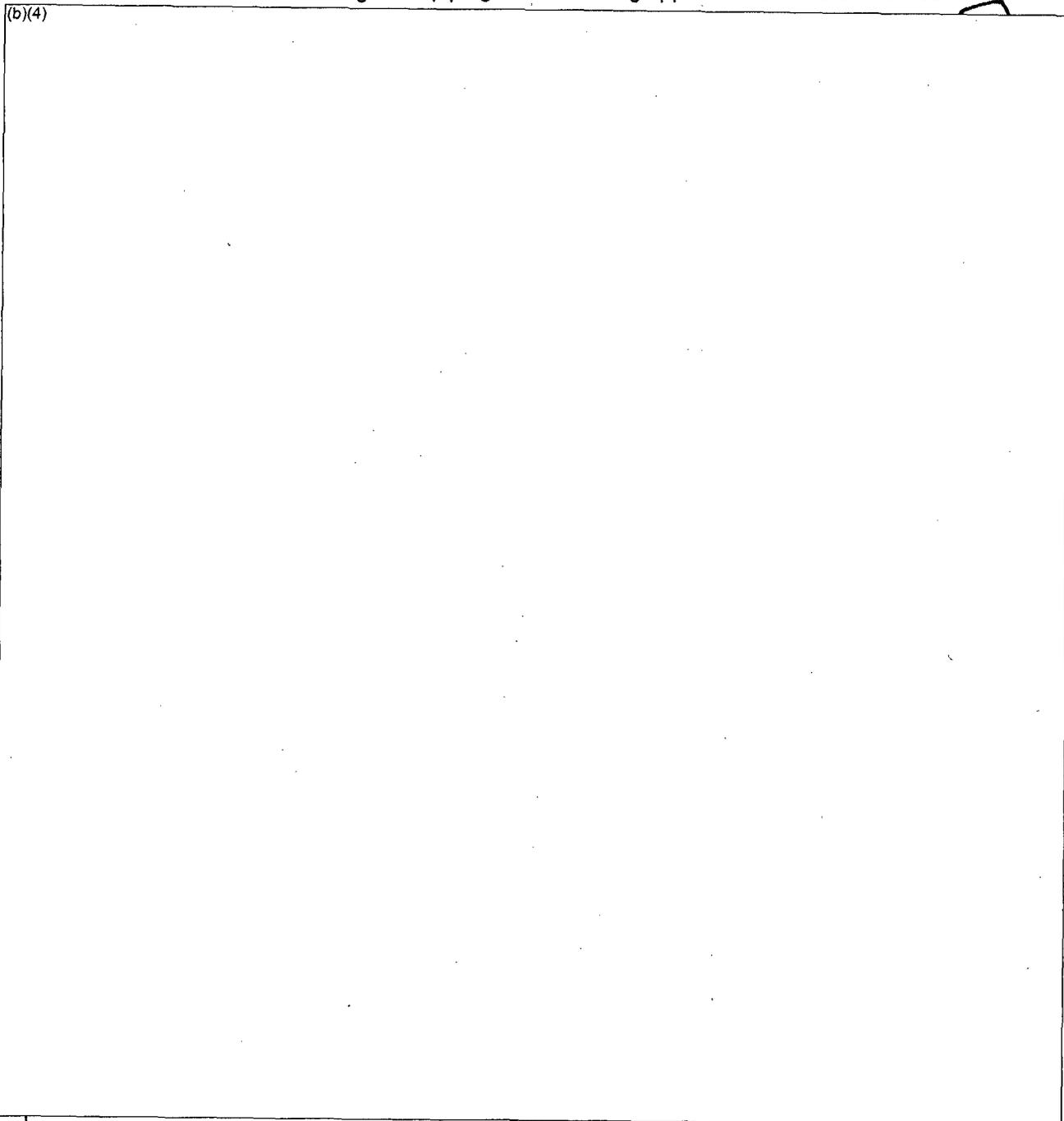
N/A

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4.1.16. REVIEW the Operating Experience databases through the INPO Internet Site or equivalent in accordance with LS-AA-115:

An Operating Experience (OE) review/search was conducted including early NRC and INPO documents on buried and underground piping. The following applicable OEs have been found:

(b)(4)



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- 4.1.17. DETERMINE if the configuration change may affect the existing Equipment Performance Information Exchange (EPIX) database.

N/A – Piping vents and drain valves are below the level detail in the EPIX database.

- 4.1.18. DETERMINE if the Configuration Change may affect the existing Probabilistic Risk Assessment (PRA), Mitigating System Performance Index (MSPI) Basis Document PRA content, and shutdown risk models by using the screening checklist in CC-AA-102, Attachment 4.

Attachment 4 of CC-AA-102 has been reviewed for this DCP and did not provided any "yes" answers. Therefore this section is not applicable to this modification.

- 4.1.19. EVALUATE if System Operational Requirements have changed.

The 12/14AF123 low point drain valves are relocated from the Unit 1 Mechanical Penetration area, El. 78'-0" to the FTTA, El. 100'-0". In addition, a new high point vent valve is added to each of the 12 and 14 Steam Generator AFW supply lines (12/14AF155). The new vent valves are located in the FTTA El. 100'-0".

The area code 02-04 (S/G Blowdown Tank Area, El. 100'-0") is expanded to encompass the FTTA. Drawing 601674 sht. 001 is updated to reflect this expansion.

- 4.1.20. IDENTIFY any Human Factors requirements.

N/A

- 4.1.21. IDENTIFY procedure changes per direction in CC-AA-102, Attachment 9 and Attachment 9A of CC-AA-102-1001.

Updating procedure S1.OP-SO.AF-0001 to include the new high point vent valves, 12AF155 and 14AF155, is tracked by SAP Operation 80101382-0230.

Updating procedure S1.OP-ST.AF-0006 to revise the use of relocated low point drain valves, 12AF123 and 14AF123, is tracked by SAP Operation 80101382-0231.

- 4.1.22. IDENTIFY any changes or additional training requirements for various departments, per direction in CC-AA-102, Attachment 9 and Attachment 9B of CC-AA-102-1001.

N/A

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- 4.1.23. CONSIDER the functional and physical system interface requirements, including the affect of cumulative tolerances between the subject system or component and adjacent or related support systems, structures, and components that may have been affected by the Configuration Change.

The AFW system provides a back-up supply of water to the Steam Generators and is also used during normal startup and shutdown. The AFW system does not directly interface with the Steam Generators, instead the AFW system provides water to the Steam Generators through the Feedwater system piping located downstream of the AF23 stop check valves and the BF22 check valves. The rerouted/ replacement piping addressed in this DCP does not affect the AFW system interface with the Feedwater system and does not adversely affect the AFW system's ability to provide the Steam Generators with the required supply of water. A revision to S-C-AF-MDC-1789 ensures that the proper amount of flow is maintained (refer to the discussion in sections 4.1.9 and 4.1.33 for a more detailed discussion of hydraulic calculations).

The Fuel Handling Building and Mechanical Penetration Area structures (i.e. walls) have been evaluated using widely accepted standards and specifications (i.e. AISC manual of Steel Design, Salem Structural Design Criteria). There are no adverse effects from attaching the designed pipe supports to these walls. Also, there is no adverse affect from core boring the two new penetrations.

- 4.1.24. DETERMINE specialized layout and arrangement requirements, such as protection from normal vehicle traffic flow, or physical location preferences that minimize plant operating requirements for both the structures and systems being modified, and adjacent equipment.

#### Designed Pipe Slope

The Salem Unit 1 12/14 AFW piping located in the yard (replaced in-kind as addressed in ECP 80101381) is sloped 0.025 inches per foot from South Penetration Area wall penetrations S1FLB-W-19401-006 and S1FLB-W-19401-008 towards the stub wall on the South side of the FTFA. To avoid redesign of the existing pipe supports which are attached to the Salem Unit 1 Containment wall, the horizontal, rerouted/ replacement piping in the Unit 1 FTFA (at elevations 105'-0" and 104'-0") is sloped 0.025 inches per foot towards the stub wall on the South side of the Unit 1 FTFA. The designed pipe slope allows for proper drainage reroute/ replacement piping in the Unit 1 FTFA at the stub wall on the South side of the Unit 1 FTFA. This also provides a common location for drainage of the yard piping.

#### Relocated Drain Valves

Drain valves 12/14AF123 are relocated from the Unit 1 Mechanical Penetration Area to the Unit 1 FTFA – the new low point in the system piping. These valves are relocated to facilitate draining of the yard piping and the rerouted / replacement piping in the Unit 1 FTFA. Due to the configuration of unrelated system piping in the vicinity of these drains, the drain lines required routing to available space. A vacuum pump must be used to properly drain these lines. This direction is included in the WCM updates provided with the DCP.

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New Vent Valves

Vent valves 12/14AF155 are added to the highpoint of the rerouted/ replacement piping in the Unit 1 FTFA. The addition of these valves facilitates AFW system venting in compliance with the Institute of Nuclear Power Significant Event Report 2-05, "Gas Intrusion In Safety Systems".

External Flooding

Due to the rerouted/ replacement piping's location above grade as opposed to the below grade in the Unit 1 FTFA, the rerouted/ replacement piping is now susceptible to external flooding. However, because the Unit 1 FTFA is enclosed, the rerouted/ replacement piping is not susceptible to the dynamic wave run-up loads described in Section 3.4 of the Salem UFSAR. The rerouted/ replacement piping is only susceptible to the static head of the Probably Maximum Hurricane surge level for the site. The rerouted/ replacement piping stress and support calculations are analyzed for this flood loading. The results of these analyses are acceptable. Refer to section 4.1.9 and 4.1.33 for a discussion of the individual calculations.

Vulnerability to Tornado Generated Missiles

Routing of the piping above grade in the Fuel Tube Transfer Area (FTFA) exposed the piping to potential tornado generated missiles from either the roof or the south wall. The roof and the wall consist of 24" concrete (reference drawing 201083 and 207483). These walls are greater than the 18" thickness that is specified in FSAR Section 3.5.2.2 for tornado missile protection so the area is protected from a tornado generated missile of a 40 foot pole 12" in diameter. However, there are 4" and 6" seismic gaps that are filled with styro-foam in which a tornado generated missile consisting of a 1" diameter steel rod 3 feet long can potentially penetrate. The 6" gap is between the roof or the FTFA and the containment wall. The 4" gap is on the south wall (reference drawing 207808).

A review of potential entry paths was conducted. It was determined that the entry from the south gap was possible. This missile could enter from the vertical expansion joint located in the south wall of the room. This joint is 4 inches wide and runs from grade to the roof. Drawing 80101382R2 SUP14R0 shows that the missile could enter horizontally through this gap. In order to protect against this missile an A-36 steel plate is placed across the expansion joint. This plate is only bolted on one side of the joint to allow seismic movement. A review of potential strikes through the roof 6" gap was completed. It was determined that there is the potential for a steel rod as specified in the FSAR to pass through the gap and strike one of the Aux Feed Pipes. Based on this assessment, steel plate will be placed in the seismic gap to prevent the tornado generated missile from striking the piping. Determination of the plate thickness was completed based on the method described in FSAR section 3.5.2.2 and is in SUP15.

- 4.1.25. DETERMINE if the Radiation Protection/ALARA programs are affected by review of changes that affect any of the following during normal or post accident conditions: Radiation sources; changes affecting controlled radiation areas; primary coolant fluid systems (Cobalt Materials); contaminated systems; radiation monitoring systems; HVAC Systems which could transport airborne contaminants; change or alter shielding. Use CC-AA-102, Attachment 5 to determine impact.

**IMPORTANT:** The Unit 1 FTFA is a locked area which requires RP approval to enter. This area must not be entered during the movement of irradiated fuel.

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- 4.1.26. DETERMINE the need for walkdowns to look at accessibility to the work area(s) and any special installation considerations that need to be addressed during design development.

Walkdowns have been performed to assist in identifying the scope of this replacement and to determine the best location for cut points and new support locations.

- 4.1.27. DETERMINE Accessibility for maintenance, repair and In-Service Inspection (ISI) and In-Service Testing (IST), and the conditions under which these activities will be performed.

The rerouted / replacement piping welds are part of the ISI program. The addition of the welds to the program is tracked by SAP Operation 80101382-0260.

IST is not applicable to the rerouted/ replacement length of piping.

- 4.1.28. DETERMINE handling, storage, cleaning, and shipping requirements, as well as transportability requirements for items which require special handling during transit from supplier to site, from site to vendor (for repair), or from site receiving to final placement in the plant.

N/A

- 4.1.29. DETERMINE the effect of the Configuration Change on existing Emergency Plan or environmental and discharge monitoring that are used to prevent undue risk to public health and safety.

N/A

- 4.1.30. DETERMINE Industrial Safety requirements such as restricting the use of dangerous materials, hazardous chemicals, escape provisions from enclosures, pertinent OSHA requirements, and grounding of electrical systems.

Existing Plant Safety Procedures shall be followed during the implementation of this changes addressed in this DCP. Guidance provided in the PSEG Nuclear Safety Manual (SA-AA-0301) shall be followed.

- 4.1.31. DETERMINE impact on nuclear fuel, core components, core design, reactivity management, criticality control and accountability of nuclear materials as well as transient and / or accident analysis, by using CC-AA-102, Attachment 6.

N/A

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4.1.32. DETERMINE Load Path requirements for installation, removal, and repair of equipment and replacement of major components.

N/A

4.1.33. IDENTIFY Mechanical System Characteristics where design limits are placed on the mechanical properties of a system or components.

#### Hydraulic Impact

The AF piping is replaced in accordance with the material requirements in Salem Piping Schedule SPS54E. The replacement piping follows a rerouted route. The route changes have a negligible impact on the hydraulic resistance of the replaced section of piping.

Comparison of the replacement AFW piping for 12 and 14 Steam Generators with the current piping in the AFW hydraulic model was performed. There is a net addition of 8-9 feet and four 90° elbows along with a net reduction of three 45° elbows. The net increase in hydraulic resistance ( $K \sim 1$  based on a friction factor of 0.02) is insignificant compared to the total resistance of the system. The length of pipe alone from the AFW pumps to the Outer Penetration Area is estimated to be approximately 350 ft (this estimated does not include the length of pipe from the AFWST to the pumps or the other valves and fittings).

#### Pipe Stress and Pipe Supports

The two 4" Auxiliary Feedwater lines that run between the Salem Unit 1 Mechanical Penetration area El. 78'-0" and the buried portion South of the FTTA are replaced and rerouted. These two lines are in stress calculations 267274D and 267274D\_Sim which will be revised. These lines are analyzed with the ME101 pipe stress program for deadweight, thermal, and seismic loads and meet all code allowables.

There is significant margin in all stresses (the maximum stress ratio is .424) – reference SUP11.

There are new supports installed to support the rerouted piping. The new supports use five basic designs (refer to SUP09). These new supports are as follows:

#12 Line Supports	#14 Line Supports
12AFWG-4626	14AFWG-4626
12AFWG-4627	14AFWG-4627
12AFWG-4628	14AFWG-4628
12AFWG-4629	14AFWG-4629
12AFWG-4630	14AFWG-4630
12AFWG-4631	14AFWG-4631
12AFWG-4632	14AFWG-4632
12AFWG-4633	14AFWG-4633
12AFWG-4634	14AFWG-4634

Two anchors are abandoned in place 12AFWH-29 and 14AWFA-29.

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Existing variable supports (12AFWH-30 and 14AFWH-30) are demolished, removed, and deleted from the 12/14 lines

Existing anchors (12AFWH-31 and 14AWFA-31) are reevaluated.

All the supports meet the current design criteria for the loading developed. Refer to SUP11 for the support loads.

New calculations are generated for the new supports. The current anchor calculations will be revised to reflect the new loads. These calculations are tracked by SAP Operation 80101382-0240.

New Penetration Seals

New penetration seals S1FLB-S-15427-011 and S1FLB-S-15427-012 are installed around two new 6" core bores. The new penetration seals are designed to VTD 311694 and 313642 and fabricated using procedure SH.MD-SP.FBR-0012 and SH.MD-SP.FBR-0014. This design is a flanged, flexible boot seat design.

SH.MD-SP.FBR-0014 Attachment 1 is used to fabricate the boot seal flange. The boot seal has at least four 1/4" Tapcon bolts with a minimum embedment of 1", attached to wall S-15437. Per VTD 311694, each Tapcon has a pull out load of 180 pounds. With four Tapcons, the sleeve has a 720 lb capacity.

The maximum Probable Maximum Hurricane (PMH) water surge level is 113.8' per FSAR Section 3.4.3. The penetrations are both 6" in diameter and the penetrating piping is all 4" in diameter. The lowest penetration centerline elevation is 94'-6". Determining the exposed area provides approximately 16 square inches of area. Assuming the maximum elevation of 113.8', the penetration would see approximately 135 pounds of force  $((113.8-94.5)/2.306 \text{ ft/psi} * 16 \text{ sq.in.})$ . Therefore, four Tapcons have sufficient capacity for the penetration.

4.1.34. IDENTIFY Chemistry requirements where limits are placed on the chemical properties of a system or component based upon safety, reliability, ALARA, economics, or other considerations.

N/A

4.1.35. IDENTIFY Electrical requirements where limits are placed on the electrical properties of a system or component.

N/A

4.1.36. IDENTIFY Instrument and Control requirements, including digital technology requirements.

N/A

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- 4.1.37. IDENTIFY Security requirements such as site monitoring, alarm systems, vehicle barrier systems, security and security lighting.

Security has completed the Safety Security screening checklist in SY-AA-500-1001. The work and condition of equipment does not change the safety security interface for security response. (reference SAP Operation 80101382-0009)

- 4.1.38. IDENTIFY Civil/Structural requirements where design limits are placed on the structural properties of a SSC such as equipment foundations and component supports.

Two new 6" core bores are installed through the S-15437 wall between the Salem Unit 1 Auxiliary Building Mechanical Penetration Area El. 78'-0" and the Unit 1 FTTA El. 100'-0".

A minor revision to calculation 6S0-1889 reflects two new 6" diameter core bores through the S-15437 wall between the Salem Unit 1 Auxiliary Building Mechanical Penetration Area, El. 78'-0" and the FTTA, El. 100'-0". For conservatism, an 8" diameter core bore is analyzed in the revision. The analysis determined that cutting two vertical rebar in the South face of the wall (which is provided with #11 rebar on 6" centers) and two rebars in the North face of the wall (which is provided with #11 rebar on 12" centers) along with cutting one horizontal rebar on each face for the two core bores is acceptable without compromising available design margin.

Boring through embedded plates is acceptable (reference 60089798-0040-0010).

The pipe support analysis was performed in accordance with ND.DE-AP.ZZ-0023 (Q), PSEG Programmatic Standard for Pipe Support Design. New components have been design classified in accordance with SC.DE-AP.ZZ-0061, "Design Classification Methodology for Component Data Module, Functional Locations and Systems". The Fuel Handling Building and Mechanical Penetration Area structures (i.e. walls) have been evaluated using widely accepted standards and specifications (i.e. AISC manual of Steel Design, Salem Structural Design Criteria). The pipe supports and building interfaces have been evaluated with respect to the pipe support loads to ensure the structural integrity of the buildings is maintained.

SUP16 contains the product information on the Enecrete WS coating material to be used on the containment exterior wall. The coating for the wall was a 1/16" EPDM rubber liner with a 1/8" hardboard applied to the outside, reference drawing 201007. The rubber liner and hardboard has degraded. Although not stated, the purpose of the 1/8" hardboard appears to be a protective boundary for the rubber liner during backfill and construction activities. The Enecrete WS is a waterproof protection layer for masonry structures. It provides a hardened water proof layer.

- 4.1.39. If the Configuration Change adds, relocates, or alters Seismic Category I mechanical and/or electrical components then ENSURE that the Seismic Dynamic Qualification (SD/Q) of the components has been addressed per CC-AA-320-001.

The rerouted/ replacement piping is all Seismic Category I (reference P&ID 205236 sht. 001). All new piping supports and existing piping supports affected by the rerouted/ replacement

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pipings are Seismic Category I mechanical components. The Seismic Dynamic Qualification (SD/Q) of each of these components is addressed in the related pipe stress calculations and pipe support calculations. Refer to Sections 4.1.9 and 4.1.33 for descriptions of the calculations.

The new vent valves are the same model as vents already installed in the AFW system. These valves are seismic / dynamically qualified Seismic Category I valves. Refer to Form 7 for the valve material masters.

- 4.1.40. DETERMINE Personnel Requirements and Limitations such as the need for trade specialists and engineering experts as well as support personnel, such as Radiation Chemistry technicians, welding technicians with special expertise, use of specific contractor or station procedures for installation or the need for mock-ups for training, installation, or operation.

N/A

- 4.1.41. LIST special procedures and installation specifications that apply, but are not part of the normal installation procedural direction.

N/A

- 4.1.42. DETERMINE Interfacing Department impact of the Configuration Change, such as Operations, Plant Engineering, Training (including Plant Simulator), Maintenance, Reactor Engineering, Radiation Protection and others. Use Attachments 10A through G of CC-AA-102 and Attachment 10 of CC-AA-102-1001.

The line department reviews are documented in the following SAP Operations:

80101382-0051: Operations Review  
 80101382-0052: Plant Engineering Review  
 80101382-0053: Buried Pipe/Flow Accelerated Corrosion Review  
 80101382-0054: In-Service Inspection Review  
 80101382-0055: Coatings Review  
 80101382-0056: License Renewal Review  
 80101382-0057: Mechanical Maintenance Review  
 80101382-0058: Maintenance Planning Review  
 80101382-0065: Seismic I  
 80101382-0066: Pipe Stress

- 4.1.43. CONSIDER impact on License Renewal/Life Extension Projects that may be in process, or may have already been approved.

The impact of this DCP on License Renewal is addressed in the License Renewal program review under SAP operation 80101382-0056.

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The review provided states: the piping is replaced in-kind. There is no new material and environment combination as a result of this DCP.

There is no impact to any License Review Aging Management Program.

- 4.1.44. REVIEW the proposed changes for conformance with requirements of any applicable Nuclear Electric Insurance Limited (NEIL) Insurance Standard, or other appropriate insurance standards.

N/A

- 4.1.45. A comprehensive single point vulnerability (SPV) review of the configuration change shall be performed to ensure the configuration change does not add the potential to cause an unplanned reactor SCRAM.

N/A

- 4.1.46. Impact on Steam Generator Replacement Projects (PWR only)

N/A

- 4.1.47. Determine if the Configuration Change has an impact on Nuclear Cyber Security by using Attachment 14, "Nuclear Cyber Security Considerations Checklist".

N/A

- 4.4. Configuration Control Activities- Use CC-AA-102, Attachment 7 and CC-AA-102-1001, Attachment 7.

The following configuration control activities are applicable to this DCP Attachment 7 of CC-AA-102 and Attachment 7 of CC-AA-102-1001:

Critical Control Room Drawings

The P&IDs for the AFW system are updated to show the new vent valves and relocated drain valves. Prior to turnover to Operations, hard copies must be sent to the control room. These drawings are required to be updated within 15 days. Operation 80101382-0180 tracks this activity.

Procedures

Procedure S1.OP-SO.AF-0001 is revised (refer to section 4.1.21). SAP operation 80101382-0230 tracks this update. Procedure S1.OP-ST.AF-0006 is revised (refer to section 4.1.21). SAP operation 80101382-0231 tracks this update. These procedures must be updated prior to turnover to Operations.

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SAP

New components are added and existing components are relocated. All new FLOCs and Equipment Masters are entered into SAP. In addition, the Component Data Module (CDM) is updated for these components. SAP operation 80101382-0170 tracks this activity.

Labels

New labels are required for the new AF system components. The label request form is provided as SUP12.

WCM

SAP Operation 80101382-0320 is populated with the WCM database revision request forms for this DCP per OP-AA-108-101-1002.

Additional Walkdowns

Per CC-AA-103 Attachment B, an Installer's Walkdown is required. SAP operation 80101382-0095 tracks completion of the Installer's Walkdown.

Bill of Material (BOM)

Refer to Form 7 for a list of materials.

Foreign Material Exclusion (FME) Program

Foreign material exclusion and control shall be maintained in accordance with MA-AA-716-008, Foreign Material Exclusion Program.

Welding Program

Welding shall be in accordance with procedure CC-AA-501, Welding/Brazing Manual.

Plant Barriers Affected

The new penetration seals exist at the Salem Unit 1 Mechanical Penetration Area EI. 78'-0" wall S-15437. Refer to SUP03 of this DCP for the appropriate Penetration Seal Work Releases (PSWRs) for S1FLB-S-15437-011 and S1FLB-S-15437-012.

The piping penetrating penetration seals S1FLB-S-15437-006 and S1FLB-S-15437-008 is abandoned in-place (capped). The penetration seals S1FLB-S-15437-006 and S1FLB-S-15437-008 are reestablished using the existing sleeves and replacement boots in accordance with VTD 311694 and procedure SH.MD-SP.FBR-0012.

- 4.5. Determination of Program Impact - (Use Attachment 8 of CC-AA-102 and Attachment 8 of CC-AA-102-1001)

The following programs are potentially affected by this DCP based on Attachment 8 of CC-AA-102 and Attachment 8 of CC-AA-102-1001:

Buried Piping Program

SAP Operation 80101382-0053 contains the Buried Piping Program Interface.

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Flow Accelerated Corrosion (FAC) Program

SAP Operation 80101382-0053 contains the FAC Program Interface.

ASME In-Service Inspection (ISI) Program

SAP Operation 80101382-0054 contains the ISI Program Interface.

Coatings Program

SAP Operation 80101382-0055 contains the Coatings Program Interface.

License Renewal Program

SAP Operation 80101382-0056 contains the License Renewal Program Interface.

## FORM 5

## PLANNING AND INSTALLATION INSTRUCTIONS AND TESTING CRITERIA

## I. Work Planning Instructions

1. DCP Description:

This Design Change Package reroutes and replaces the Salem Unit 1 AFW piping that runs from Unit Mechanical Penetration Area El. 78'-0" through the Unit 1 Fuel Transfer Tube Area El. 100'-0".

2. Plant Mode(s) Applicability:

The work associated with this DCP may only be performed during Mode 4 (Hot Shutdown), 5 (Cold Shutdown) or 6 (Refueling). The Auxiliary Feedwater is a safety related system governed by Technical Specification 3/4.7.1.2. Per UFSAR Section 10.4.7.2, the Auxiliary Feedwater System serves as a backup system for supplying feedwater to secondary side of the steam generators at times when the Main Feedwater System is not available. The AFW System is relied upon to prevent core damage and system overpressurization in the event of accidents such as a loss of normal feedwater or a secondary system pipe rupture, and to provide a means for plant cooldown. The proposed activity has been appropriately evaluated and determined not to have an adverse impact on any SSC. The proposed activity does not change the design, function or operation of the Auxiliary Feedwater system. Therefore, there are no changes required to the Technical Specifications or Operating License due to the proposed activity.

3. Installation Details:

- Exercise caution when removing the AFW piping so as not to damage other piping that utilizes the same supports.
- Foreign material exclusion and control shall be maintained in accordance with procedure MA-AA-716-008, Foreign Material Exclusion Program.
- System cleanliness shall be maintained in accordance with procedure NC.CH-AP.ZZ-0021, System Cleanliness Program.
- Welding shall be performed in accordance with procedure CC-AA-501, PSEG Welding/Brazing Manual.
- Disposition of excess materials shall be performed in accordance with procedure SM-AA-404-1000, Nuclear Procurement and Control of Materials and Services.
- Prior to plate fabrication, verify that the area underneath sheathing between FTTA and containment building is solid and firm. This may be accomplished by lightly tapping on sheathing, drilling a small hole through sheathing and probing, or other means within the skill of the craft. If verification determines that the area is questionable, contact engineering for disposition. Use caution as the sheathing may contain lead.

AWA #1

Core Bore Instructions:

ENGINEERING HOLD POINT

The core bore locations were inaccessible during the development of this AWA. Verify ALL core bore drawing dimensions in field PRIOR to performing core bores. Also verify that control air piping will NOT interfere with new AFW piping route. Contact Engineering for guidance as necessary.

- All core bores to be done in accordance with NC DE-TS.ZZ-4007. This includes scanning for rebar and marking rebar locations PRIOR to performing core bores. Every effort should be made to miss rebar. If absolutely necessary to cut rebar, cutting a total of two vertical rebar in each face of wall S-15437 and cutting a total of two horizontal bars on each face of wall S-15437 is permissible.
- Perform 6" core bore through the S-15437 wall in accordance with AD P01. The core bore machine can be set up in the Salem Unit 1 FTTA or the Salem Unit 1 Mechanical Penetration Area.

NOTE: Drain piping 12 and 14 Steam Generator AFW supply piping in accordance with appropriate system procedures prior to performing piping cuts.

- Cut Existing 12 Steam Generator AFW Supply Piping Instructions:
- Pin variable support 12AFWH-30 PRIOR to cutting the 12 Steam Generator AFW supply piping. Variable support 12AFWH-30 reference drawing - 226129 sht. 15. Demolish this support as it will not be reused

IMPORTANT: To avoid injury and equipment damage due to falling piping, temporary supporting of the 12 Steam Generator AF supply piping between CUT POINT A and CUT POINT B will be necessary prior to performing cuts. Temporary support may be removed as part of demolition of this piping.

- CUT POINT A - Cut the 12 Steam Generator AF supply piping in the Unit 1 Mechanical Penetration area accordance with SUP02 page 4.
- CUT POINT B - Cut the 12 Steam Generator AF supply piping in the Unit 1 Mechanical Penetration area in accordance with SUP02 page 4.
- CUT POINT C - Cut the 12 Steam Generator AFW supply piping in the FTTA with SUP02 page 3. NOTE: additional excavation of the 12 Steam Generator AFW supply piping in the Salem Unit 1 FTTA as well as additional removal of standing water may be required to perform CUT C.

Demolition of Existing 12 Steam Generator AFW Supply Piping Instructions:

- Demolish all remaining 12 Steam Generator AFW supply piping between CUT A and CUT B.
- Demolish all remaining 12 Steam Generator AFW supply piping downstream of CUT A and CUT B.
- SAVE 1" drain valve 12AF123 for reuse in accordance with SUP02.

Cut Existing 14 Steam Generator AFW Supply Piping Instructions:

- Pin variable support 14AFWH-30 PRIOR to cutting the 14 Steam Generator AFW supply piping. Variable support 14AFWH-30 reference drawing 226129 sht. 15. Demolish this support as it will not be reused.

IMPORTANT: To avoid injury and equipment damage due to falling piping, temporary support of the 12 Steam Generator AFW supply piping between CUT POINT D and CUT POINT E will be necessary prior to cuts performed. Temporary support may be removed as part of demolition of this piping.

- CUT POINT D - Cut the 14 Steam Generator AFW supply piping in the Unit 1 Mechanical Penetration area in accordance with SUP02 page 4.
- CUT POINT E - Cut the 14 Steam Generator AFW supply piping (in the Unit 1 Mechanical Penetration area in accordance with SUP02 page 4.
- CUT POINT F - Cut the vertical 14 Steam Generator AFW supply piping in the FTTA in accordance with SUP02. NOTE: additional excavation of the 14 Steam Generator AFW supply piping in the Salem Unit 1 FTTA as well as additional removal of standing water may be required to perform CUT POINT F page 3.

Demolition Existing 14 Steam Generator AFW Supply Piping Instructions:

- Demolish all remaining 14 Steam Generator AFW supply piping between CUT D and CUT E.
- Demolish all remaining 14 Steam Generator AFW supply piping downstream of CUT F.
- SAVE 1" drain valve 14AF123 for reuse in accordance with SUP02.

Abandonment of Existing 12 / 14 Steam Generator AFW Supply Piping in Mechanical Penetration Area Instructions:

- Cap remaining 12 / 14 Steam Generator AFW Supply Piping on elevations 82'-11" and 83'-11", respectively, in accordance with SUP02. 4" pipe caps to be butt welded to remaining piping.
- Replace boot seal on existing sleeves for Penetrations S-15437-005 and S-15437-007 in accordance with SH.MD-SP.FBR-0001 and SH.MD-SP.FBR-0012.

Abandonment of Existing 12 / 14 Steam Generator AFW Supply Piping in Salem Unit 1 FTTA Instructions:

- Cap vertical 12 / 14 Steam Generator AFW Supply Piping at elevation 92'-6" in accordance with SUP02. 4" pipe caps to be butt welded to remaining piping.

AWA #2

New Support Fabrication Instructions:

- Fabricate new supports in accordance with SUP09 and SUP10.

## New Piping Installation Instructions:

- Install new 12 Steam Generator AFW supply piping in accordance with SUP05, SUP06, and SUP07.
- ENSURE variable support 12AFWH-30 has been demolished prior to installing new 12 Steam Generator AFW supply piping. Variable support 12AFWH-30 reference drawing - 226129 sht. 15.
- REUSE 1" drain valve 12AF123 in accordance with SUP05 and SUP06.
- INSTALL new 1" vent valve in accordance with SUP05 (detail B) and SUP06.
- Install new 14 Steam Generator AFW supply piping in accordance with SUP05, SUP06, and SUP07.
- ENSURE variable support 14AFWH-30 has been demolished prior to installing new 14 Steam Generator AFW supply piping. Variable support 14AFWH-30 reference drawing - 226129 sht. 15.
- REUSE 1" drain valve 14AF123 in accordance with SUP05 and SUP06.
- INSTALL new 1" vent valve in accordance with SUP05 (detail B) and SUP06.

## Post modification work

- Coat piping up to El. 100'-0" with same coating material used in ECP 80101381 (see SUP16).
- Paint/coat piping above El. 100'-0" in accordance with NC.MD-AP.ZZ-0001, Station Coatings Program.

## Missile Shield installation

- Contact Safety prior to installation of missile shields due to potential lead and asbestos. Ref. dwg 207808.
- For installation of missile shield on roof of FTTA, verify concrete fill is present by drilling several pilot holes, ref SUP13 and dwg 207808. Caulk holes if not used for hiltis.
- Install missile shields on the roof of the FTTA in accordance with SUP13.
- Verify flashing configuration per drawing 207808, section 11-11 on vertical seismic.
- Install vertical missile shield on the south wall of the FTTA in accordance with SUP17.

4. Special Installation Sequencing and Considerations:

- Exercise caution when removing the AFW piping so as not to damage other piping that utilizes the same supports.
- The excavated area cannot be backfilled until after the pressure test is performed.
- The installers are to provide final configuration to Engineering for updates to hanger drawings and isometrics.
- Coat containment outer wall with Enecrete WS and let cure in accordance with manufacturers directions prior to back filling.
- Provide Engineering with as built configuration for piping and supports for incorporation into AD and spool drawings as required.
- Do not bury / back fill the drain valves (12AF123 and 14AF123).

- Place warning label and caution tape in front the Mech Pen to FTTA door stating warning of drop after door.

5. Engineering Instructions Requiring Assigned Tasks:

The following calculations will not be approved at the time of approval of Revision 2 of this DCP:

S-C-AF-MDC-1789  
267274D  
267274D\_Sim  
1P-12AFWA-0029  
1P-14AFWA-0029  
1P-12AFWH-0030  
1P-14AFWH-0030  
1P-12AFWA-0031  
1P-14AFWA-0031  
1P-12AFWG-4626  
1P-14AFWG-4626  
1P-12AFWG-4627  
1P-14AFWG-4627  
1P-12AFWG-4628  
1P-14AFWG-4628  
1P-12AFWG-4629  
1P-14AFWG-4629  
1P-12AFWG-4630  
1P-14AFWG-4630  
1P-12AFWG-4631  
1P-14AFWG-4631  
1P-12AFWG-4632  
1P-14AFWG-4632  
1P-12AFWG-4633  
1P-14AFWG-4633  
1P-12AFWG-4634  
1P-14AFWG-4634

These calculations will all receive approval following issuance of the DCP.

The Salem Auxiliary Feedwater Thermal Hydraulic Flow Model (S-C-AF-MDC-1789) has been reviewed prior to approval of Revision 2 of this DCP. The conclusion of the review is that the overall increase in the hydraulic resistance of the new piping routes is negligible and there are no adverse, hydraulic consequences of these modifications (refer to the AD M02 coversheet and Sections 4.1.9 or 4.1.33 of the DCPs).

There are five different support designs for the rerouted / replacement piping. The bounding loads for each of the five different supports have been analyzed and found acceptable (refer to SUP11). In addition, the pipe stress runs have been reviewed and found acceptable prior to approval of Revision 2 of this DCP (refer to SUP11). A separated calculation for each pipe support will be issued following issuance of the DCP.

SAP Operations 80101382-0020 and 80101382-0240 track the approval of these calculations.

Since the re-routed aux feed lines are now above ground in the FTTA area freeze protection for the lines need to be addressed. Due to the emergent nature of this DCP this task will be addressed on a revision to the DCP. Drain valves 12/14AF123 require a positive means to keep the valves free of the sand in the FTTA. Both of these items have been added to SAP operation 80101382-0360 to track.

6. Engineering Restraint Items and Unverified Assumptions:  
Rebar locations AS DESIGNED are shown on drawing 201064 sht. 001. Use this drawing for field aid in determining rebar locations; however, scanning for rebar and marking rebar locations must be complete prior to core bores. Refer to the Engineering Hold Point outlined in the Installation Details of this Form.  
For installation of missile shield on roof of FTTA, verify concrete fill is present by completing several pilot holes, ref SUP13 and dwg 207808.
7. Impact of Pending or Related Configuration Change Packages and Temporary Configuration Changes:  
This DCP ties into ECP 80101381 via welds S1-FW-1-AF-P-215-2 and S1-FW-1-AF-P-205-3 near the wall between the FTTA and the yard area. Refer to SUP07.
8. Configuration Change Package Classification:  
This Configuration Change is classified as Safety Related and Seismic Design Class 1.
9. Applicable Installation Codes and Specifications:  
Per NC.DE-TS.ZZ-3005, the piping shall be fabricated, installed and inspected to the requirements of ANSI B31.7, Nuclear Power Piping Code, 1969.
10. Procurement/Materials Engineering Requirements (special considerations not on ECML):  
Disposition of excess materials shall be performed in accordance with procedure SM-AA-404-1000, Nuclear Procurement and Control of Materials and Services.

## II. Testing acceptance and requirements

### Installation Testing

- Perform cleanliness verification of piping in accordance with NC.CH-AP.ZZ-0021(Q), System Cleanliness Program.
- With the aid of proper lighting, visually inspect each of the 4" pipe cap welds to ensure proper fusion and weld quality. Acceptance Criteria – No visual weld, pipe, or pipe cap defects.
- Perform NDE of welds in accordance with CC-AA-501, Welding/Brazing Manual and the code job package. With exception of abandoned piping pipe cap butt welds. These welds only require a visual inspection to ensure no visible defects.
- Perform holiday testing of pipe coating in accordance with ASTM D 5162.

### Modification Testing

ASME Section XI only requires a system pressure test at normal operating pressure (NOP) and normal operating temperature (NOT). A system pressure test shall be performed at NOP/NOT

in accordance with SH.MD-GP.ZZ-0240. Use acceptance criteria defined in SH.MD-GP.ZZ-0240.

As an option, the field may perform partial pressure tests in accordance with SC.MD-GP.ZZ-0035 to test portions of the piping. If partial pressure test is performed, use acceptance criteria defined in SC.MD.GP.ZZ-0035 for section of piping tested.

Operations shall also perform procedure S1.OP-ST.AF-0005 to ensure that the full flow requirements through each replaced line are able to be met.

System testing indicated above should be coordinated with DCP 80101381 which replaces the buried pipe for the #12 and #14 AFW lines.



**FORM 6**  
**AFFECTED DOCUMENT LIST (ADL)**

A Package Rev of AD Additions/ Deletions	B AD No.	C Affected Document Number/Revision Requiring Update	✦	D Document Sheet Number	E SAP Order Operation Number
2	H01	267274D / Rev. 1		000	BANKED
2	H02	267274D_Sim / Rev. 1		000	BANKED
2	H03	1P-12AFWA-0029 / Rev. 1		000	BANKED
2	H04	1P-14AFWA-0029 / Rev. 1		000	BANKED
2	H05	1P-12AFWH-0030 / Rev. 0		000	BANKED
2	H06	1P-14AFWH-0030 / Rev. 0		000	BANKED
2	H07	1P-12AFWA-0031/ Rev. 1		000	BANKED
2	H08	1P-14AFWA-0031/ Rev. 1		000	BANKED
2	H09	1P-12AFWG-4626 / NEW		000	0210
2	H10	1P-14AFWG-4626 / NEW		000	0210
2	H11	1P-12AFWG-4627 / NEW		000	0210
2	H12	1P-14AFWG-4627 / NEW		000	0210
2	H13	1P-12AFWG-4628 / NEW		000	0210
2	H14	1P-14AFWG-4628 / NEW		000	0210
2	H15	1P-12AFWG-4629 / NEW		000	0210

**NOTE:** CAT 1 and CAT 2 Line Department procedures and programs are no longer listed on the ADL. See ADL instructions on page 1 of Form 6.

**✦ For Equivalent CPs ONLY**

If the affected document is to be updated after installation is complete, place an "I" in the Affected Document Number column at the right. Normally, this column is left blank because Equivalent CP ADs are issued with all acceptable equivalencies included since SAP tracks current configuration at installation.

CHANGE NO: 80101382REVISION NO.: 2

**FORM 6**  
**AFFECTED DOCUMENT LIST (ADL)**

A	B	C	D	E
Package Rev of AD Additions/ Deletions	AD No.	Affected Document Number/Revision Requiring Update	Document Sheet Number	SAP Order Operation Number
2	H16	1P-14AFWG-4629 / NEW	000	0210
2	H17	1P-12AFWG-4630 / NEW	000	0210
2	H18	1P-14AFWG-4630 / NEW	000	0210
2	H19	1P-12AFWG-4631 / NEW	000	0210
2	H20	1P-14AFWG-4631 / NEW	000	0210
2	H21	1P-12AFWG-4632 / NEW	000	0210
2	H22	1P-14AFWG-4632 / NEW	000	0210
2	H23	1P-12AFWG-4633 / NEW	000	0210
2	H24	1P-14AFWG-4633 / NEW	000	0210
2	H25	1P-12AFWG-4634 / NEW	000	0210
2	H26	1P-14AFWG-4634 / NEW	000	0210
2	H27	226129 / Rev. 12	002	BANKED
2	H28	226129 / NEW	025	0210
2	H29	226129 / NEW	026	0210
2	H30	226129 / NEW	027	0210

**NOTE:** CAT 1 and CAT 2 Line Department procedures and programs are no longer listed on the ADL. See ADL instructions on page 1 of Form 6.

**✦ For Equivalent CPs ONLY**

If the affected document is to be updated after installation is complete, place an "I" in the Affected Document Number column at the right. Normally, this column is left blank because Equivalent CP ADs are issued with all acceptable equivalencies included since SAP tracks current configuration at installation.

CHANGE NO: 80101382REVISION NO.: 2

**FORM 6**  
**AFFECTED DOCUMENT LIST (ADL)**

A	B	C	D	E
Package Rev of AD Additions/ Deletions	AD No.	Affected Document Number/Revision Requiring Update	Document Sheet Number	SAP Order Operation Number
2	H31	226129 / NEW	028	0210
2	H32	226129 / NEW	029	0210
2	H33	226129 / NEW	030	0210
2	H34	226129 / NEW	031	0210
2	H35	226129 / NEW	032	0210
2	H36	226129 / NEW	033	0210
2	H37	226129 / NEW	034	0210
2	H38	226129 / Rev. 8	015	BANKED
2	H39	226129 / Rev. 8	015	BANKED

**NOTE:** CAT 1 and CAT 2 Line Department procedures and programs are no longer listed on the ADL. See ADL instructions on page 1 of Form 6.

**\* For Equivalent CPs ONLY**

If the affected document is to be updated after installation is complete, place an "I" in the Affected Document Number column at the right. Normally, this column is left blank because Equivalent CP ADs are issued with all acceptable equivalencies included since SAP tracks current configuration at installation.

**FORM 7**  
**WORK IN PROGRESS MATERIALS LIST**

CATEGORY: MATERIAL / EQUIPMENT (EQUIPMENT, SERVICES, MATERIAL AND CRITICAL SPARES)				DISCIPLINE: MECHANICAL
ITEM NO.	QUANTITY	ITEM DESCRIPTION / SPECIFICATION (Add Material Master number as necessary)	REQUIRED PURCHASE CLASSIFICATION	MATERIAL USAGE COMMENTS (Identify any needed Critical Spares here in addition to installation Quantities shown at left.)
M01	4	CAP PIPE 4" SCH 40 BW, CS, ASTM A234, MM Y607659	PC3	For use to cap abandoned 12 /14 S/G Supply AF piping
M02	2 yards	BOOT-MATERIAL, SGR-600, MM Y874654	PC3	For use to re-establish boot seal around Pens S-15437-005 and 007
M03	140 ft	4" Sch. 80 SMLS Pipe, ASTM A106 Gr. B, MM 1074252	PC1	
M04	14	90 deg. Elbow, 4" Sch. 80 Butt Weld, ASTM A234 WPB, MM 1074262	PC1	
M05	5	1" HALF CPLG. SW CS ASTM A105, MM Y607696	PC1	
M06	3 ft	1" 3000# CS PIPE, ASTM A106, GR. B, MM 1058331	PC1	
M07	5	1" 90 DEGREE ELBOW, SW, CS ASTM A105, MM Y608236	PC1	
M08	4	1" X 3" LG SCH. 160 CS PIPE NIPPLE, T.O.E. ASTM A106, GR. B, MM Y606377	PC1	
M09	4	1" 3000# THREADED PIPE CAP, CS ASTM A105, MM Y607656	PC1	
M10	2	1" VLV ASSEMBLY, MM X400412	PC1	
M11	12	4" U-Bolt w/ four (4) nuts, ASTM A36, MM Y874304 or equivalent	PC1	CSUB-4 SPECIAL

**NOTE: All engineered material is normally listed and reviewed in this Form 7 as initial controlled source for Planner input to the Component Screen (tab) of the NUCM installation order. Work with the Planner for minor material quantity and detail changes in the Component Screen without CP revision (if major scope is unchanged). Engineer direct initial input to the NUCM Component Screen (tab) should be by Management direction.**

CHANGE NO: 80101382REVISION NO.: 2**FORM 7****WORK IN PROGRESS MATERIALS LIST**

CATEGORY: MATERIAL / EQUIPMENT (EQUIPMENT, SERVICES, MATERIAL AND CRITICAL SPARES)				DISCIPLINE: PIPE SUPPORTS
ITEM NO.	QUANTITY	ITEM DESCRIPTION / SPECIFICATION (Add Material Master number as necessary)	REQUIRED PURCHASE CLASSIFICATION	MATERIAL USAGE COMMENTS (Identify any needed Critical Spares here <u>in addition</u> to installation Quantities shown at left.)
M12	20 ft	Angle, 3" x 3" x 3/8", ASME SA36, MM Y605117 or equivalent	PC1	
M13	20 ft	Angle, 4" x 4" x 1/2", ASME SA36, MM Y605133 or equivalent	PC1	
M14	20 ft	Angle, 6" x 4" x 1/2", ASME SA36, MM Y605137 or equivalent	PC1	
M15	8 ft <sup>2</sup>	Plate, 3/4", ASME SA36, MM Y605730 or equivalent	PC1	
M16	8	4" Pipe Guide, ASTM A36, MM X377380 or equivalent	PC1	CC-4 Type 'A'
M17	25	3/4"x8" Hilti Kwik Bolt 3 Part # 282520 (CS) MM 1056411	PC1	
M18	6	3/4"x7" Hilti Kwik Bolt 3 Part # 282520 (CS) MM 1049321	PC1	
M19	40	5/8"x10" Hilti Kwik Bolt 3 (MM 1054501)	PC1	SUP13 & SUP17
M20	6	1" SA36 Carbon Steel Plate (Y605732) 4'x 8'	PC1	SUP17 & SUP13
M21	5	1/16" EPDM Rubber (MM 1020151) or Equivalent	PC4	SUP13 and 17

**NOTE: All engineered material is normally listed and reviewed in this Form 7 as initial controlled source for Planner input to the Component Screen (tab) of the NUCM installation order. Work with the Planner for minor material quantity and detail changes in the Component Screen without CP revision (if major scope is unchanged). Engineer direct initial input to the NUCM Component Screen (tab) should be by Management direction.**