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Serial: RA-20-0036
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10 CFR 50.55a

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

OCONEE NUCLEAR STATION, UNITS NO. 1 AND 2
DOCKET NO. 50-269 AND 270 / RENEWED LICENSE NO. DPR-38 AND DPR-47

SUBJECT: Request for Alternative to Defect Removal Prior to Performing Repair/Replacement Activities on Low Pressure Service Water (LPSW) System Piping

Pursuant to 10 CFR 50.55a(z)(2), Duke Energy Carolinas, LLC (Duke Energy) requests the NRC to grant relief from Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for Oconee Nuclear Station, Units 1 and 2 (Oconee). Relief is being sought due to the hardship, with no compensating increase in quality or safety, caused by performing a repair/replacement activity in accordance with the ASME Code requirements applicable to Oconee's fifth ISI Interval. This Relief Request addresses the need to encapsulate a thru-wall leak in Low Pressure Service Water (LPSW) system piping shared by Units 1 and 2.

In accordance with ASME Code Case N-513-3, operation with the thru-wall leak through routine monitoring is allowed until the next Unit 1 Refueling Outage (O1R31, fall 2020). Approval of this Request would prevent the need to bring Unit 2 into a forced outage to isolate the piping for leak repair in accordance with ASME Code requirements. Therefore, Duke Energy requests that this Relief Request receive review and approval by August 1, 2020 to support the scheduled Unit 1 Fall refueling outage.

Relief Request RA-20-0036 is provided as an enclosure to this letter. If you have questions concerning this request, please contact Art Zaremba, Director - Fleet Licensing, at (980) 373-2062.

Sincerely,

J. Ed Burchfield, Jr.
Vice President
Oconee Nuclear Station

Enclosure:

1. Relief Request RA-20-0036

Attachment:

1. Relief Request RA-20-0036 Engineering Change (EC) 416973 Sketch
2. Relief Request RA-20-0036 Oconee Flow Diagram, OFD-124B-1.1

cc : L. Dudes, Regional Administrator USNRC Region II
J. Nadel, USNRC Senior Resident Inspector – ONS
A. L. Klett, NRR Project Manager – ONS

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Enclosure 1

Duke Energy Carolinas, LLC

Oconee Nuclear Station, Units 1 and 2

Relief Request RA-20-0036

(7 pages)

Relief Request in Accordance with 10 CFR 50.55a(z)(2) to use an Alternative to Defect Removal Prior to Performing Repair/Replacement Activities on Low Pressure Service Water (LPSW) System Piping

1.0 ASME CODE COMPONENT(S) AFFECTED:

Oconee Nuclear Station, Units 1 and 2 Low Pressure Service Water (LPSW) System piping listed below:

1.1 The 3 inch piping (terminated with a line stop fitting) connected to a 12 inch LPSW header in the Turbine Building Basement, as shown on drawing OFD-124B-1.1 and attached sketch. This piping was constructed to USAS B31.1.0-1967, is classified as ISI Class 3, and is subject to the repair/replacement requirements of the ASME Code, Section XI, IWA-4000. The 12 inch LPSW header is shared between Units 1 and 2 and supplies cooling water to the Component Cooling (CC) Coolers for both Units 1 and 2.

1.2 Design data applicable to the above piping is provided below from Duke Energy Specification OSS-0243.00-00-0001 and Oconee Flow Diagram OFD-124B-1.1:

Nominal Wall Thickness: 0.216 inches (3 inch pipe schedule 40)

Design Pressure: 100 psig

Design Temperature: 100°F

Material Specification: Carbon Steel, A-106 Gr B

2.0 APPLICABLE CODE EDITION AND ADDENDA:

2.1 The ASME Boiler and Pressure Vessel Code, Section XI, 2007 Edition with the 2008 Addenda is used for the Oconee Units 1 and 2, 5th Inservice Inspection Interval.

2.2 The 5th Inservice Inspection Interval for Oconee Units 1 and 2 began on July 15, 2014 and is scheduled to end on July 15, 2024.

3.0 APPLICABLE CODE REQUIREMENT:

3.1 IWA-4421 requires that defects be removed or mitigated in accordance with IWA-4340, IWA-4411, IWA-4461, or IWA-4462.

[Note: Use of IWA-4340 is prohibited by 10 CFR 50.55a(b)(2)(xxv)]

4.0 REASON FOR REQUEST:

4.1 On September 26, 2019 a thru-wall leak was discovered on the LPSW system at a 3 inch branch connection weld to a 12 inch header upstream of 1LPSW-109. The 12 inch header and the 3 inch branch line are both carbon steel piping and located inside the Turbine Building Basement. The 3 inch branch line had previously been

removed from service and terminated with a line stop. At the time of discovery, the leakage was measured at 1 drop every two minutes. ASME Code Case N-513-3, "Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping" was applied to allow continued operation through routine monitoring until the next Unit 1 Refueling Outage (O1R31, Fall 2020).

4.2 The 12 inch LPSW header is the common cooling water supply header to the Unit 1 and the Unit 2 Component Cooling (CC) System's heat exchangers (CC Coolers) which provide cooling on the respective Unit for the Reactor Coolant Pump (RCP) seals, High Pressure Injection (HPI) Letdown Coolers, Quench Tank (QT) Cooler, and the Control Rod Drive (CRD) stators. As a result, hydraulic isolation of this header for a code repair of the 3 inch line would only be possible through a forced shutdown of Unit 2 during the Unit 1 Refueling outage, or a forced shutdown of both Unit 1 and Unit 2 prior to the Unit 1 Refueling outage, since this continuous cooling supply is essential to plant operation. For example, Abnormal Procedures AP/1,2/A/1700/020 (Loss of CC) state that CRD stator temperatures will reach 180°F in approximately 4 minutes if CC is lost, resulting in a requirement to trip the reactor. Additionally, if High Pressure Injection (HPI) letdown temperatures reach 135°F, containment isolation valve HP-5 on that unit will automatically close isolating letdown which would require initiation of a rapid unit shutdown per Abnormal Procedures AP/1,2/A/1700/032 (Loss of Letdown).

4.3 Relief is requested from the requirement of IWA-4421 to remove defects in accordance with IWA-4411, IWA-4461, or IWA-4462 on the piping identified in this request, prior to performing repair/replacement activities.

4.4 This request is submitted to allow the installation of pressure retaining materials that will be used to encapsulate the thru-wall leak on the 3 inch LPSW piping connected to the 12 inch LPSW header. Installation of replacement pressure retaining materials without first removing the degraded portions of the piping does not comply with the requirement of IWA-4421.

4.5 The proposed alternative has been developed because other repair/replacement options that would fully comply with IWA-4421 create a hardship or unusual difficulty without a compensating increase in the level of quality and safety, for the reasons detailed in this request. A fully compliant code repair requires a dual unit shutdown to remove the defect and replace the degraded pipe.

5.0 PROPOSED ALTERNATIVE AND BASIS FOR USE:

5.1 Proposed Alternative

In lieu of the requirement of IWA-4421 to remove the defective portion of the component prior to performing repair/replacement activities by welding, unacceptable wall thickness loss or thru-wall leakage caused by localized general or pitting corrosion shall be corrected by installation of replacement pressure retaining materials that fully encapsulate the degraded piping. The following requirements shall be met:

5.1.1 Replacement pressure retaining materials shall comply with the Construction Code and Owner's requirements, as shown in Attachment 1. The modification is being designed such that the piping system no longer relies on the degraded parts for structural integrity or leak tightness. The design pressure and temperature for this portion of the LPSW is 100 psig and 100°F. The outer piping (the encapsulation) is designed based on this pressure and temperature.

5.1.2 The original Construction Code is B31.1-1967. As allowed by ASME Section XI, IWA-4221(c), the encapsulation is procured and designed to B31.1-2007 (in lieu of the original construction code). Welding and Weld NDE requirements are performed per B31.1-2004 (in lieu of the original construction code).

5.1.3 The original 3 inch pipe run had no external supports in the span between the 12 inch header and the line stop. Design analysis of the new configuration did not require the addition of supports.

5.1.4 The locations where the encapsulation is to be welded to the system pressure boundary are located sufficiently far from the 3 inch pipe thru-wall leak to preclude the growth of identified corrosion from challenging the integrity of the encapsulation for the remaining life of the component to which the encapsulation is welded. The 12 inch header pipe will continue to be monitored as part of the Service Water Piping Inspection Program.

5.1.5 An ultrasonic thickness exam utilizing 1" x 1" grids was performed on the 12 inch LPSW header to determine pipe wall thickness in order to evaluate, a) circumferential (hoop) pressure stresses, b) longitudinal (bending) stresses.

a) The lowest thickness reading obtained was 0.215". The minimum required thickness for circumferential (hoop) pressure stress per B31.1 Code is 0.042" (Code T_{min}). Therefore, the 12 inch pipe wall thickness was found to be acceptable with respect to circumferential (hoop) pressure stresses.
b) The mill tolerance value for this 12 inch Standard Schedule pipe is 0.328" (i.e., 87.5% of nominal) and the minimum average circumferential wall thickness was found to be 0.335". Therefore, longitudinal (bending) stresses for this pipe header were found to be acceptable.

5.1.6 Prior to installation of replacement pressure retaining materials, ultrasonic thickness measurements shall be re-performed where the encapsulation is to be welded to the 12 inch pipe header to confirm that material thickness has remained adequate for the encapsulation design. The other end of the encapsulation shall be welded to the reinforcing tee of the line stop fitting (See Attachment 1).

5.1.7 A visual examination shall be performed on welds for the replacement pressure retaining materials in accordance with ASME B31.1-2004, Table 136.4.

5.1.8 A system leakage test shall be performed in accordance with ASME Section XI, 2007 edition with 2008 addenda, IWA-4540, IWA-5000, and IWD-5220 upon completion of the repair/replacement activity to confirm the leak-tight integrity of the modification and its connecting welds to the component pressure boundary.

5.1.9 A threaded port in the outer pipe is used to facilitate filling the cavity between the inner pipe and the outer pipe for the inservice leakage test. The system leakage test will be conducted at a normal operating pressure (approximately 80 psig), a fluid temperature ≤ 100°F, and a hold time of 10 minutes after attaining test pressure. A pressure gauge shall be used to verify test pressure is achieved.

5.1.10 Upon implementation of this relief request, the encapsulation boundary (the outer piping) will become the credited pressure retaining boundary for this portion of the system. Thus, the encapsulation boundary will be subject to inservice inspection in accordance with Table IWD-2500-1, Category D-B, which requires a system leakage test and accompanying VT-2 examination each inspection period. The piping internal to the encapsulation boundary will be inaccessible and will not be examined under Section XI in the future because credit will no longer be taken for its pressure retaining function.

5.1.11 Encapsulation of the defective area at this location shall be performed only once.

5.2 Basis for Request

Duke Energy believes that complying with IWA-4421 requirements to remove defective portions of this piping prior to performing a repair/replacement activity represents a hardship or unusual difficulty without a compensating increase in the level of quality and safety for the following reasons:

5.2.1 Removal of defective portions of this piping would require that the piping be isolated and depressurized. The 3 inch piping cannot be isolated for the following reason:

1. System isolation using upstream valves is not possible without removing heat removal capability to Units 1 and 2 CC coolers. System isolation would require both Unit 1 and Unit 2 be in a shutdown condition.

5.2.2 Use of other alternative repair/replacement techniques that would avoid having to isolate and depressurize the 3 inch piping were considered, but were rejected for reasons identified below:

1. Use of ASME Code Cases N-562-2 or N-661-2
   Use of repair/replacement techniques detailed in Code Cases N-562-2 or N-661-2 are not possible because Figure 1 requires a minimum distance from branch reinforcement welds, and the location of the leak is located at one such weld.
2. Use of ASME Code Case N-786-1 or N-786-2
   Installation of a full-structural Type B reinforcing sleeve in accordance with Code Case N-786-1 or N-786-2, Figure 2 was considered, but was rejected because the degraded portion of the 3 inch piping is located very close to the branch connection weld to the 12 inch diameter LPSW header. General Requirement 1(f) states that this Case cannot be applied to branch connection welds.
3. Use of ASME Code Case N-789-1 or N-789-2
   Use of Code Case N-789-1 or N-789-2 to install reinforcing pads over locally thinned areas is not possible because paragraph 1(e) of the case

allows the reinforcing pads to be used only until the next refueling outage. Difficulty with isolating and depressurizing the system during the next refueling outage would still present a hardship. Additionally, Figure 1 requires a minimum distance from branch reinforcement welds, and the location of the leak is located at one such weld. Because N-789-1 or N-789-2 is not approved for use in NRC Regulatory Guide 1.147, Rev. 18, relief would also be required in order to use this case.

5.2.3 The proposed alternative shall be designed, constructed, and examined in accordance with all applicable requirements of the Construction Code. All welds shall be visually examined in accordance with ASME B31.1-2004. The encapsulation shall be pressure tested and VT-2 examined in accordance with IWA-4540 to confirm the absence of leakage from the replacement pressure retaining materials and their connecting welds. All other requirements of ASME Code, Section XI, for which relief has not been specifically requested, remain applicable including third-party review by the Authorized Nuclear Inservice Inspector. For these reasons, Oconee believes that the proposed alternative to IWA-4421 will provide reasonable assurance of continued structural integrity of the component.

6.0 DURATION OF PROPOSED ALTERNATIVE:

The proposed alternative is requested for the remaining life of ONS Unit 1 and Unit 2.

7.0 PRECEDENTS:

7.1 **ADAMS Accession Number ML15349A453. NRC approved dated December 29, 2015.** Duke Energy Carolinas, LLC, Oconee Nuclear Station, Units 1 and 2 "Relief Request in Accordance with 10 CFR 50.55a(z)(2) to use an Alternative to Defect Removal Prior to Performing Repair/Replacement Activities on Low Pressure Service Water System Piping, dated June 12, 2015 (ML15169A860).

7.2 **ADAMS Accession Number ML110800426. NRC approved dated March 28, 2011.** Duke Energy Corporation, McGuire Nuclear Station, Unit 1, Relief Request Serial #09-MN-002 "Proposed Alternative in Accordance with 10 CFR 50.55a(a)(3)(i)", dated May 4, 2009, (ML092170658).

8.0 REFERENCES:

8.1 2007 Edition through 2008 Addenda, ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components."

8.2 ASME Code Case N-513-3, "Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping Section XI, Division 1."

9.0 ATTACHMENTS

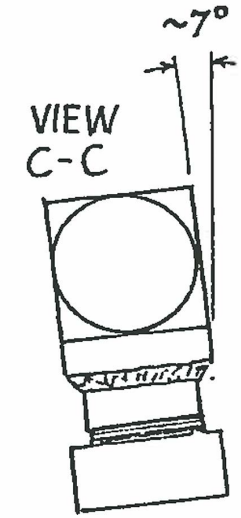
9.1 Attachment 1: Engineering Change (EC) 416973 Sketch, (2 pages)

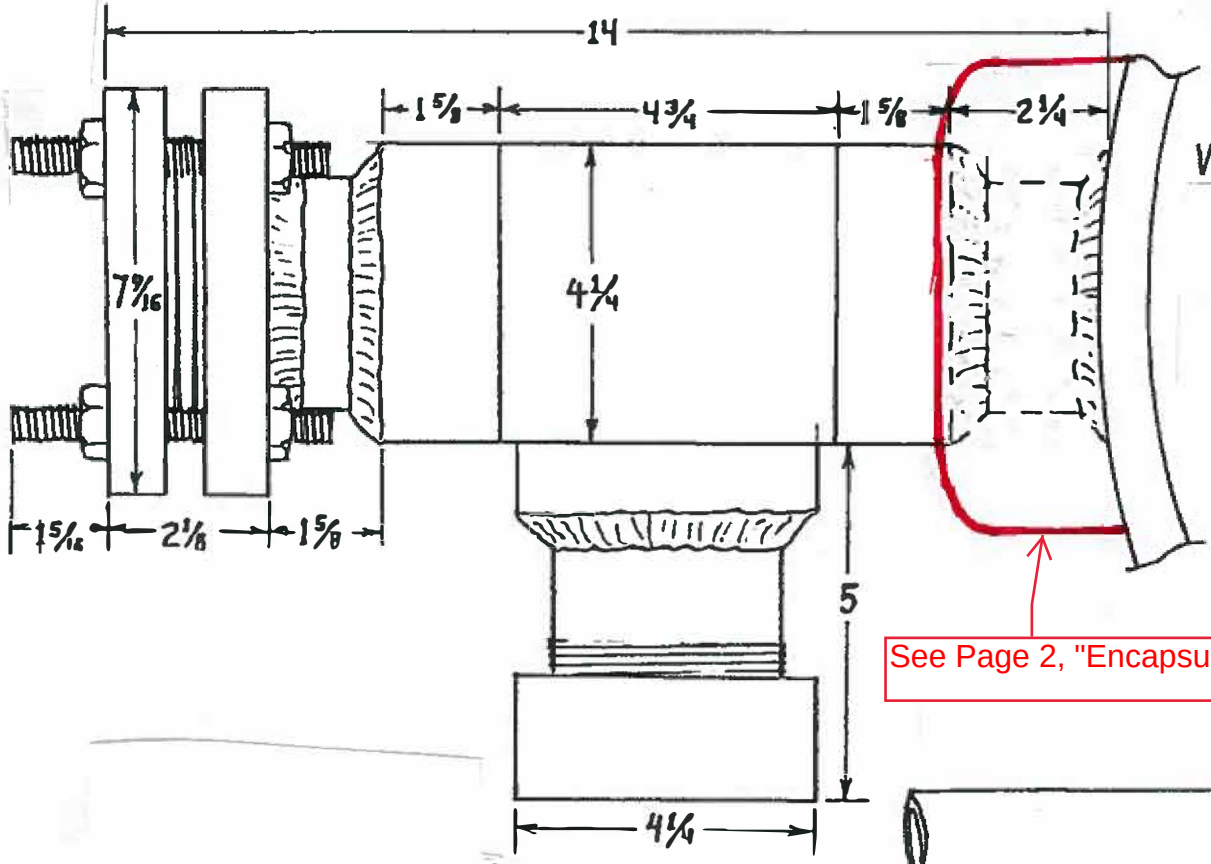
9.2 Attachment 2: Oconee Flow Diagram, OFD-124B-1.1, (1 page)

Attachment 1

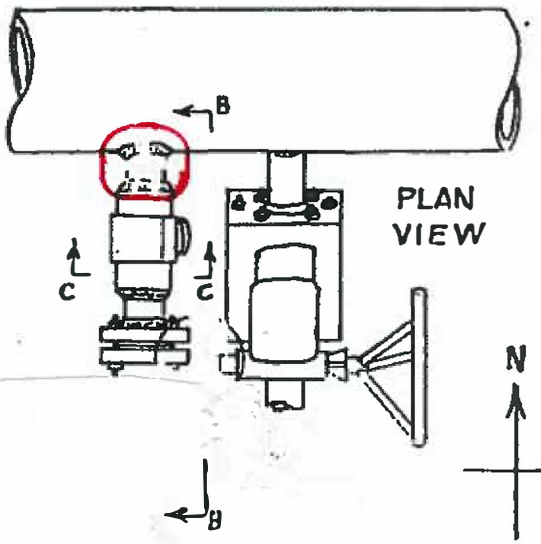
Relief Request RA-20-0036

Engineering Change (EC) 416973 Sketch

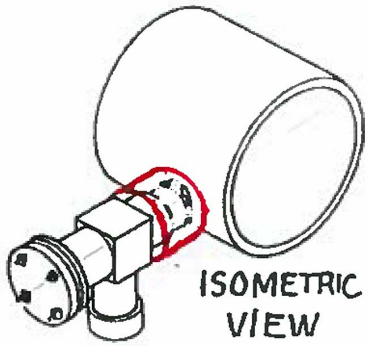




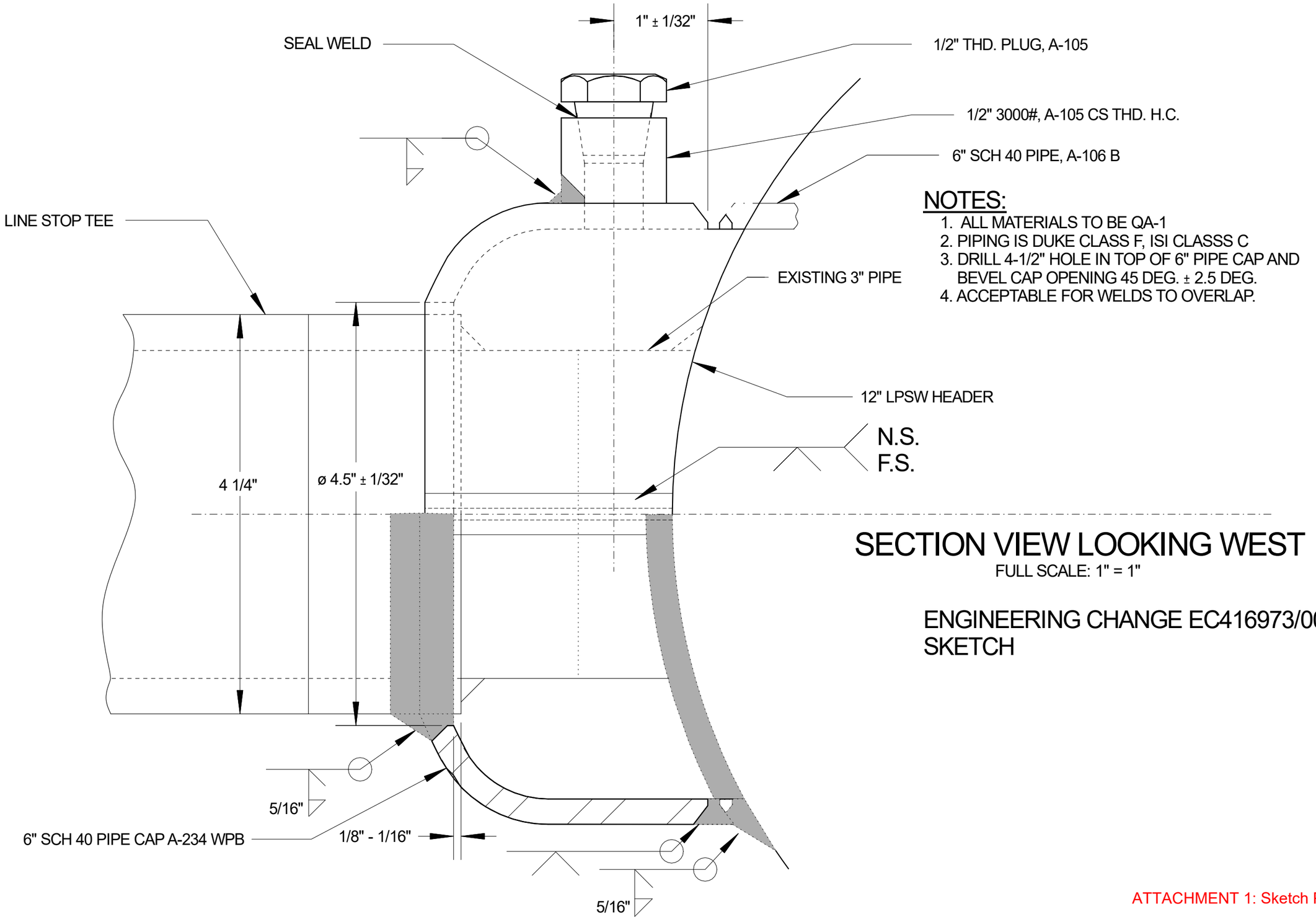
See Page 2, "Encapsulation Detail"



3" LPSW PIPE WITH 6" PIPE & CAP ENCAPSULATION



ENCAPSULATION DETAIL



NOTES:

1. ALL MATERIALS TO BE QA-1
2. PIPING IS DUKE CLASS F, ISI CLASSS C
3. DRILL 4-1/2" HOLE IN TOP OF 6" PIPE CAP AND BEVEL CAP OPENING 45 DEG. ± 2.5 DEG.
4. ACCEPTABLE FOR WELDS TO OVERLAP.

SECTION VIEW LOOKING WEST

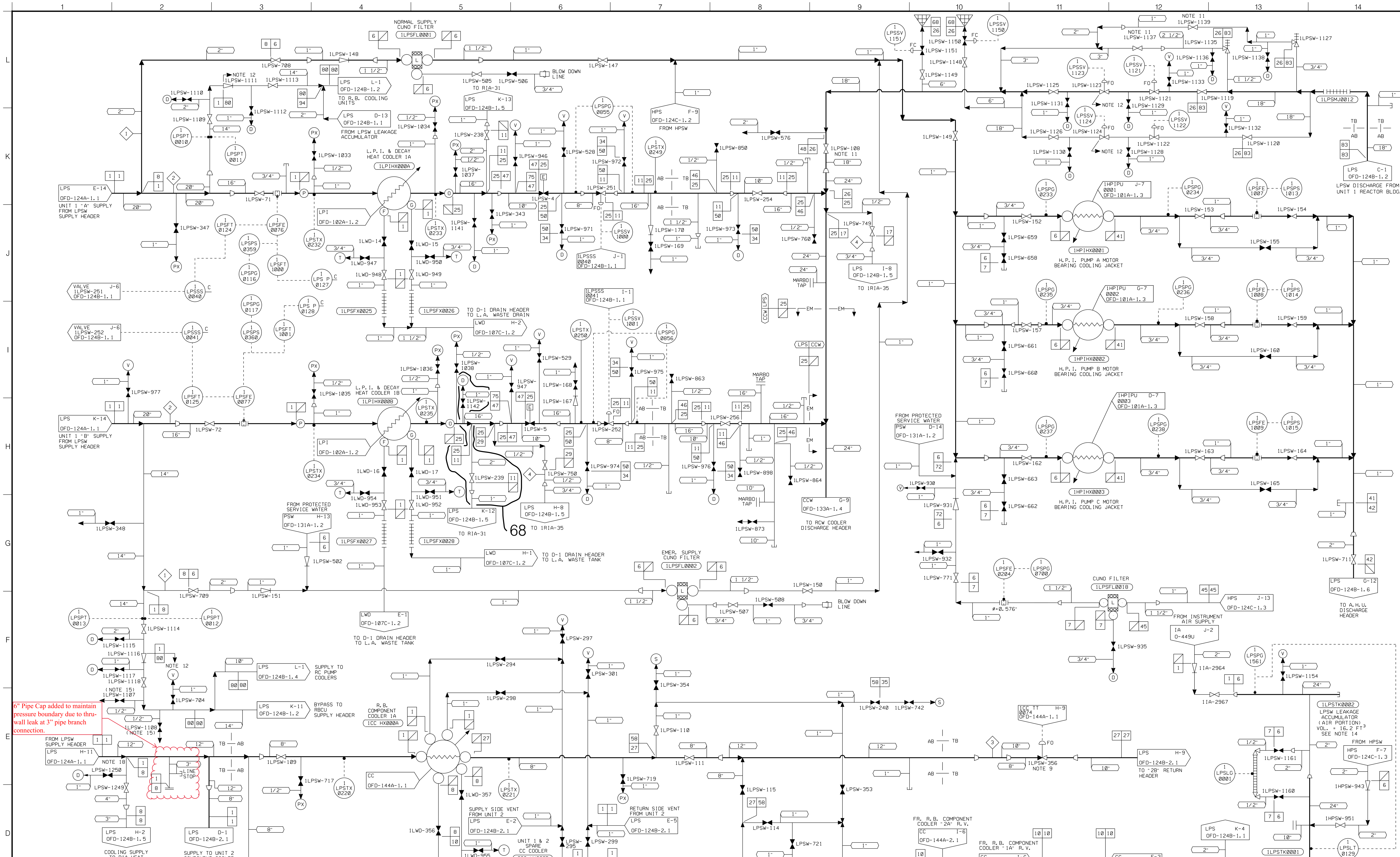
FULL SCALE: 1" = 1"

ENGINEERING CHANGE EC416973/000
SKETCH

Attachment 2

Relief Request RA-20-0036

Oconee Flow Diagram, OFD-124B-1.1



NOTES:

1. OPERATING MODE REPRESENTED BY BOLD LINES: LPSW SUPPLY & RETURN THRU L.P.I. & DECAY HEAT COOLERS, H.P.I. PUMP MOTOR BEARING COOLING JACKETS, AND REACTOR BUILDING COMPONENT COOLER 1A.
2. ORIGINAL ISSUE OF THIS DRAWING WAS BASED ON PO-124A-1, REV. 7, PO-124B-1, REV. 9, & PO-115B, REV. 27.
3. 1/2" THRU 10" SCH. = 40
   12" THRU 24" SCH. = STD
5. STAINLESS STEEL (PS-151.4) MAY BE SUBSTITUTED FOR PIPE SIZES 1/2" THRU 6". EXISTING PIPING MAY BE OF AUSTENITIC STAINLESS STEEL MATERIAL OR OF CARBON STEEL TO THE APPLICABLE "PS" INDICATED. PIPING ENGINEERING APPROVAL IS REQUIRED PRIOR TO ANY CHANGE OF THE EXISTING MATERIAL. SEE NOTE 24 IN APPENDIX C, MATERIAL REQUIREMENTS, OF OS-243.00-00-0001.
6. OPEN ENDED - NO HYDROTEST REQD.
7. 193°F IS THE MAXIMUM POST-LOCA TEMPERATURE. ALL OTHER PLANT SYSTEM CONDITIONS ARE ENVELOPED BY THE 100°F DESIGN TEMPERATURE.
8. BRASS AND BRONZE VALVES MAY BE USED. SCREWED CONNECTIONS DO NOT REQUIRE SEAL WELDS.
9. VALVE 1LPSW-356 IS A 4" VALVE WITH 8" END CONNECTIONS.
10. PIPE SPEC. AND PIPE SCH. WERE DICTATED BY STRESS CONSIDERATIONS FOR VIBRATION.
11. VALVES TO BE LOCKED OPEN TO PROVIDE OVERPRESSURE PROTECTION ANY TIME THE LPSW RB WATERHAMMER SYSTEM IS OPERABLE.
12. DURING ACTUATION OF THE LPSW RB WATERHAMMER PREVENTION SYSTEM, THE PRESSURE MAY MOMENTARILY INCREASE ABOVE THE DESIGN PRESSURE. THE REGION OF THIS INCREASED PRESSURE IS BETWEEN CHECK VALVES, 1LPSW-1111, 1LPSW-1116 AND AIR OPERATED VALVES, 1LPSW-1121, 1LPSW-1122, 1LPSW-1123 AND 1LPSW-1124. THIS REGION HAS BEEN EVALUATED FOR 150 PSIG.
13. TANK TO BE FABRICATED AS CLASS F PIPING FROM 2 FEET OF 24" STD. PIPING WITH PIPE CAPS. TANK AND ASSOCIATED SUPPORTS ARE TO BE TREATED AS ISI CLASS C PIPING.
14. TANK TO BE FABRICATED AS CLASS F PIPING FROM 4 FEET OF 24" STD. PIPING WITH PIPE CAPS. TANK AND ASSOCIATED SUPPORTS ARE TO BE TREATED AS ISI CLASS C PIPING.
15. THE PIPE NIPPLE AND CAP ON THE OUTLET OF VALVES 1LPSW-1107 AND 1LPSW-1108 CAN BE TREATED AS CLASS "G" AS IF THEY WERE A VENT OR A DRAIN.
16. UPDATE INSERVICE INSPECTION NDE BOUNDARY DRAWINGS (O-ISIL & O-ISIN SERIES) IN CONJUNCTION WITH ALL REVISIONS MADE TO THIS DRAWING.
17. THE 260°F TEMPERATURE IS A RESULT OF A ONE-TIME NON DESIGN BASIS EVENT THAT IS NOT COINCIDENT WITH AN EARTHQUAKE. ALL OTHER PLANT SYSTEM CONDITIONS ARE ENVELOPED BY THE 100°F DESIGN TEMPERATURE
18. 3" DIA. HOLE CUT INTO 12" HEADER.

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DESIGN PARAMETERS

LINE NO.	DUKE CLASS	DESIGN PRESS.	DESIGN TEMP.	MATERIAL	PIPE SPEC. NO.	PIPE SCH. NO.	ISI CLASS
1	F	100 PSIG	100°F	CS (NOTE 5)	150.4 (NOTE 5)	NOTE 3	C
6	F	150 PSIG	100°F	SS	151.4	NOTE 3	C
7	G	150 PSIG	100°F	SS	151.4	NOTE 3	-
8	F	100 PSIG	100°F	SS	151.4	NOTE 3	C
10	H	ATM	200°F	CS	150.4	NOTE 3	-
11	F	100 PSIG	246°F	SS	151.4	NOTE 3	C
17	G	100 PSIG (NOTE 6)	246°F	SS	151.4	40S	-
25	F	100 PSIG	246°F	CS (NOTE 5)	150.4 (NOTE 5)	NOTE 3	C
26	F	100 PSIG	193°F (NOTE 7)	CS (NOTE 5)	150.4 (NOTE 5)	NOTE 3	C
27	F	100 PSIG	150°F	CS (NOTE 5)	150.4 (NOTE 5)	NOTE 3	C
29	F	100 PSIG (NOTE 6)	246°F	SS	151.4	NOTE 3	C
34	G	100 PSIG	246°F	CS	150.4(NOTE 5)	NOTE 3	-
35	G	100 PSIG	150°F	CS(NOTE 5)	150.4(NOTE 5)	NOTE 3	-
41	F	150 PSIG	200°F	SS	151.4	NOTE 3	C
42	G	150 PSIG	200°F	SS	151.4	NOTE 3	-
45	G	150 PSIG	100°F	CS(NOTE 5)	150.6 (NOTE 5)	NOTE 3	-
46	G	100 PSIG	246°F	SS	1501.4 (NOTE 8)	160	-
47	F	100 PSIG	246°F	CS	150.4	60	C
48	F	100 PSIG	193°F (NOTE 7)	SS	151.4	NOTE 3	C
50	F	100 PSIG	246°F	SS	1501.4 (NOTE 10)	160 (NOTE 10)	C
58	F	100 PSIG	150°F	CS(NOTE 5)	150.6 (NOTE 5)	NOTE 3	C
59	G	100 PSIG	150°F	CS(NOTE 5)	150.6 (NOTE 5)	NOTE 3	-
68	G	100 PSIG	100°F	SS	151.4	NOTE 3	-
72	F	150 PSIG	150°F	SS	151.4(a)	NOTE 3	C
75	F	100 PSIG	246°F	CS	150.4	40	C
80	F	100 PSIG(NOTE 12)	100°/260°F(NOTE 17)	CS (NOTE 5)	150.4 (NOTE 5)	NOTE 3	C
83	F	100 PSIG(NOTE 12)	193°/260°F(NOTE 7, 17)	CS (NOTE 5)	150.4 (NOTE 5)	NOTE 3	C
94	F	100 PSIG	100°/260°F (NOTE 17)	SS	151.4	NOTE 3	C

ATTACHMENT 2: Oconee Flow Diagram, OFD-124B-1.1
PAGE 1 of 1

DESIGN FLOW

NO.	FLOW
1	12 GPM
2	3000 GPM
3	1300 GPM
4	5 1/2 GPM
5	2 GPM

QA CONDITION 1

No.	Revisions
68	REV. PER EC77313, EC412128, EC414792
67	REV. PER EC410600

DUKE ENERGY
OCONEE NUCLEAR STATION – Unit 1
FLOW DIAGRAM OF
LOW PRESSURE SERVICE WATER SYSTEM
(AUXILIARY BUILDING SERVICES)
SCALE
DWG. No. OFD–124B–1.1 REV. 68