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March 14, 2020

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Serial No. 20-103
NLOS/MLC R0
Docket No. 50-423
License No. NPF-49

DOMINION ENERGY NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 3
ALTERNATIVE REQUEST IR-4-03 FOR USE OF AN ALTERNATIVE NON-CODE METHODOLOGY TO DEMONSTRATE STRUCTURAL INTEGRITY OF CLASS 3 MODERATE-ENERGY PIPING

Pursuant to 10 CFR 50.55a(z)(2), Dominion Energy Nuclear Connecticut, Inc. (DENC) requests Nuclear Regulatory Commission (NRC) approval to use a non-code methodology in lieu of a repair allowed by the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, IWA-4000, to address a through-wall leak in a reinforced branch connection of the service water system at Millstone Power Station Unit 3 (MPS3). DENC has evaluated the branch connection structural reinforcing pad and the underlying ASME pipe and welds to demonstrate structural integrity of the Class 3 moderate energy service water line, 3-SWP-19-2-7-3. NRC's acceptance of DENC's alternate methodology to establish structural integrity will allow continued operation of the unit until a repair is completed no later than the end of the next scheduled MPS3 refueling outage in the fall 2020.

The basis for this request is provided in Attachment 1. A copy of the structural integrity evaluation for 3-SWP-19-2-7-3 supporting this request is provided in Attachment 2. A schematic of ASME Branch Reinforcement Weld Details is provided in Attachment 3.

DENC is requesting NRC verbal approval of this alternate method for evaluating structural integrity of the through-wall leak condition identified on the MPS3 'A' train service water header. Per MPS3 Technical Specification (TS) 3.7.4, an inoperable service water loop must be restored to OPERABLE status within 72 hours or the plant must be in at least HOT STANDBY within the next 6 hours. Repair of this leak would require a unit shutdown and cooldown to Mode 5 to remove the affected header from service. The unit would need to be maintained in Mode 5 with limited decay heat removal and backup on-site emergency power availability for the duration of the repair. Therefore, DENC has determined that repairing the leak at this time would represent a hardship without a compensating increase in the level of quality and safety.

Approval of this alternate method for evaluating structural integrity will allow deferral of the required repair to no later than the end of the fall 2020 MPS3 refueling outage. Verbal approval is requested by 1113 hours on March 17, 2020 to allow the 'A' train of the service water system to be declared OPERABLE and avoid an unplanned unit

shutdown. The duration of the proposed alternative is requested to be until completion of the next MPS3 refueling outage.

Should you have any questions regarding this submittal, please contact Shayan Sinha at (804) 273-4687.

Sincerely,

Mark D. Sartain
Vice President Nuclear Engineering & Fleet Support

Attachments:

1. Alternative Request IR-4-03, Use of an Alternative Non-Code Methodology to Demonstrate Structural Integrity of Class 3 Moderate-Energy Piping

2. Engineering Technical Evaluation (ETE-MP-2020-1027) Structural Integrity Evaluation of Degraded Service Water Line 3-SWP-19-2-7-3, Service Water Header.

3. Schematic of ASME Branch Reinforcement Weld Details

Commitments made in this letter: None

cc: U.S. Nuclear Regulatory Commission
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ATTACHMENT 1

ALTERNATIVE REQUEST IR-4-03 USE OF AN ALTERNATIVE NON-CODE METHODOLOGY TO DEMONSTRATE STRUCTURAL INTEGRITY OF CLASS 3 MODERATE-ENERGY PIPING

MILLSTONE POWER STATION UNIT 3
DOMINION ENERGY NUCLEAR CONNECTICUT, INC.

Alternative Request IR-4-03
In Accordance with 10 CFR 50.55a(z)(2)

Hardship or Unusual Difficulty
Without Compensating Increase in Level of Quality and Safety

1. ASME Code Component(s) Affected

ASME Code Class: 3

References: American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, IWA-4000.

Components: Moderate-energy (i.e., ≤ 200°F (93°C) and ≤ 275 psig (1.9 MPa) maximum operating conditions) Service Water System Piping, line designation 3-SWP-19-2-7-3.

The subject piping segment is carbon steel seam welded pipe with a non-pressure retaining Cu-Ni roll clad interior lining provided for corrosion resistance.

2. Applicable Code Edition and Addenda

The current Code of record for Millstone Power Station Unit 3 (MPS3) is the ASME Section XI, 2013 Edition, no Addenda. MPS3 is in its fourth 10-year inservice inspection (ISI) interval which began on April 23, 2019 and will end on April 22, 2029.

3. Applicable Code Requirements

ASME Section XI, Article IWD-3132, Acceptance

- A component whose examination detects relevant conditions described in the standards of Table IWD-3410-1 shall be unacceptable for continued service unless such components meet the requirements of IWD-3132.1, IWD-3132.2, or IWD-3132.3.

ASME Section XI, Article IWD-3132.2, Acceptance by Corrective Measure or Repair/Replacement Activity

- A component containing relevant conditions is acceptable for continued service if the relevant conditions are corrected by a repair/replacement activity or by corrective measures to the extent necessary to meet the acceptance standards of Table IWD-3410-1.

ASME Section XI, Article IWD-3133, Repair/Replacement Activity and Reexamination

- The repair/replacement activity and reexamination shall comply with the requirements of Article IWA-4000.

ASME Code, Section XI, IWA-4400 of the 2013 Edition provides requirements for welding, brazing, metal removal, and installation of repair/replacement activities.

- ASME Section XI, Paragraph IWA-4422, Defect Evaluation and Examination states, a defect is considered removed when it has been reduced to an acceptable size. If the resulting section thickness is less than the minimum required thickness, the component shall be corrected by repair/replacement activities in accordance with this article.

  Alternatively, the defect removal area and any remaining portion of the defect may be evaluated, and the component accepted in accordance with the appropriate flaw evaluation provisions of Section XI, or the design provisions of the owner's Requirements and either the Construction Code or Section III.

4. Reason for Request

On March 11, 2020, water was found dripping from the weep hole in a reinforcing pad (also referred to as a branch reinforcement by the Code or as a saddle plate in Attachment 2) on a 30-inch diameter section of service water (SW) supply piping (i.e., 3-SWP-19-2-7-3) in the 'A' SW train at MPS3. The presence of the reinforcing pad precludes identifying and characterizing the flaw as required by ASME Section XI.

Implementation of the applicable ASME Section XI requirements necessitates removal of the defect through an appropriate repair process. Such a repair would require removing the system from service and performing a major disassembly for access to the flaw. Other alternative repair methods such as local weld overlays are not practicable because of the configuration of the joint and the presence of the reinforcing pad.

Repair of the degraded piping will require significant time for evaluation, design, material procurement, planning, scheduling, and implementation and would necessitate a unit shutdown and removal of the 'A' SW train from service. This would render one train of decay heat removal and one emergency diesel generator inoperable. In cold shutdown, loss of the remaining operable train of decay heat removal would result in an uncontrolled temperature increase and mode change until decay heat removal from the steam generators could be established. During a refueling outage, the repair could be performed with the refueling cavity flooded, providing additional defense-in-depth against a loss of the train of decay heat removal. The proposed alternative method demonstrates that structural integrity is maintained, with margin. Therefore, complying with the requirements of the Code and affecting a repair now will present an undue hardship without a compensating increase in the level of quality and safety of the

unit. Until a repair is complete, the leakage will be managed by implementation of compensatory monitoring actions described below.

NRC approval is needed since the methodology used to establish structural integrity has not been previously approved by the NRC. Although the alternate methodology utilizes code equations to assess the capacity of the load path through the branch reinforcement, the Code does not provide a direct means of crediting a fabricated tee for structural design loading without a full penetration weld between the branch and the main pipe run.

5. Proposed Alternative and Basis for Use

Dominion Energy Nuclear Connecticut (DENC) proposes to use an alternative, non-Code methodology to evaluate structural integrity of the affected section of piping. Leakage will be monitored on a daily basis and the leak rate trended. UT examination of the piping and reinforcing pad will be performed monthly (30 days +/- 25%) and in response to an increase in leakage that indicates further degradation of the underlying flaw.

The affected piping (3-SWP-19-2-7-3) is the common line of the 'A' train of SW located downstream of 3SWP*MOV102A and 3SWP*MOV102C. The affected piping is located in the 'A' SW cubicle in the intake structure.

The leak has the potential to affect the following systems, structures, and components:

- 'A' train of SW
- SW piping spool 3-SWP-19-2-7-3
- Safety related heat exchangers cooled by the 'A' train of SW
- SW pumps P1A & P1C hydraulic performance
- Intake structure equipment susceptible to spray or flooding damage

Leak Description:

The leak is coming from a weep hole on the upper reinforcing pad which is welded to the intersection of two 30-inch pipes to provide structural support for the piping joint (fabricated tee). The reinforcing pad has a drilled weep hole from which water is being discharged at a rate of about 1 drop every 40 seconds with one 'A' header SW pump running. The rate changes to 1 drop every 20 seconds with both 'A' header SW pumps running (based on field observation). The reinforcing pad is 60 inches long and ¾ inch thick with a 69 ¾ degree arc rolled to a 30-inch inside diameter.

The location and size of the flaw under the reinforcing pad cannot be determined.

Structural Integrity:

DENC's structural integrity evaluation is provided in Attachment 2. In summary, the structural integrity load path is from the reinforcing pad fillet weld on the branch piping (immediately downstream of 3SWP*MOV102A) and across the reinforcing pad to the reinforcing pad fillet weld on the run piping (immediately downstream of 3SWP*MOV102C). No credit for structural integrity is taken for the full penetration butt weld, which connects the two 30-inch pipe pieces into a fabricated tee. Based on the low leak rate (1 drop in 40 seconds), and previous large bore SW leaks at MPS3, it is possible that SW penetrated the Cu-Ni clad and epoxy coating on the piping via a pinhole defect, and began to corrode the underlying carbon steel (SA-516) piping resulting in a leak path. Pinhole degradation of the butt weld resulting in a leak path under the reinforcing pad is also a possible cause.

Documentation was reviewed to confirm that the subject piping spool was fabricated and inspected to the appropriate Code. A review of the inservice conditions of this spool concluded that inservice degradation of the spool components needed for structural integrity is not likely based on the following conditions:

- The installed configuration of the piping spool results in primary applied stresses that are below the Code allowable stresses by a factor of approximately 3.
- There is substantial margin in the weld capacity (0.215 inch weld required versus 0.500 inch weld nominal).
- Thermal and dead load stresses are approximately 50% of the Code allowable stresses. The number of thermal cycles on this spool are low. Thus, the potential for thermal induced fatigue is low.
- The spool is isolated from pump vibrations by an installed strainer and expansion joint, resulting in minimal high cycle fatigue.

Additionally, inspections of the inservice spool were performed to confirm that the condition of the spool will support the continued structural integrity of the spool. NDE inspections are documented on pages 8 through 17 of Attachment 2 (Note: inspections were subject to geometric limitations as specified in the NDE reports). These inspections included:

- UT measurements of accessible pipe wall thickness adjacent to the reinforcing pad welds and of accessible areas of the pipe directly under the welds using shear wave UT.
- UT measurements of the reinforcing pad thickness adjacent to the reinforcing pad welds and at selected locations across the reinforcing pad.
- A visual exam of the reinforcing pad welds.

Based on these considerations, there is reasonable expectation that the inservice condition of the reinforcing pad and the piping that can be examined are, and will remain, in a condition to support their intended use for maintaining structural integrity of this piping spool. The confirmed integrity of these components provides a sound load carrying path between the branch and main run of the piping.

Flow Concerns:

The effects on SW system hydraulic performance due to a leak at the junction between pumps 3SWP*P1A and 3SWP*P1C was evaluated using the PROTO-FLO model of the system (Reference 5). This evaluation assumed a 60 gpm leak rate to bound the capacity of the SW pump cubicle floor drain capacity of 56 gpm documented in an internal flooding calculation (Reference 6). Delivered flows to the various heat exchangers cooled by the SW system during system operation with 60 gpm of leakage out of the header were compared to delivered flows during system operation with no leakage. This was evaluated for the normal and design accident cases (i.e., Cases 1 through 9 of Reference 5). It was determined that the impact on delivered flows due to a 60 gpm leak rate is negligible and will not have an adverse impact on system operation. Minimum required flow rates to all heat exchangers are maintained for the design basis alignments.

These accident configurations are consistent with the system design requirements and conservative to minimize delivered flow to the safety related heat exchangers. Thus, there are no concerns with adequate flow from the SW system to the safety related heat exchangers with the existing leak or increases in leakage up to 60 gpm.

Spray Concerns:

Spraying adjacent components is not a concern based upon the location of the leak. The leak is through the pipe wall at an unknown location under the reinforcing pad and is thus inherently limited in its flow capacity due to the probable tortuous path to the atmosphere. A daily visual inspection to monitor leakage will be performed. No components susceptible to spray damage are in the immediate vicinity of the leak. With respect to spray from a bounding leak, the nearest electrical target is the conduit and flex conduit for the 4160 VAC line for the 'A' SW Pump. These conduits are rated for spray without damage. With respect to both spray and flooding from a bounding leak, the nearest electrical target is safety related MCC 3EHS*MCC1A5 (32-5T). The MCC stands on a 5-inch high concrete pedestal and is 25 feet away from the leak. Daily checks of the leak will identify a worsening leak well before these targets would be exposed to spray.

Flooding Concerns:

Flooding concerns were evaluated for safety related components within the 'A' SW pump cubicle. Based on the structural integrity evaluation of the leak,

catastrophic failure of the pipe or reinforcing pad is considered unlikely. Compensatory measures as discussed below, have been established to ensure that the capability of existing room flood control systems will not be challenged.

Each SW pump cubicle has two SW pumps with a sump to collect pump seal leak off, which is typically 1-2 gpm. Seal leak off water and water issuing from the weep hole in the reinforcing pad is gravity drained to the intake structure pump bay via a 1-1/2" line under normal conditions.

During hurricane scenarios (or other conditions when high tidal surges are experienced or expected), the normal sump drain lines are isolated by Operators per AOP 3569 (Reference 8) and the 'A' header SW cubicle sump is drained using sump pump 3PBS-P1A. Sump pump will pass approximately 20 gpm at 30 feet of head (PDCR MP3-92-091) which exceeds the maximum acceptable leak rate of 5 gpm and other expected leakage such as pump and strainer seal leakage which is typically 2-3 gpm per pump.

Compensatory Actions:

For the duration for the proposed alternative, DENC will perform the following actions:

- Daily observation and recording of leak rate by Operators. Maximum acceptable leak rate is 5 gpm.

- Periodically (every 30 days +/- 25%) or upon identification of an increase of 100 drops/min (10 ml/min) over the previous 7 days, UT verification that degradation of the piping base metal adjacent to and under the reinforcement pad fillet weld, and reinforcing pad base metal is within the bounds of the structural integrity determination provided in Attachment 2.

Multiple alarms, including low discharge pressure, and low flow to cooled components, are available to alert operators should a gross failure of the pipe occur. Indication of pressure is also available to the operators both on the main control board as well as the plant process computer. Operators would respond to such a condition as directed by applicable Alarm Response Procedures and Abnormal Operating Procedure AOP 3560, Loss of Service Water (Reference 7).

Extent of Condition:

- SW piping in the 'A' train SW cubicle was walked down with no signs of exterior piping leakage noted besides the leakage from the weep hole on the upper reinforcing pad.

- The weep hole on lower reinforcing pad was verified to have no leakage.

- Inspection robotic videos and inspection results from the last two inspections (3R16 - October 2014 and 3R18 - October 2017) were reviewed for the 'A' train SW header in the intake to determine if any piping problems had been identified. No corrosion problems were evident from the video and no corrosion or coating problems were noted on the inspection forms. The previous robotic camera inspections from 3R17 (April 2016) and 3R19 (April 2019) of the corresponding spool piece with the 30-inch fabricated tee on the 'B' train of MPS3 SW were also reviewed. No corrosion problems were evident from the video and no corrosion problems or coating problems were noted on the inspection forms.

Conclusion:

Although a regulatory-approved methodology for demonstrating structural integrity is not available for use in this case, structural integrity of the 30-inch fabricated tee on service water line 3-SWP-19-2-7-3 has been demonstrated using an alternate analysis methodology detailed in Attachment 2. The safety function of the 'A' train SW header is unaffected by the identified leakage and the leak rate is within the capabilities of the floor drain system in the 'A' SW pump train cubicle. Therefore, there is no potential adverse impact on neighboring equipment due to either spray or flooding.

Leakage will be monitored on a daily basis and the leak rate trended. UT examination of the piping and reinforcing pad will be performed monthly (30 days +/- 25%) and in response to an increase in the leakage that indicates further degradation of the underlying flaw.

A Code-compliant repair will be completed no later than the next MPS3 refueling outage, which is scheduled for fall 2020.

6. Duration of Proposed Alternative

The duration of the proposed alternative for SW piping, 3-SWP-19-2-7-3, is requested to be until the end of the fall 2020 refueling outage.

7. Precedents

No precedents were found.

8. References

1. American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, 2013 Edition.
2. American Society of Mechanical Engineers (ASME) Section III, 1971 Edition through Winter 1973 Addenda, Class 3.
3. ETE-MP-2020-1027, Structural Integrity Evaluation of MP3 Service Water Spool 3-SWP-19-2-7-3.
4. Operability Determination for CR1142973, as reviewed by FSRC on 3/14/2020.
5. Calculation 96-001, Empirical Adjustment MP3 SW Model to 1995 Flow Test Data and Incorporation of Latest Service Water Design Change Notice
6. Calculation 01-ENG-01884M3, MP3 Service Water Pump Cubicle Internal Flooding Evaluation, Rev 0, CCN 1
7. AOP 3560, Loss of Service Water, Rev 012
8. AOP 3569, Severe Weather Conditions, Rev 026

ATTACHMENT 2

ENGINEERING TECHNICAL EVALUATION (ETE-MP-2020-1027) STRUCTURAL INTEGRITY EVALUATION OF DEGRADED SERVICE WATER LINE 3-SWP-19-2-7-3, SERVICE WATER HEADER

MILLSTONE POWER STATION UNIT 3
DOMINION ENERGY NUCLEAR CONNECTICUT, INC.

Engineering Technical Evaluation Cover Sheet and Body

CM-AA-ETE-101 Attachment 2 Page 1 of 7

1. Stations:	2. Doc Type:	3. Sub Type:	4. Document Number:	5. Rev.:	6. Add:	7. Decomm?:
☒ MP ☐ SU ☐ NA	ETE	000	ETE-MP-2020-1027	0	N/A	☐ Yes ☒ No

8. Title:
Structural Integrity Evaluation of MP3 Service Water Spool 3-SWP-19-2-7-3

9. ETE Level:	10. Unit(s):	11. Quality Classification:	12. FSRC Approval:	13. Risk Assessment:
☒ Level 1 ☐ Level 2	☐ Unit 1 ☐ Unit 2 ☒ Unit 3 ☐ ISFSI	☒ SR ☐ NS ☐ NSQ	☐ Yes ☒ No	☐ Low ☐ Medium ☐ High ☒ N/A

14. *Preparation, Review, and Approval Signatures (add or delete rows as needed)*

Prepared by/Affiliation Mechanical Calculations: (Print) Digitally Signed by [redacted]	Signature: [redacted]	Date: 03/13/2020 06:04:17 PM
Reviewed by/Affiliation IND Mechanical Calculations: (Print) ☒ IND ☐ PEER Digitally Signed by [redacted]	Signature: [redacted]	Date: 03/13/2020 06:05:21 PM
Supervisor Approval/Affiliation Mech / Electrical: (Print) Digitally Signed by [redacted]	Signature: [redacted]	Date: 03/13/2020 06:08:41 PM

Standard Attachments	Attachment	# of Pages	Reviewed/No Impact	Not Req.
15. Design Effects and Considerations (DNES-AA-GN-1003)	-	-	☐	☒
16. Document Impact Summary (DRUL) (DNES-AA-GN-1002)	-	-		☒

17. Considerations and Conditions for Document Updates (check N/A ☒ if no document updates are noted on the DRUL)

☐ All Document updates noted on the DRUL can be initiated immediately

☐ Document updates noted on the DRUL are delayed until the following documents/actions are completed:

____ (e.g., WO, CR etc.) (See DRUL Remarks section)

10CFR50.59 Attachments	Attachment	# of Pages	Not Req.
18. 10CFR50.59/72.48 applicability review forms (CM-AA-400)	-	-	☒
19. 10CFR50.59/72.48 screen form (CM-AA-400)	-	-	☒
20. 10CFR50.59/72.48 evaluation form (CM-AA-400)	-	-	☒

21. Additional Attachments

Attachment	# of Pages	Description
Attachment 1	10	NDE Inspection Reports
Attachment 2	2	Alternate Structural Evaluation - Required weld size
Attachment 3	2	Alternate Structural Evaluation - Area Reinforcement evaluation
Attachment 4	3	Piping Drawings
Attachment 5	2	Corporate Engineering Corrosion Rate
Attachment 6	1	Spool 3-SWP-19-2-7-3 Certificate of Design

22. Distribution

Engineering Technical Evaluation Cover Sheet and Body

CM-AA-ETE-101 Attachment 2 Page 2 of 7

Primary Recipient(s):			
Copy To?	Other Recipient / Department or Location	Copy To?	Other Recipient / Department or Location
☐	Preparer		
☐	Reviewer		
☐	Supervisor		
☐	Site Design Engineering Designee		
☐	Affected Organization		
☐	Program Owners		
☐	System Engineer		
☐	Nuclear Document Management		

Source Document

1. CR1142973 "Water coming from under insulation from common discharge piping SW"

Purpose

The purpose of this ETE is to document the structural integrity evaluation of the fabricated tee in Millstone Unit 3 service water pipe spool 3-SWP-19-2-7-3 to support a service water train Operability Determination and Alternative Request in response to the reference 1 CR. This ETE is prepared as a Level 1 ETE in accordance with CM-AA-ETE-101 Step 2.4.a "Document a technical position in cases where more rigorous documentation is required to support the position" and Step 2.4.c. "Document technical basis supporting responses to INPO, NRC...". Note the current version of the ETE cover page (form 730801) is dated Apr 2019 while the version in CMIS is dated Sep 2018. The difference between the two versions has been reviewed and is administrative (administrative note have been included in the latest version). This difference has no impact on the development or quality of this ETE. A formal risk assessment has not been performed within this ETE. Engineering technical risk is addressed through the follow on operability determination and relief request process. A challenge review has been performed on 3/13/2020 including members of Millstone site engineering management, site licensing management, Dominion corporate engineering and Dominion corporate licensing.

Discussion

The Reference 1 CR documents a degraded condition (evidence of through wall pipe leakage) on Millstone Unit 3 moderate energy service water line 3-SWP-030-15-3(A-), spool 3-SWP-19-2-7-3 as shown on fabrication installation drawing reference 2.2. This spool is a 30 inch OD, 0.500 inch nominal wall thickness pipe class 158 with a design pressure of 100 psig and a maximum operating pressure of 92 psig and a design temperature of 80°F. The pipe material is SA-516 Gr 70 base metal with 0.100 inch minimum thick clad of SB-402 #706 Cu-Ni. The CR indicates water is emanating from the weep hole in the fabricated tee reinforcing pad of this spool. Note that reference 2.1 refers to the reinforcement as a reinforcing pad and reference 2.3 refers to the reinforcement as a reinforcing pad. The water emanating from the weep hole is indicative of a through wall hole in the pipe and or weld material that is obscured by the reinforcing pad. The presence of the reinforcing pad precludes the use of NDE to locate and characterize flaw(s) at this location. NDE has been

used to assess the condition of the reinforcing pad, the reinforcing pad fillet weld and the pipe and branch run base material immediately under the reinforcing pad fillet welds (see attachment 1 for inspection results). The reinforcing pad design is shown on the spool drawing (reference 2.1) item G. The reinforcing pad is designed in accordance with the shop fabrication specification reference 7 and the construction code reference 4, ASME Code Section III, ND-3600, NC-3600 as supplemented by Winter 1972 Addenda. The reinforcing pad is fabricated from SA-516-70 ¾ inch rolled plate per reference 2.1.

To ensure that in the current condition of the spool will support the structural analysis, the following has been performed (see attachment 1 for inspection reports):

Confirmed that the reinforced opening of the piping spool was fabricated to the appropriate Code NC 3643.3 and reviewed the certificate of inspection.

A review of the in-service conditions of this piping spool concluded that in-service degradation of the spool components needed for structural integrity is not likely based on the following conditions:

The installed configuration of the piping spool results in primary applied stresses that are well below allowable stresses by a factor of greater than 3.

The stresses at this location result in approximately 50%of allowable stress due to thermal and dead load. The Code allowables are based on 7000 thermal cycles. This pipe spool has experienced significantly less than 7000 cycles based on seasonal temperature fluctuations of the seawater and any maintenance activities (i.e., draining of the pipe). Thus, the potential for thermally induced fatigue is low.

The spool is isolated from pump vibrations by an installed strainer and expansion joint. Thus, the installed configuration of this spool results in minimal high cycle fatigue.

Additionally, inspections of the in-service spool were performed to confirm that the conditions of the spool will support the continued structural integrity of the spool. These inspections included:

UT measurements of pipe wall thickness adjacent to the reinforcing pad welds and of the area of the pipe directly under the welds using shear wave UT

UT measurements of the reinforcing pad thickness adjacent to the reinforcing pad welds and at selected locations across the reinforcing pad.

A visual exam of the reinforcing pad welds.

Relative to the welds, there is substantial margin in the weld capacity (0.215 inch weld required versus 0.500 inch weld nominal – see attachment 2).

Based on these considerations there is reasonable expectation that the in service condition of the reinforcing pad and the piping that can be examined are and will remain in a condition to support their intended use for maintaining structural integrity of this piping spool.

The confirmed integrity of these components provides a sound load carrying path between the branch and main run of the piping.

The approach of this evaluation is to assess the capability of the reinforcing pad to carry the mechanical loads present at this location without credit of the load carrying capacity of the underlying branch to run pipe weld connection. The load carrying capability of the reinforcing pad is assessed by comparing the design margin between the calculated design stress (extracted from the pipe stress analysis of record, reference 3) and the allowable stress for the applicable ASME Code load combinations. This comparison is performed for both reinforced and unreinforced tee designs. The comparison of stress for the reinforced and unreinforced tee configurations provides an assessment of the load carrying capability provided by the reinforcing pad.

The pipe stress calculation (reference 1) work sketch indicates this tee connection is located at node 215 of the pipe stress model. The associated as built drawing (reference 2.3) shows the pipe support configuration. The support nomenclature is defined as follows. VC indicates vertical constraint (ie restrains up and down vertical motion) and PSA indicates pipe support anchor. The NUPIPE computer model run of record is R1884E01 dated 2/19/93. Referring to the NUPIPE run table of intersection stresses shown on pages 414 (normal / upset) and 422 (faulted) the following maximum stresses for Code equations and stress intensification values are extracted for both a reinforced and unreinforced tee configuration. The associated code allowable stress values(1) are also extracted from the Maximum Stress Levels & Allowables table from pages 56 and 57 of reference 3. The Millstone Unit 3 Piping Operability Manual section 5.1.3 Piping Acceptance Criteria (reference 5) indicates Level A normal loads (equation 8) and Level D faulted loads (equation 9F) are applicable for this assessment.

To make a comparison of the moment carrying capability of the reinforcing pad it is reasonable to compare the moment terms of the above load combinations. The longitudinal pressure term (P*d/4t = 1500 psi)(2) is removed from the ASME Code (reference 4) Section NC-3652 Equation 8 and Equation 9 faulted values to obtain stress due to deadweight S_D and stress due to seismic inertia S_E. Code Equation 9 also includes stresses due to occasional loads other than seismic such as water hammer, opening and closing of safety relief valves, etc. In the pipe stress calculation reference 4 there are no occasional loads other than seismic to be considered.

Pipe Stress Calculation NP(B) X1901 Node 215 Stresses							
	Stress Intensification Factor	Eq 8 stress psi	Eq 9F stress psi	Deadweight longitudinal stress S_D psi	Seismic + Deadweight longitudinal Stress $S_D + S_E$ psi	Eq 8 / Allowable	Eq 9F / Allowable
Reinforced Tee	4.375	3539	7676	2039	6176	0.202	0.183
Unreinforced Tee	8.602	5509	13644	4009	12144	0.315	0.325
Allowable Stress psi		17500	42000				

Based on the above table the presence of a reinforcing pad reduces the deadweight and seismic stress levels by a factor of 1.97, which corresponds to the ratio of the reinforced to unreinforced SIFs of (8.602/4.375).

Based on the principle of superposition it is therefore reasonable to consider the reinforcing pad as having a similar mechanical load carrying capacity as an unreinforced branch tee connection. As shown in the table above, the mechanical load carrying capability of an unreinforced tee configuration at this location has a margin of approximately 3 (1/0.325) to the original Equation 9 faulted allowable stress. This provides reasonable assurance the reinforcing pad also has considerable margin to the Code stress allowables for carrying the mechanical deadweight and seismic loads described above.

It is recognized this evaluation does not consider the reinforcing pad to provide pressure retaining capability. As noted above, the reinforcing pad has an approximately 3/8 inch diameter weep hole to preclude the development of full system pressure internal to the reinforcing pad. If the reinforcing pad were to be subject to the full internal design pressure of 100 psig (if the weephole were plugged) the corresponding longitudinal stress would be approximately 1050psi = 100psig * 31.5 inch /4*0.750 inch (Design Pressure*Outside Diameter/4*nominal wall thickness). As demonstrated above there is a large margin between the stress resulting from applied mechanical loads and the allowable stress. The potential longitudinal pressure stress of 1050psi is small compared to the available margin of approximately 12000psi.

In addition to the review of pipe stress analysis ASME Section III Code equations (i.e., Equations 8 and 9) performed above, two additional checks were performed as an alternate evaluation of the design margin available at this location. These checks are included in attachment 2 and attachment 3. The first evaluation is the required weld size for the applied loads at the branch connection for the worst combined design loads. The second check is a Code area reinforcement evaluation (i.e., area that can be credited to compensate for the material removed by the hole for the branch connection and still meet Code requirements for area reinforcement).

Results of the weld size evaluation performed in attachment 2 show that the required weld size is 0.215 inches, which is less than the actual weld size of nominally at least 0.500 inches on average (see attachment 1). Additionally, the area reinforcement evaluation provided in attachment 3 for a run and branch line nominal wall thickness of 0.500 inches indicates that significant wall loss from 0.500 inches to 0.205 inches could be accommodated and still meet the minimum required area reinforcement for internal pressure considerations. These two independent assessments provide additional assurance that structural integrity will be maintained with the load path provided by the reinforcing pad alone, with adequate margins of safety for the subject branch connection.

The next refueling outage is scheduled for Fall of 2020. Relative to corrosion considerations, the low corrosion rate expected for this condition (approximately 0.0006 inches / month (see attachment 5) for the carbon steel reinforcing pad) and the time to the next refueling outage (approximately 8 months which assumes a 30 day mission time beginning the day the outage is scheduled to start), results in a wall loss of approximately 0.0048 inches. The material thickness considering this corrosion material loss at the end of 8 months is still sufficient to provide adequate margin to maintain structural integrity based on the above evaluations.

Note 1: ASME Section III Appendix F of the Code and reference 5 allow the use of higher Level D allowables for all load combinations however use of these higher allowables was not necessary to demonstrate acceptable results.

Note 2: P=Design Pressure (psig), d=Pipe Outside Diameter (inches), t=Pipe Wall Thickness (inches).

Note 3: Use of an increased ASME Code design stress intensity value (Sm) of 20,000 psi for SA-516 Grade 70 material would also be acceptable based on a code reconciliation review of the construction code to later code editions, which would provide an additional 14% margin to the evaluations performed in this ETE (Ref. 4, 8 & 9).

Conclusions

This ETE has documented the acceptable structural integrity evaluation of the subject service water spool with consideration of the degraded condition documented in the reference 1 CR. Reasonable assurance has been demonstrated that the reinforcing pad of the subject fabricated tee has considerable margin to the Code stress allowables (and can accommodate expected reinforcing pad material wall loss) for carrying the mechanical deadweight and seismic loads required to support an Operability Assessment and Alternative Request. While structural integrity has been demonstrated this condition is not Code compliant since the Code does not provide for the design of a fabricated tee using only a reinforcing pad and not having a full penetration weld between the branch and the main pipe run.

References

1. CR1142973 "Water coming from under insulation from common discharge piping SW"
2. Drawings (See attachment 4)
   2.1. Spool Drawing 3-SWP-19-2-7-3 Revision 4 (attachment 4)
   2.2. 25212-21041 Sh 16 (12179-CI-SWP-19 Sh 1) Rev 17 "Fabrication Installation Control Drawing" (attachment 4)
   2.3. 25212-21041 Sh 18 Rev 17 "Fabrication Installation Control Drawing Stress Reconciliation Piping Location Isometric" (attachment 7)
3. Calculation 12179-NP(B)-X1901 Rev 03 through Addendum 12, "Pipe Stress Analysis: Service Water Piping – CW Pump House to Turbine Building"
4. ASME Code Section III, 1971 edition through Summer 1973 Addenda
5. Piping Operability Determination Manual, Millstone Unit 3, Rev. 1
6. Work Order 53203264267 "Insulation removal on Service Water Pipe 2-SWP-030-415-3"
7. Specification 2280.000-450, Revision 3 through Addendum 4, "Shop Fabricated Piping, ASME Code Section III, Classes 1, 2 & 3, and ANSI B31.1, Class 4"
8. ASME Code Section II-D 2007 Edition through 2009 Addenda
9. Corporate Standard DNES-VA-ME-0023 "Code Reconciliation"

Attachments

1. NDE Inspection Report for Work Order 53203264267
2. Alternate Structural Evaluation - Required weld size at the branch connection

3. Alternate Structural Evaluation - Area Reinforcement evaluation with nominal wall thickness (i.e. 0.5") of run and branch lines and with 0.25" wall thickness of run and branch lines
4. Piping Drawings (Spool and Fabrication)
5. Corporate Engineering Corrosion Rate
6. Certificate of Shop Inspection for Spool 3-SWP-19-2-7-3
7. Drawing 25212-21041 Sh 18 Rev 17 "Fabrication Installation Control Drawing Stress Reconciliation Piping Location Isometric"

MILLSTONE INSPECTION AND VERIFICATION PLAN

AWO/Change No.: 53203264267		Procedure No. and Rev #: MP-02-NO-FAP04.3 Rev. 000	Component ID.: M33SWP*MOV102C		
*Level of Verification	Attribute To Be Inspected/Verified	Acceptance Criteria	Inspection Results	Inspector Signature	Date
QC	Reinforcement Pad Weld (Visual inspection)	Perform visual inspection of reinforcement pad weld IAW MP-02-NO-FAP04.3 and ASME III Class 3. Weld size is not available on drawing and is therefore not part of the inspection criteria. Note minimum weld size in remarks.	SAT	[redacted]	3/12/2020

*_PERFORMANCE VERIFICATION_: QC = QC Hold Point
NOTE: Method of inspection is visual unless otherwise noted

REMARKS: Weld size is greater than ½" all around. [redacted] 3/12/2020

Mich843
March 12, 2020

NO-MP-QCI-103
ATTACHMENT 1

Ultrasonic Instrument Linearity

Site: MPS
Procedure: ER-AA-NDE-130
Procedure Rev.: 4
Report No.: MP-L-20-007

Instrument:

Manufacturer: GE
Model: USN 60 SW
Serial No.: 021D9Y

Transducer:

Size: .375"
Frequency: 2.25
Serial No.: 001SRS

Angle Beam:

Size: .375"
Frequency: 2.25
Serial No.: 001SRS

Couplant:

Type: Ultragel II
Batch No.: 19A039

Calibration Standard:

Serial No.: 95-5966

Horizontal Linearity

BR	Screen Location	Actual Location
1	1	1
2	2	2.0
3	3	3.0
4	4	4.0
5	5	5.0
6	6	6.0
7	7	7.0
8	8	8.0
9	9	9.0
10	10	10

*Acceptable limits are +/- 5% full screen.

Screen Height Linearity
Signal Amplitude In % FSH

No.	Actual Higher	1/2 of Higher	* Acceptable Limits	Actual Lower
1	100%	50%	55% to 45%	50
2	90%	45%	50% to 40%	45
3	80%	40%	SetPoint	40
4	70%	35%	40% to 30%	35
5	60%	30%	35% to 25%	30
6	50%	25%	30% to 20%	25
7	40%	20%	25% to 15%	20
8	30%	15%	20% to 10%	15
9	20%	10%	15% to 5%	10

*Acceptable limits are 1/2 of the higher signal +/- 5% FSH.

Amplitude Control Linearity

Initial Amplitude	dB Change	Acceptable Limits	Results
80% FSH	-6dB	32% to 48%	40
80% FSH	-12dB	16% to 24%	20
40% FSH	+6dB	64% to 96%	80
20% FSH	+12dB	64% to 96%	80

Results: (•) Sat ( ) Unsat

Comments: **Utilized angle beam transducer.**

Examiner	Level II	[redacted]	Signature	Date 3/12/2020	Reviewer N/A	Signature	Date
Examiner N/A	Level N/A		Signature	Date	Site Review	[redacted]	Date 3/12/2020
Other N/A	Level N/A		Signature	Date	ANII Review N/A	Signature	Date

Ultrasonic Instrument Linearity <Edit From Setup>

UT Calibration/Examination

Site/Unit:	MPS / 3	Procedure:	ER-AA-NDE-UT-701	Outage No.:	N/A
Summary No.:	N/A	Procedure Rev.:	7	Report No.:	BOP-UT-20-059
Workscope:	BOP	Work Order No.:	N/A	Page:	1 of 2

Code: N/A Cat./Item: N/A Location: Intake Structure 14'-6"

Drawing No.: 25212-21041 Sh.16 Description: 30" Saddle Reinforced Tee(Fish Mouth)

System ID:

Component ID: Line # 3-SWP-030-18-3(A) DS of 3SWP*MOV102C Size/Length: N/A Thickness/Diameter: .500" & .750"/ 30"

Limitations: From TDC, 16.25" to 32.25" obstructed due to flange joint US of main run. Start Time: 14:00 Finish Time: 17:30

Instrument Settings

Serial No.:	021D9Y		
Manufacturer:	GE		
Model:	USN 60 SW	Linearity:	MP-L-20-007
Delay:	-0.305	Range:	1.0"
M'tl Cal/Vel:	.2350	Pulser Type:	Square
Damping:	500 Ohms	Reject:	0%
PRF:	Auto High	SU Freq.:	4 MHz
Frequency:	4.0 MHz	Rectify:	Fullwave
Voltage:	450	Pulse Width:	250

Ax. Gain (dB): N/A Circ. Gain (dB): N/A

1 Screen Div. = .10 in. of Depth

Calibration Block

Cal. Block No. N/A

Thickness 0250"-1.000" Dia.: N/A

Cal. Blk. Temp. * Temp. Tool: N/A

Comp. Temp. 44** Temp. Tool: N/A

Search Unit

Serial No.: 57462-9687

Manufacturer: KB-Aerotech

Size: 3.5mm x 10mm Model: N/A

Freq.: 4 MHz Center Freq.: N/A

Exam Angle: 0 deg Squint Angle: N/A

Measured Angle: N/A Mode: Long.

Exit Point N/A # of Elements: 2

Config.: N/A Focus: N/A

Shape: 2 Contour: N/A

Wedge Style: N/A

Search Unit Cable

Type: RG-174 Length: 6' No. Conn.: 0

Scan Coverage

Upstream ☑ Downstream ☑ Scan dB: 43

CW ☑ CCW ☑ Scan dB: N/A

Exam Surface: OD

Surface Condition: Smooth

Cal. Checks	Time	Date
Initial Cal.	14:00	3/12/2020
Inter. Cal.	N/A	
Inter. Cal.	N/A	
Inter. Cal.	N/A	
Final Cal.	17:30	3/12/2020

Couplant

Cal. Batch: 19A039

Type: Ultragel II

Mfg.: Sonotech, Inc.

Exam Batch: 19A039

Type: Ultragel II

Mfg.: Sonotech, Inc.

Reference Block

Serial No.: 95-5768

Type: CS

Axial Oriented Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Depth
.250" Step	80%	2.5	.250"
1.000" Step	80%	10.0	.1.000"

Circumferential Oriented Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Depth
N/A			

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Depth
N/A				

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)

Results: NRI ☑ RI ☐ Geom ☐ *Cal Block amb. **Comp. Temp from PPC= T47A

Comments: Scanned around the Saddle Reinforced Tee and adjacent Pipe approx. 3" on either side of the Saddle Fillet Weld.

Percent Of Coverage Obtained > 90%: N/A Reviewed Previous Data: N/A

Examiner	Level III	Signature	Date	Reviewer		Signature	Date
[redacted]			3/12/2020	N/A			
Examiner	Level N/A	Signature	Date	Site Review		Signature	Date
N/A				[redacted]			3/12/20
Other	Level N/A	Signature	Date	ANII Review		Signature	Date
N/A				N/A			

Supplemental Report

Report No.: BOP-UT-20-059

Page: 2 of 2

Summary No.: N/A

Examiner:	[redacted]	Level:	IIL	Reviewer:	N/A	Date:	N/A
Examiner:	N/A	Level:	N/A	Site Review:	[redacted] Lv-II	Date:	3/12/20
Other:	N/A	Level:	N/A	ANII Review:	N/A	Date:	N/A

Comments:

0 degree UT scan of the pipe has an overall average thickness of .660" with a low UT reading of .600".
0 degree UT scan of the plate has an average of .750" to .780" with a low UT reading of .730".

Ultrasonic Instrument Linearity

Site: MPS | Procedure Rev.: 4

Procedure: ER-AA-NDE-130 | Report No.: MP-L-20-004

Instrument:

Manufacturer: Krautkramer

Model: USN-52L

Serial No.: 00CLXR

Transducer:

Size: .75"

Frequency: 2.25 MHz

Serial No.: A02628

Angle Beam:

Size: N/A

Frequency: N/A

Serial No.: N/A

Couplant:

Type: Ultragel II

Batch No.: 19A039

Calibration Standard:

Serial No.: 94-7759

Horizontal Linearity

BR	Screen Location	Actual Location
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10	10	10

*Acceptable limits are +/- 5% full screen.

Screen Height Linearity
Signal Amplitude In % FSH

No.	Actual Higher	1/2 of Higher	* Acceptable Limits	Actual Lower
1	100%	50%	55% to 45%	50
2	90%	45%	50% to 40%	45
3	80%	40%	SetPoint	40
4	70%	35%	40% to 30%	35
5	60%	30%	35% to 25%	30
6	50%	25%	30% to 20%	25
7	40%	20%	25% to 15%	20
8	30%	15%	20% to 10%	15
9	20%	10%	15% to 5%	8

*Acceptable limits are 1/2 of the higher signal +/- 5% FSH.

Amplitude Control Linearity

Initial Amplitude	dB Change	Acceptable Limits	Results
80% FSH	-6dB	32% to 48%	40
80% FSH	-12dB	16% to 24%	20
40% FSH	+6dB	64% to 96%	80
20% FSH	+12dB	64% to 96%	80

Results: (•) Sat ( ) Unsat

Comments: N/A

Examiner	Level	Signature	Date	Reviewer	Signature	Date
[redacted]	II		12/26/2019	N/A		
Examiner N/A	Level N/A	Signature	Date	Site Review	[redacted]	3/12/2020
Other N/A	Level N/A	Signature	Date	ANII Review N/A	Signature	Date

Ultrasonic Instrument Linearity <Edit From Setup>

UT Calibration/Examination

Site/Unit:	MPS / 3	Procedure:	ER-AA-NDE-UT-801	Outage No.:	N/A
Summary No.:	N/A	Procedure Rev.:	8	Report No.:	BOP-UT-20-060
Workscope:	BOP	Work Order No.:	53203239036	Page:	1 of 2

Code: N/A | Cat./Item: N/A | Location: 14'6" Intake

Drawing No.: 25212-21041 Sh. 16 | Description: 30" Saddle reinforced, Tee.

System ID: SWS

Component ID: 3-SWP-030-18-3, DS of 3SWP*MOV102C | Size/Length: N/A | Thickness/Diameter: .500"/30"

Limitations: From TDC, 16.25" to 32.25" Obstructed due to flange joint US of main run. | Start Time: 1400 | Finish Time: 1730

Instrument Settings

Serial No.:	00CLXR		
Manufacturer:	Krautkramer		
Model:	USN-52L	Linearity:	MP-L-20-004
Delay:	-0.313	Range:	2.5"
M'tl Cal/Vel:	1283	Pulser:	Single
Damping:	1000 Ohms	Reject:	0%
PRR/PRF:	Hlgh	SU Freq.:	5.0 Mhz
Inst. Freq.:	2.0-8.0 MHz	Disp. Mode:	Full Wave

Ax. Gain (dB): 43 | Circ. Gain (dB): N/A

1 Screen Div. = .05" in. of Sound Path

Calibration Block

Cal. Block No.	01-6678		
Thickness	0.50"	Dia.:	N/A
Cal. Blk. Temp.	**	Temp. Tool:	N/A
Comp. Temp.	**44	Temp. Tool:	N/A

Search Unit

Serial No.:	01P8NX		
Manufacturer:	GE		
Size:	.5"	Model:	COMP G
Freq.:	5.0 Mhz	Center Freq.:	N/A
Exam Angle:	70	Squint Angle:	N/A
Measured Angle:	68	Mode:	Shear
Exit Point	N/A	# of Elements:	1
Config.:	Single	Focus:	N/A
Shape:	Round	Contour:	N/A
Wedge Style:	MSWQC		

Search Unit Cable

Type: RG-174 Length: 6' No. Conn.: 0

Scan Coverage

Upstream ☑ Downstream ☑ Scan dB: *70

CW ☑ CCW ☑ Scan dB: *70

Exam Surface: OD

Surface Condition: Smooth

Cal. Checks	Time	Date
Initial Cal.	1400	3/12/2020
Inter. Cal.	N/A	
Inter. Cal.	N/A	
Inter. Cal.	N/A	
Final Cal.	1730	3/12/2020

Couplant

Cal. Batch:	19A039
Type:	Ultragel II
Mfg.:	Sonotech, Inc.
Exam Batch:	19A039
Type:	Ultragel II
Mfg.:	Sonotech, Inc.

Reference Block

Serial No.: 93-7226

Type: CS

Axial Oriented Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
.50" Notch	80%	5.8	1.442"

Circumferential Oriented Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A	N/A	N/A	N/A

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
43	NSDH	80%	3.6	.830"

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)

Results: NRI ☑ RI ☐ Geom ☐

Percent Of Coverage Obtained > 90%: N/A | Reviewed Previous Data: N/A

Comments: **Performed 70 deg exam of weld base material adjacent to saddle weld for evidence of material degradation. *Maintained apprx. 10%-20% ID roll.**

Examiner	Level II	Signature [redacted]	Date 3/12/2020	Reviewer N/A		Signature	Date
Examiner N/A	Level N/A	Signature	Date	Site Review [redacted]		Signature	Date 3/12/20
Other N/A	Level N/A	Signature	Date	ANII Review N/A		Signature	Date

Supplemental Report

Report No.: BOP-UT-20-060

Page: 2 of 2

Summary No.: N/A

Examiner:	[redacted]	Level:	II	Reviewer:	N/A	Date:	N/A
Examiner:	N/A	Level:	N/A	Site Review:	[redacted] Lv-II	Date:	3/12/20
Other:	N/A	Level:	N/A	ANII Review:	N/A	Date:	N/A

Comments:

* ER-AA-NDE-UT-801 used as a guideline.
** Cal block temperature was ambient. Component temperature was 44 degrees per plant computer point T47A.

ISI performed UT scan of pipe adjacent to saddle weld/reinfocement plate on the main run and the branch welds. Scanning was performed perpendicular to the weld, covering approximately 2" of piping under the plate. ISI also scanned paralell to the saddle weld in both directions. No pipe material degradation was observed.

Attachment 1 Exam Data Sheet

Millstone Power Station

ULTRASONIC EXAMINATION
STRAIGHT BEAM MEASUREMENTS

Plant Millstone Unit 3
System & Zone No. SWP
Component ID 3-SWP-030-15-3
Component Description Saddle/Reinforcement plate
Examination Purpose Engineering Information

Page 1 of 3
Exam Data Sheet No. N/A
AWO Number 53203264267
Drawing No. 25212-21041 Sh. 18
Line No. 3-SWP-030-15-3

Instrument & Settings	
Manufacturer	Olympus
Model No.	38 DL Plus
Serial No.	120497309
Range	1.000"
Velocity	.2336
Delay	N/A
Zero Value	28460
Cal Tolerance	+/- .002"

Calibration Block(s)		
Type	Serial No.	Material
Step Block	95-5768	CS
N/A	N/A	N/A

Component Data	
Component T_{nom}	N/A
Component Dia.	N/A
Attachments.	N/A

Calibration Checks		Block Thickness		Instrument Reading	
Type	Time	Min.	Max.	Min.	Max.
Initial	1400	.250"	1.000"	.250"	1.000"
Intermediate	N/A	N/A	N/A	N/A	N/A
Intermediate	N/A	N/A	N/A	N/A	N/A
Final	1505	.250"	1.000"	.250"	1.000"

Search Unit Data	
Manufacturer	Panametrics
Type No.	D791-RM
Serial No.	833197
Frequency	5 MHZ
Size	.312"

Couplant Data	
Brand	Ultragel II
Batch No.	19A039
SAP Batch Mgmt. No.	N/A

Temperature Data	
Cal. Blk. Temp.	N/A
Component Temp	N/A
Thermometer S/N	N/A

ISI Performed a 4" grid and UT of saddle/Reinforcement plate on pipe 3-SWP-030-15-3. See attached photo and UT data.

NOTE: 4" grid did not stay on pipe due to excessive condensation.

6'Dual Cable

Examiner (print & sign) [redacted] Level II Date 03/13/2020

Reviewer (sign) [redacted] Level IIL Date 03/13/2020

ANI/ANII If Required (Sign) N/A Date N/A

Level of Use
Reference

STOP THINK ACT REVIEW

ER-AA-NDE-UT-701
Rev. 7

COLOR CODED DATA GRID

The Survey Name:	SWP-MOV102C	Survey Date:	1/1/2011 12:00:00 PM
Survey Description:		Survey Mode:	THICKNESS
Survey Type:	2D GRID	Erase Protection:	OFF
Location Note:		Inspector ID:	

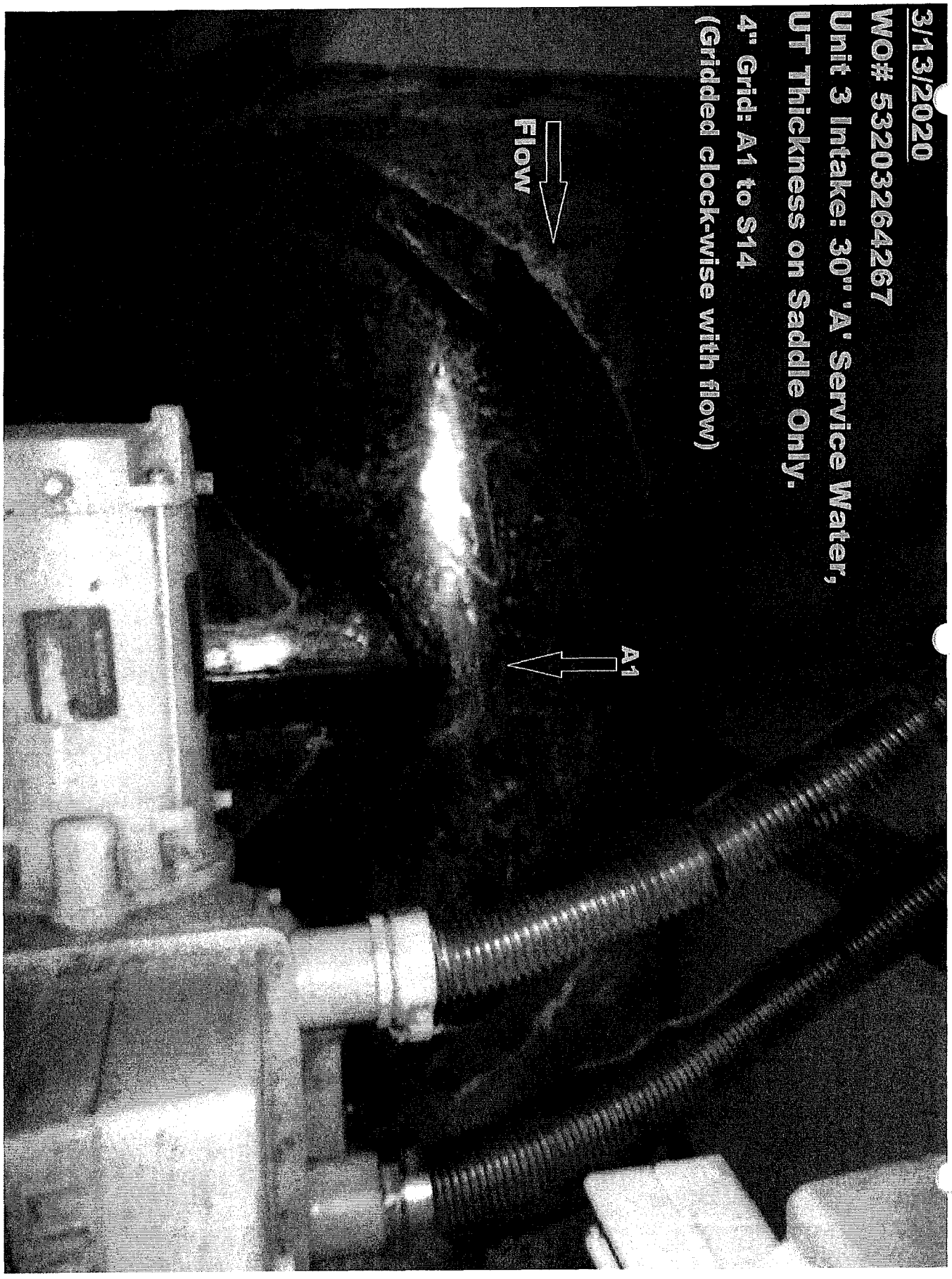
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.772	0.773	0.780	0.779	0.775	0.771	0.000	0.000	0.000	0.000	0.000	0.000
2	0.000	0.000	0.000	0.000	0.759	0.767	0.775	0.772	0.771	0.774	0.775	0.774	0.773	0.774	0.773	0.000	0.000	0.000	0.000
3	0.000	0.000	0.000	0.761	0.769	0.771	0.775	0.765	0.769	0.772	0.775	0.772	0.770	0.770	0.762	0.776	0.766	0.000	0.000
4	0.000	0.000	0.762	0.761	0.765	0.761	0.770	0.000	0.770	0.771	0.770	0.766	0.000	0.773	0.770	0.770	0.771	0.000	0.000
5	0.000	0.760	0.748	0.763	0.763	0.765	0.000	0.000	0.000	0.000	0.000	0.000	0.758	0.762	0.764	0.767	0.768	0.768	0.000
6	0.000	0.765	0.764	0.759	0.764	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.769	0.764	0.765	0.753
7	0.761	0.760	0.760	0.759	0.743	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.761	0.765	0.766	0.760
8	0.000	0.760	0.758	0.763	0.760	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.754	0.766	0.764	0.767
9	0.000	0.758	0.759	0.751	0.758	0.763	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.747	0.764	0.764	0.765	0.758
10	0.000	0.000	0.752	0.759	0.761	0.000	0.762	0.000	0.000	0.000	0.000	0.000	0.000	0.756	0.760	0.761	0.758	0.763	0.000
11	0.000	0.000	0.000	0.743	0.760	0.762	0.761	0.762	0.764	0.766	0.768	0.765	0.759	0.762	0.760	0.761	0.765	0.000	0.000
12	0.000	0.000	0.000	0.000	0.746	0.735	0.762	0.760	0.766	0.766	0.765	0.767	0.761	0.757	0.762	0.764	0.765	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000	0.000	0.760	0.765	0.765	0.768	0.763	0.761	0.760	0.761	0.763	0.763	0.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.771	0.760	0.764	0.764	0.762	0.755	0.000	0.000	0.000	0.000	0.000	0.000

Color Legend:

Over Range	
Not Used	
Not Used	
Not Used	
Not Used	
Not Used	
Not Used	0.000
Under Range	
Row or Column Statistics	

Total Statistics:

Maximum	0.780
Minimum	0.735
Average	0.764


3/13/2020
WO# 532032644267
Unit 3 Intake: 30" 'A' Service Water,
UT Thickness on Saddle Only.
4" Grid: A1 to S14
(Gridded clock-wise with flow)
Flow
A1

Data taken from NUPIPE Run, 215 LOCAL

$Fx_{DL} := 184\ lb$ $Fx_{SSEtotal} := 23020\ lb$ $Fx_{OCC} := 1924\ lb$

$Fy_{DL} := 592\ lb$ $Fy_{SSEtotal} := 7599\ lb$ $Fy_{OCC} := 748\ lb$

$Fz_{DL} := 85\ lb$ $Fz_{SSEtotal} := 3074\ lb$ $Fz_{OCC} := 2381\ lb$

$Mx_{DL} := 8651\ ft \cdot lb$ $Mx_{SSEtotal} := 11935\ ft \cdot lb$ $Mx_{OCC} := 1344\ ft \cdot lb$

$My_{DL} := 188\ ft \cdot lb$ $My_{SSEtotal} := 36415\ ft \cdot lb$ $My_{OCC} := 12376\ ft \cdot lb$

$Mz_{DL} := 4540\ ft \cdot lb$ $Mz_{SSEtotal} := 6686\ ft \cdot lb$ $Mz_{OCC} := 1175\ ft \cdot lb$

$Fx_{therm33} := 1191\ lb$ $Fx_{therm75} := 172\ lb$ $Fx_{thermLC11} := 1145\ lb$

$Fy_{therm33} := 3222\ lb$ $Fy_{therm75} := 458\ lb$ $Fy_{thermLC11} := 3747\ lb$

$Fz_{therm33} := 16951\ lb$ $Fz_{therm75} := 2438\ lb$ $Fz_{thermLC11} := 15740\ lb$

$Mx_{therm33} := 2885\ ft \cdot lb$ $Mx_{therm75} := 384\ ft \cdot lb$ $Mx_{thermLC11} := 3826\ ft \cdot lb$

$My_{therm33} := 111799\ ft \cdot lb$ $My_{therm75} := 16072\ ft \cdot lb$ $My_{thermLC11} := 98588\ ft \cdot lb$

$Mz_{therm33} := 3451\ ft \cdot lb$ $Mz_{therm75} := 483\ ft \cdot lb$ $Mz_{thermLC11} := 7876\ ft \cdot lb$

$Fx_{thermLC12} := 3193\ lb$

$Fy_{thermLC12} := 377\ lb$

$Fz_{thermLC12} := 16892\ lb$

$Mx_{thermLC12} := 387\ ft \cdot lb$

$My_{thermLC12} := 111390\ ft \cdot lb$

$Mz_{thermLC12} := 64\ ft \cdot lb$

Determine maximum thermal forces and moments from the thermal load cases:

$Fx_{therm} := \max\left(\langle Fx_{therm33}, Fx_{therm75}, Fx_{thermLC11}, Fx_{thermLC12}\rangle\right) = 3193\ lb$

$Fy_{therm} := \max\left(\langle Fy_{therm33}, Fy_{therm75}, Fy_{thermLC11}, Fy_{thermLC12}\rangle\right) = 3747\ lb$

$Fz_{therm} := \max\left(\langle Fz_{therm33}, Fz_{therm75}, Fz_{thermLC11}, Fz_{thermLC12}\rangle\right) = 16951\ lb$

$Mx_{therm} := \max\left(\langle Mx_{therm33}, Mx_{therm75}, Mx_{thermLC11}, Mx_{thermLC12}\rangle\right) = 3826\ lb \cdot ft$

$My_{therm} := \max\left(\langle My_{therm33}, My_{therm75}, My_{thermLC11}, My_{thermLC12}\rangle\right) = 111799\ lb \cdot ft$

$Mz_{therm} := \max\left(\langle Mz_{therm33}, Mz_{therm75}, Mz_{thermLC11}, Mz_{thermLC12}\rangle\right) = 7876\ lb \cdot ft$

Combine deadload, seismic, occasional, and max thermal as bounding load condition:

$Fx_{total} := Fx_{DL} + Fx_{SSEtotal} + Fx_{OCC} + Fx_{therm} = 28321\ lb$

$Fy_{total} := Fy_{DL} + Fy_{SSEtotal} + Fy_{OCC} + Fy_{therm} = 12686\ lb$

$Fz_{total} := Fz_{DL} + Fz_{SSEtotal} + Fz_{OCC} + Fz_{therm} = 22491\ lb$

$Mx_{total} := Mx_{DL} + Mx_{SSEtotal} + Mx_{OCC} + Mx_{therm} = 309072\ lb \cdot in$

$My_{total} := My_{DL} + My_{SSEtotal} + My_{OCC} + My_{therm} = 1929336\ lb \cdot in$

$Mz_{total} := Mz_{DL} + Mz_{SSEtotal} + Mz_{OCC} + Mz_{therm} = 243324\ lb \cdot in$

Evaluate circular fillet weld per DNES-VA-EM-0019:

$F1 := Fz_{total}$ $M1 := Mz_{total}$

$F2 := Fx_{total}$ $M2 := Mx_{total}$ $Dia := 30\ in$

$F3 := Fy_{total}$ $M3 := My_{total}$

$$Fweld := \sqrt{\left(\left(\frac{F2}{\pi \cdot Dia} + \frac{\sqrt{M1^2 + M3^2}}{\pi \cdot \frac{Dia^2}{4}}\right)^2 + \left(\frac{M2}{\pi \cdot \frac{Dia^2}{2}} + \frac{\sqrt{F1^2 + F3^2}}{\pi \cdot Dia}\right)^2\right)} = 3091\ \frac{lb}{in}$$

$$fweld := min\left(0.707 \cdot 0.3 \cdot 70000\ \frac{lb}{in^2}, 0.4 \cdot 36000\ \frac{lb}{in^2}\right) = 14400\ \frac{lb}{in^2}$$

$$Wreq := \frac{Fweld}{fweld} = 0.215\ in$$

Branch Reinforcement Area Check

Component: test

Line: line

Station: SP5-2

	US Main	DS Main	Branch
O.D., in	30.000	30.000	30.000
Nominal I.D., in	29.000	29.000	29.000
Design T_n, in	0.500	0.500	0.500
Actual T_a, in	0.250	0.250	0.250
Wear Rate, in/yr	0.025	0.025	0.025
Pad Thickness T_e, in	0.000		
Alpha, deg	90		
Width of Reinforcing Ring, in	0		

	Main	Branch
Design Pressure, psi	100	100
Design Temperature, °F	100	200
Allowable Stress, S_h, psi	17500	17500
Allowable Stress, S_c, psi	17500	17500
Design Pressure Stress, SLP, psi	1425.42	1425.42

	US Main	DS Main	Branch
	Evaluate to Code Tm, In		
Code T_m, in	0.100	0.100	0.100
USER T_{min}, in	0.100	0.100	0.100
Req'd Reinforcement, in^2	3.116	3.116	

Time	US Main	DS Main	Branch		US Main	DS Main			US Main	DS Main				US Main		DS Main	
	Actual T_a	Actual T_a	Actual T_a	d1	d2	d2	L	A1	A1	A2	A4	A4	A1+A2+A4	Req'd Area	A1+A2+A4	Req'd Area
(years)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in^2)	(in^2)	(in^2)	(in^2)	(in^2)	(in^2)	(in^2)	(in^2)	(in^2)
0.00	0.250	0.250	0.250	29.500	29.500	29.500	0.625	4.425	4.425	0.188	0.000	0.000	4.613	3.157	4.613	3.157
0.20	0.245	0.245	0.245	29.510	29.510	29.510	0.613	4.279	4.279	0.178	0.000	0.000	4.457	3.158	4.457	3.158
0.40	0.240	0.240	0.240	29.520	29.520	29.520	0.600	4.133	4.133	0.168	0.000	0.000	4.301	3.159	4.301	3.159
0.60	0.235	0.235	0.235	29.530	29.530	29.530	0.588	3.987	3.987	0.159	0.000	0.000	4.145	3.160	4.145	3.160
0.80	0.230	0.230	0.230	29.540	29.540	29.540	0.575	3.840	3.840	0.150	0.000	0.000	3.990	3.161	3.990	3.161
1.00	0.225	0.225	0.225	29.550	29.550	29.550	0.563	3.694	3.694	0.141	0.000	0.000	3.834	3.162	3.834	3.162
1.20	0.220	0.220	0.220	29.560	29.560	29.560	0.550	3.547	3.547	0.132	0.000	0.000	3.679	3.163	3.679	3.163
1.40	0.215	0.215	0.215	29.570	29.570	29.570	0.538	3.401	3.401	0.124	0.000	0.000	3.524	3.164	3.524	3.164
1.60	0.210	0.210	0.210	29.580	29.580	29.580	0.525	3.254	3.254	0.116	0.000	0.000	3.369	3.165	3.369	3.165
1.80	0.205	0.205	0.205	29.590	29.590	29.590	0.513	3.107	3.107	0.108	0.000	0.000	3.215	3.166	3.215	3.166
2.00	0.200	0.200	0.200	29.600	29.600	29.600	0.500	2.960	2.960	0.100	0.000	0.000	3.060	3.167	3.060	3.167
2.20	0.195	0.195	0.195	29.610	29.610	29.610	0.488	2.813	2.813	0.093	0.000	0.000	2.906	3.168	2.906	3.168
2.40	0.190	0.190	0.190	29.620	29.620	29.620	0.475	2.666	2.666	0.086	0.000	0.000	2.751	3.169	2.751	3.169
2.60	0.185	0.185	0.185	29.630	29.630	29.630	0.463	2.519	2.519	0.079	0.000	0.000	2.597	3.170	2.597	3.170
2.80	0.180	0.180	0.180	29.640	29.640	29.640	0.450	2.371	2.371	0.072	0.000	0.000	2.443	3.171	2.443	3.171
3.00	0.175	0.175	0.175	29.650	29.650	29.650	0.438	2.224	2.224	0.066	0.000	0.000	2.289	3.173	2.289	3.173
3.20	0.170	0.170	0.170	29.660	29.660	29.660	0.425	2.076	2.076	0.060	0.000	0.000	2.136	3.174	2.136	3.174
3.40	0.165	0.165	0.165	29.670	29.670	29.670	0.413	1.929	1.929	0.054	0.000	0.000	1.982	3.175	1.982	3.175
3.60	0.160	0.160	0.160	29.680	29.680	29.680	0.400	1.781	1.781	0.048	0.000	0.000	1.829	3.176	1.829	3.176
3.80	0.155	0.155	0.155	29.690	29.690	29.690	0.388	1.633	1.633	0.043	0.000	0.000	1.676	3.177	1.676	3.177
4.00	0.150	0.150	0.150	29.700	29.700	29.700	0.375	1.485	1.485	0.038	0.000	0.000	1.523	3.178	1.523	3.178
4.20	0.145	0.145	0.145	29.710	29.710	29.710	0.363	1.337	1.337	0.033	0.000	0.000	1.370	3.179	1.370	3.179
4.40	0.140	0.140	0.140	29.720	29.720	29.720	0.350	1.189	1.189	0.028	0.000	0.000	1.217	3.180	1.217	3.180
4.60	0.135	0.135	0.135	29.730	29.730	29.730	0.338	1.041	1.041	0.024	0.000	0.000	1.064	3.181	1.064	3.181
4.80	0.130	0.130	0.130	29.740	29.740	29.740	0.325	0.892	0.892	0.020	0.000	0.000	0.912	3.182	0.912	3.182
5.00	0.125	0.125	0.125	29.750	29.750	29.750	0.313	0.744	0.744	0.016	0.000	0.000	0.759	3.183	0.759	3.183
5.20	0.120	0.120	0.120	29.760	29.760	29.760	0.300	0.595	0.595	0.012	0.000	0.000	0.607	3.184	0.607	3.184
5.40	0.115	0.115	0.115	29.770	29.770	29.770	0.288	0.447	0.447	0.009	0.000	0.000	0.455	3.185	0.455	3.185
5.60	0.110	0.110	0.110	29.780	29.780	29.780	0.275	0.298	0.298	0.006	0.000	0.000	0.303	3.186	0.303	3.186
5.80	0.105	0.105	0.105	29.790	29.790	29.790	0.263	0.149	0.149	0.003	0.000	0.000	0.152	3.188	0.152	3.188
6.00	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
6.20	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
6.40	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
6.60	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
6.80	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
7.00	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
7.20	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
7.40	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
7.60	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
7.80	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
8.00	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
8.20	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
8.40	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
8.60	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
8.80	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
9.00	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
9.20	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
9.40	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
9.60	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
9.80	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
10.00	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
10.20	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
10.40	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
10.60	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
10.80	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
11.00	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
11.20	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
11.40	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
11.60	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
11.80	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
12.00	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
12.20	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
12.40	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
12.60	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
12.80	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL
13.00	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	FAIL	0.000	FAIL

Branch Reinforcement Area Check

Component: test

Line: line

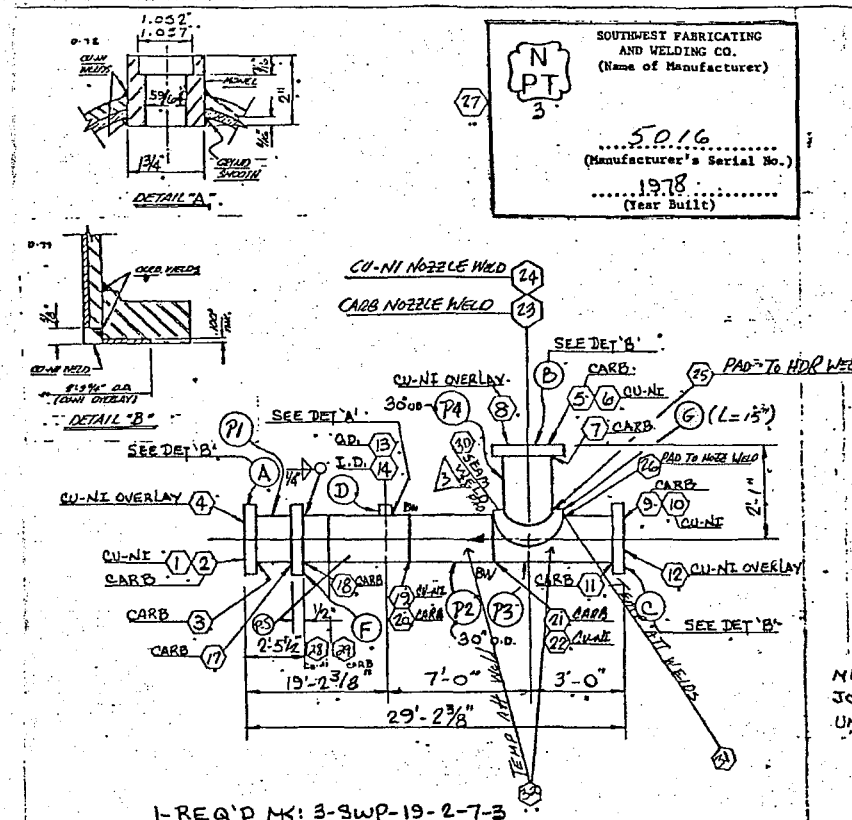
Station: SPS-2

	US Main	DS Main	Branch
O.D., in	30.000	30.000	30.000
Nominal I.D., in	29.000	29.000	29.000
Design T_n, in	0.500	0.500	0.500
Actual T_a, in	0.500	0.500	0.500
Wear Rate, in/yr	0.025	0.025	0.025
Pad Thickness T_p, in	0.000		
Alpha, deg	90		
Width of Reinforcing Ring, in	0		

	Main	Branch
Design Pressure, psi	100	100
Design Temperature, °F	100	200
Allowable Stress, S_h, psi	17500	17500
Allowable Stress, S_c, psi	17500	17500
Design Pressure Stress, SLP, psi	1425.42	1425.42

	US Main	DS Main	Branch
	Evaluate to USER Tmin, in		
Code T_m, in	0.100	0.100	0.100
USER T_{min}, in	0.100	0.100	0.100
Req'd Reinforcement, in^2	3.116	3.116	

Time	US Main	DS Main	Branch	d1	US Main d2	DS Main d2	L	US Main A1	DS Main A1	A2	US Main A4	DS Main A4	US Main A1+A2+A4	US Main Req'd Area	DS Main A1+A2+A4	DS Main Req'd Area
(years)	Actual T_a (in)	Actual T_a (in)	Actual T_a (in)	(in)	(in)	(in)	(in)	(in^2)	(in^2)	(in^2)	(in^2)	(in^2)	(in^2)	(in^2)	(in^2)	(in^2)
0.00	0.500	0.500	0.500	29.000	29.000	29.000	1.250	11.600	11.600	1.000	0.000	0.000	12.600	3.116	12.600	3.116
0.20	0.495	0.495	0.495	29.010	29.010	29.010	1.238	11.459	11.459	0.978	0.000	0.000	12.437	3.116	12.437	3.116
0.40	0.490	0.490	0.490	29.020	29.020	29.020	1.225	11.318	11.318	0.956	0.000	0.000	12.273	3.116	12.273	3.116
0.60	0.485	0.485	0.485	29.030	29.030	29.030	1.213	11.177	11.177	0.934	0.000	0.000	12.110	3.116	12.110	3.116
0.80	0.480	0.480	0.480	29.040	29.040	29.040	1.200	11.035	11.035	0.912	0.000	0.000	11.947	3.116	11.947	3.116
1.00	0.475	0.475	0.475	29.050	29.050	29.050	1.188	10.894	10.894	0.891	0.000	0.000	11.784	3.116	11.784	3.116
1.20	0.470	0.470	0.470	29.060	29.060	29.060	1.175	10.752	10.752	0.870	0.000	0.000	11.622	3.116	11.622	3.116
1.40	0.465	0.465	0.465	29.070	29.070	29.070	1.163	10.611	10.611	0.849	0.000	0.000	11.459	3.116	11.459	3.116
1.60	0.460	0.460	0.460	29.080	29.080	29.080	1.150	10.469	10.469	0.828	0.000	0.000	11.297	3.116	11.297	3.116
1.80	0.455	0.455	0.455	29.090	29.090	29.090	1.138	10.327	10.327	0.808	0.000	0.000	11.135	3.116	11.135	3.116
2.00	0.450	0.450	0.450	29.100	29.100	29.100	1.125	10.185	10.185	0.788	0.000	0.000	10.973	3.116	10.973	3.116
2.20	0.445	0.445	0.445	29.110	29.110	29.110	1.113	10.043	10.043	0.768	0.000	0.000	10.811	3.116	10.811	3.116
2.40	0.440	0.440	0.440	29.120	29.120	29.120	1.100	9.901	9.901	0.748	0.000	0.000	10.649	3.116	10.649	3.116
2.60	0.435	0.435	0.435	29.130	29.130	29.130	1.088	9.759	9.759	0.729	0.000	0.000	10.487	3.117	10.487	3.117
2.80	0.430	0.430	0.430	29.140	29.140	29.140	1.075	9.616	9.616	0.710	0.000	0.000	10.326	3.118	10.326	3.118
3.00	0.425	0.425	0.425	29.150	29.150	29.150	1.063	9.474	9.474	0.691	0.000	0.000	10.164	3.119	10.164	3.119
3.20	0.420	0.420	0.420	29.160	29.160	29.160	1.050	9.331	9.331	0.672	0.000	0.000	10.003	3.120	10.003	3.120
3.40	0.415	0.415	0.415	29.170	29.170	29.170	1.038	9.189	9.189	0.654	0.000	0.000	9.842	3.121	9.842	3.121
3.60	0.410	0.410	0.410	29.180	29.180	29.180	1.025	9.046	9.046	0.636	0.000	0.000	9.681	3.122	9.681	3.122
3.80	0.405	0.405	0.405	29.190	29.190	29.190	1.013	8.903	8.903	0.618	0.000	0.000	9.521	3.123	9.521	3.123
4.00	0.400	0.400	0.400	29.200	29.200	29.200	1.000	8.760	8.760	0.600	0.000	0.000	9.360	3.124	9.360	3.124
4.20	0.395	0.395	0.395	29.210	29.210	29.210	0.988	8.617	8.617	0.583	0.000	0.000	9.200	3.125	9.200	3.125
4.40	0.390	0.390	0.390	29.220	29.220	29.220	0.975	8.474	8.474	0.566	0.000	0.000	9.039	3.127	9.039	3.127
4.60	0.385	0.385	0.385	29.230	29.230	29.230	0.963	8.331	8.331	0.549	0.000	0.000	8.879	3.128	8.879	3.128
4.80	0.380	0.380	0.380	29.240	29.240	29.240	0.950	8.187	8.187	0.532	0.000	0.000	8.719	3.129	8.719	3.129
5.00	0.375	0.375	0.375	29.250	29.250	29.250	0.938	8.044	8.044	0.516	0.000	0.000	8.559	3.130	8.559	3.130
5.20	0.370	0.370	0.370	29.260	29.260	29.260	0.925	7.900	7.900	0.500	0.000	0.000	8.400	3.131	8.400	3.131
5.40	0.365	0.365	0.365	29.270	29.270	29.270	0.913	7.757	7.757	0.484	0.000	0.000	8.240	3.132	8.240	3.132
5.60	0.360	0.360	0.360	29.280	29.280	29.280	0.900	7.613	7.613	0.468	0.000	0.000	8.081	3.133	8.081	3.133
5.80	0.355	0.355	0.355	29.290	29.290	29.290	0.888	7.469	7.469	0.453	0.000	0.000	7.922	3.134	7.922	3.134
6.00	0.350	0.350	0.350	29.300	29.300	29.300	0.875	7.325	7.325	0.438	0.000	0.000	7.763	3.135	7.763	3.135
6.20	0.345	0.345	0.345	29.310	29.310	29.310	0.863	7.181	7.181	0.423	0.000	0.000	7.604	3.136	7.604	3.136
6.40	0.340	0.340	0.340	29.320	29.320	29.320	0.850	7.037	7.037	0.408	0.000	0.000	7.445	3.137	7.445	3.137
6.60	0.335	0.335	0.335	29.330	29.330	29.330	0.838	6.893	6.893	0.394	0.000	0.000	7.286	3.138	7.286	3.138
6.80	0.330	0.330	0.330	29.340	29.340	29.340	0.825	6.748	6.748	0.380	0.000	0.000	7.128	3.139	7.128	3.139
7.00	0.325	0.325	0.325	29.350	29.350	29.350	0.813	6.604	6.604	0.366	0.000	0.000	6.969	3.140	6.969	3.140
7.20	0.320	0.320	0.320	29.360	29.360	29.360	0.800	6.459	6.459	0.352	0.000	0.000	6.811	3.142	6.811	3.142
7.40	0.315	0.315	0.315	29.370	29.370	29.370	0.788	6.315	6.315	0.339	0.000	0.000	6.653	3.143	6.653	3.143
7.60	0.310	0.310	0.310	29.380	29.380	29.380	0.775	6.170	6.170	0.326	0.000	0.000	6.495	3.144	6.495	3.144
7.80	0.305	0.305	0.305	29.390	29.390	29.390	0.763	6.025	6.025	0.313	0.000	0.000	6.338	3.145	6.338	3.145
8.00	0.300	0.300	0.300	29.400	29.400	29.400	0.750	5.880	5.880	0.300	0.000	0.000	6.180	3.146	6.180	3.146
8.20	0.295	0.295	0.295	29.410	29.410	29.410	0.738	5.735	5.735	0.288	0.000	0.000	6.023	3.147	6.023	3.147
8.40	0.290	0.290	0.290	29.420	29.420	29.420	0.725	5.590	5.590	0.276	0.000	0.000	5.865	3.148	5.865	3.148
8.60	0.285	0.285	0.285	29.430	29.430	29.430	0.713	5.445	5.445	0.264	0.000	0.000	5.708	3.149	5.708	3.149
8.80	0.280	0.280	0.280	29.440	29.440	29.440	0.700	5.299	5.299	0.252	0.000	0.000	5.551	3.150	5.551	3.150
9.00	0.275	0.275	0.275	29.450	29.450	29.450	0.688	5.154	5.154	0.241	0.000	0.000	5.394	3.151	5.394	3.151
9.20	0.270	0.270	0.270	29.460	29.460	29.460	0.675	5.008	5.008	0.230	0.000	0.000	5.238	3.152	5.238	3.152
9.40	0.265	0.265	0.265	29.470	29.470	29.470	0.663	4.863	4.863	0.219	0.000	0.000	5.081	3.153	5.081	3.153
9.60	0.260	0.260	0.260	29.480	29.480	29.480	0.650	4.717	4.717	0.208	0.000	0.000	4.925	3.154	4.925	3.154
9.80	0.255	0.255	0.255	29.490	29.490	29.490	0.638	4.571	4.571	0.198	0.000	0.000	4.769	3.155	4.769	3.155
10.00	0.250	0.250	0.250	29.500	29.500	29.500	0.625	4.425	4.425	0.188	0.000	0.000	4.613	3.157	4.613	3.157
10.20	0.245	0.245	0.245	29.510	29.510	29.510	0.613	4.279	4.279	0.178	0.000	0.000	4.457	3.158	4.457	3.158
10.40	0.240	0.240	0.240	29.520	29.520	29.520	0.600	4.133	4.133	0.168	0.000	0.000	4.301	3.159	4.301	3.159
10.60	0.235	0.235	0.235	29.530	29.530	29.530	0.588	3.987	3.987	0.159	0.000	0.000	4.145	3.160	4.145	3.160
10.80	0.230	0.230	0.230	29.540	29.540	29.540	0.575	3.840	3.840	0.150	0.000	0.000	3.990	3.161	3.990	3.161
11.00	0.225	0.225	0.225	29.550	29.550	29.550	0.563	3.694	3.694	0.141	0.000	0.000	3.834	3.162	3.834	3.162
11.20	0.220	0.220	0.220	29.560	29.560	29.560	0.550	3.547	3.547	0.132	0.000	0.000	3.679	3.163	3.679	3.163
11.40	0.215	0.215	0.215	29.570	29.570	29.570	0.538	3.401	3.401	0.124	0.000	0.000	3.524	3.164	3.524	3.164
11.60	0.210	0.210	0.210	29.580	29.580	29.580	0.525	3.254	3.254	0.116	0.000	0.000	3.369	3.165	3.369	3.165
11.80	0.205	0.205	0.205	29.590	29.590	29.590	0.513	3.107	3.107	0.108	0.000	0.000	3.215	3.166	3.215	3.166
12.00	0.200	0.200	0.200	29.600	29.600	29.600	0.500	2.960	2.960	0.100	0.000	0.000	3.060	3.167	3.060	3.167
12.20	0.195	0.195	0.195	29.610	29.610	29.610	0.488	2.813	2.813	0.093	0.000	0.000	2.906	3.168	2.906	3.168
12.40	0.190	0.190	0.190	29.620	29.620	29.620	0.475	2.666	2.666	0.085	0.000	0.000	2.751	3.169	2.751	3.169
12.60	0.185	0.185	0.185	29.630	29.630	29.630	0.463	2.519	2.519	0.079	0.000	0.000	2.597	3.170	2.597	3.170
12.80	0.180	0.180	0.180	29.640	29.640	29.640	0.450	2.371	2.371	0.072	0.000	0.000	2.443	3.171	2.443	3.171
13.00	0.175	0.175	0.175	29.650	29.650	29.650	0.438	2.224	2.224	0.066	0.000	0.000	2.289	3.173	2.289	3.173



SOUTHWEST FABRICATING AND WELDING CO.
(Name of Manufacturer)

N PT 3

5016
(Manufacturer's Serial No.)

1978
(Year Built)

D-61

ASME SECT. III 1971 WITH WINTER 1972 ADDENDA-CLASS 3 CU-NI CLAD

1. PERMANENT IDENTIFICATION MARKING-LOW STRESS STAMPING OR VIBRO-ETCH. (METHOD OF MARKING USED MUST NOT INFRINGE ON MIN. W. THK.)
2. TEMPORARY IDENTIFICATION MARKING-FERRALOX NO 9916 (ALUMINUM) PAINT.
3. EVERY PART IS TO BE PERMANENTLY MARKED TO SHOW COMPONENT'S MAT'L SPEC. & GRADE, HEAT NO & IF REQ'D. SERIAL NO.
4. STRIP BACK CU-NI CLAD ½" MAX TO SOUND BASE METAL FOR FIT-UPS.
5. MAX. THK. B.W. REINF.

PIPE SIZE	O.D.	I.D.
30" O.D.	5/32"	1/8"

6. GRIND I.D. OF CARBON BUTTWELDS APPROX. FLUSH BEFORE OVERLAY.
7. TEMPORARY ATTACHMENTS AND THEIR WELDS MUST BE COMPATIBLE WITH BASE MATERIAL BEING FABRICATED. AFTER REMOVAL, THE IMMEDIATE AREA MUST BE SUITABLE MARKED FOR EXAMINATION. (SEE NOTE 8)
8. WELD EXAMINATION: (PER APPROVED PROCEDURES PT-1, R/2, S/1, N/A R/A & N/S R/2, OR MT-1, R/2, S/3, ATTACH. 185)
   (A) 100% MT ALL CARBON BUTTWELDS & NOZZLE WELDS. ON O.D.
   (B) MT OR PT EXAMINE.
      (1) 100% ALL CARBON WELDS ON I.D.
      (2) CODE SYMBOL ATTACHMENT WELDS.
      (3) TEMPORARY ATTACHMENT WELDS AFTER REMOVAL. (SEE NOTE 7)
   (C) PT ALL CU-NI WELDS & OVERLAYS.
9. CLEAN PER APPROVED PROCEDURE...7-102, R/0, S/1 (METHOD A).
10. PREPARE FOR SHIPMENT PER APPROVED PROCEDURE...7-102, R/0, S/1 (METHOD 3).

Q3418 | 107

ALL MAT'L CU-NI CLAD CARB (KAN)

S.W.E.C. QC INSPECTED 22

STONE & WEBSTER ENGR. CORP.
NORTHEAST UTILITIES SERVICE CO.
MILLSTONE NUCLEAR POWER STATION
UNIT # 3
P. O. 2280.000 - 450
SF & WCO S. O. Q3418
PL. MK. NO. 3-SWP-19-2-7-3

MILLSTONE NUCLEAR POWER STA:
JOB# 12179.
UNIT# 3.

REV	DATE	DESCRIPTION	BY
4	9/18/78	ADDED AS BUILT DATA	MP
3	11/8/77	DELETE ITEM "E"	4/
2	10/18/76	DIM. CHANGED ADDED REINF. PAD.	CM
1	11-26-75	REMOVE "PARTIAL FAB"	4 ✓

1-REQ'D MK: 3-SWP-19-2-7-3

MK	QUA	ALL BEVELS DESCRIPTION 37½°	ASTM	QUA.	UNIT	TOTAL	DISC.	NET
		SA350-LF1						
A	1	30" CL125 SO. FF FLG (PER TAYLOR FORGE CAT #571 PG # 102). HT# RWF						
B	1	30" CL125 S.O. F.F FLG (PER TAYLOR FORGE CAT #571 PG # 102) HT# RWF						
C	1	30" CL125 S.O. FF FLG (PER TAYLOR FORGE CAT #571, PG 102) HT# RWF						
D	1	SB-164 MONEL - CL-A 13/4" OD x 2" LG x 59/64" BORE BARSTOCK CDLG W/1.1057" ID x 7/16" DEEP SOCKET ONE END. HT# M07733						

MK	QUA.	DESCRIPTION	ASTM	QUA.	UNIT	TOTAL	DISC.	NET
		SA 515-70						
E	1	R RING 38¾" OD x 30⅛" ID x ½" THK HT# 87489						
G	1	30 ON 30" NOM. PAD 60" LG x ¾" THK. x 69¾" ARC (ROLL TO 30"10) (L=15") HT# U 484 IS SER # RP 7002	SA-516-70			USE 36" x 60" LG x 23½"		
		B PIPE - ROLLED TO SA-155 DIM TOLS MADE FROM B-432 CLAD B (500" W) SA-516-70 BASE METAL NI.100" MIN SB-402 # 70C CLAD (100% MT. LONG SEAM) (NPT-3 CODE STAMPED)						
P1	4	30" O.D. 9'-2" 1BE/PE HT# A9625-278 M052 6						
P2	1	30" O.D. 9'-2" 2BE HT# A9625-278 M05255						
P3	1	30" O.D. 9'-5" 1AE/PE HT# B9125-278 M05208 TOTAL OF PIPE PCS = 29'-1 5/8"						
P4	1	30" O.D. 2'-0 5/8" 1PE HT# B9125-279 P4230 M05552						
P5	1	30" O.D. 1'-7 3/8" 2MBE HT# A9125-279 SN M05158						

RECEIVED
JAN 3 1979
STONE & WEBSTER ENGINEERING CORPORATION CONTROL LEVEL 1 J.O. No. 12179

TOTAL 80 PAGES

PREHEAT	
POST WELD HEAT TREAT	
DYE CHK	
MAG PART	SEE NOTE #8
RADIOGRAPH	SEE NOTE #8
X-RAY CODE	
PAINT	NONE
SURF. PREP.	NONE
COLOR CODE	
HYDRO	
REV.	
WEIGHT LBS	977 NET 4773
FAB. CODE	ASME SECT III CL-3, 1971 W/WINTER, 1972 ADDENDA
CUST. PWO. NO.	SWP 150 # 3SWP-19 2/3
SPEC.	158-3
DATE	4-4-75 DRAWN BY KEN CHKD.

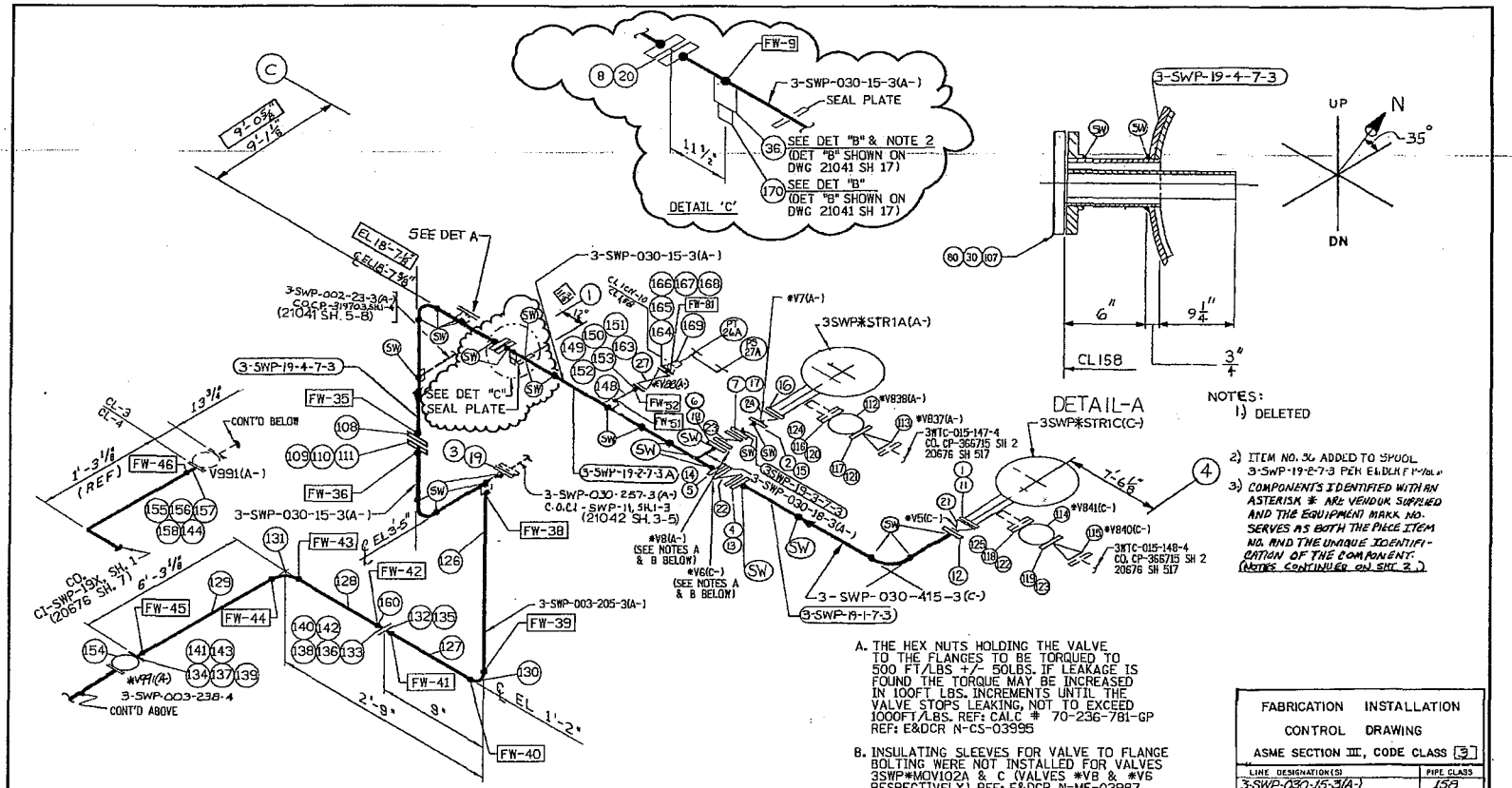
SOUTHWEST FABRICATING & WELDING CO. P.O. BOX 9449 HOUSTON, TEXAS 77011 713-928-3451

CUSTOMER STONE & WEBSTER ENG'R

P.O. NO. 2280-000-450

NORTHEAST NUCLEAR ENERGY Co.

S.O. Q3418 SHEET NO 107



NOTES:

1) DELETED

2) ITEM NO. 36 ADDED TO SPOOL 3-SWP-19-2-7-3 PER E&DCR F-P-7806.

3) COMPONENTS IDENTIFIED WITH AN ASTERISK * ARE VENDOR SUPPLIED AND THE EQUIPMENT MARK NO. SERVES AS BOTH THE PIECE ITEM NO. AND THE UNIQUE IDENTIFICATION OF THE COMPONENT.

(NOTES CONTINUED ON SHT 2.)

A. THE HEX NUTS HOLDING THE VALVE TO THE FLANGES TO BE TORQUED TO 500 FT/LBS +/- 50LBS. IF LEAKAGE IS FOUND THE TORQUE MAY BE INCREASED IN 100FT LBS. INCREMENTS UNTIL THE VALVE STOPS LEAKING, NOT TO EXCEED 1000FT/LBS. REF: CALC # 70-236-781-GP REF: E&DCR N-CS-03995

B. INSULATING SLEEVES FOR VALVE TO FLANGE BOLTING WERE NOT INSTALLED FOR VALVES 3SWP*MOV102A & C (VALVES *V8 & *V6 RESPECTIVELY). REF: E&DCR N-ME-03987

FABRICATION INSTALLATION CONTROL DRAWING

ASME SECTION III, CODE CLASS 3

LINE DESIGNATION(S)	PIPE CLASS
3-SWP-030-15-3(A-)	158
3-SWP-030-18-3-(A-)	
3-SWP-003-205-3(A-)	
4-WTC-003-42-3(C)	
SWP-030-415-3(C)	

REFERENCE DWG No(s)	ISSUE
12179-EP-19A, 0 EP-68F	11, 10, 4
2361-300-450-019A	
FSK 9-10A, FSK 13-05	15, 15
E&DCR F-P-7806, F-P-7808	
N-ME-04026, F-P-8530, F-P-14211	

MATERIAL CONTROL

PIECE No	SIZE	DESCRIPTION	UNIQUE IDENTIFICATION
*	30"	3-SWP-19-1-7-3 (PREFAB); PIPE SA516 GR70 .365W	*
*		3-SWP-19-2-7-3A (PREFAB); PIPE SA516 GR70 .500W; BOSS SA105	*
*		3-SWP-19-3-7-3 (PREFAB); FLANGED 150#	*
*		3-SWP-19-4-7-3 (PREFAB); PIPE SA 516 GR70 .500W; BOSS SA105	*
1	1 1/4"	STUDS - CONT THRD SA193 GR B6 (28 QTY); HEX NUTS - HVY SERIES SA194 GR 6 (56 QTY)	QTY 28 - 1304; QTY 56 - 1305
2			QTY 28 - 1306; QTY 56 - 1307
3			QTY 28 - 1308; QTY 56 - 1309
4		ADD'L'S - CONT THRD'D SA193 GR B6 (28 QTY); HEX NUTS - HVY SERIES SA194 GR 6 (28 QTY)	QTY 28 - 1310; QTY 56 - 1311
5			QTY 28 - 1312; QTY 56 - 1313
6			QTY 28 - 1314; QTY 56 - 1315
7			QTY 28 - 1316; QTY 56 - 1317
8		STUDS - CONT THRD'D SA193 GR B6 (28 QTY); HEX NUTS - HVY SERIES SA194 GR 6 (56 QTY)	QTY 28 - 1318; QTY 56 - 1319
9		DELETED	
10		DELETED	
11	1/8" NOM	GASKET - RED RUBBER FULL FACE 150	N/R

PIECE No	SIZE	DESCRIPTION	UNIQUE IDENTIFICATION
12	1/8"	GASKET: RED RUBBER FULL FACE 150	N/R
13			
14			
15			
16			
17			
18			
19			
20			
21	30"	VALVE, CHECK, INSERT TYPE, 150LB, SB 148 C95200	0-0057-1-3 86018-1-3 0-0057-2-3 86018-2-3
22		VVF015-1-3 150# FLANGED MOV102C	
23		VVF015-1-3 150# FLANGED MOV102A	
24		VALVE, CHECK, INSERT TYPE, 150LB, SB 148 C95200	
25		DELETED	
26		DELETED	

WELD JOINT CONTROL

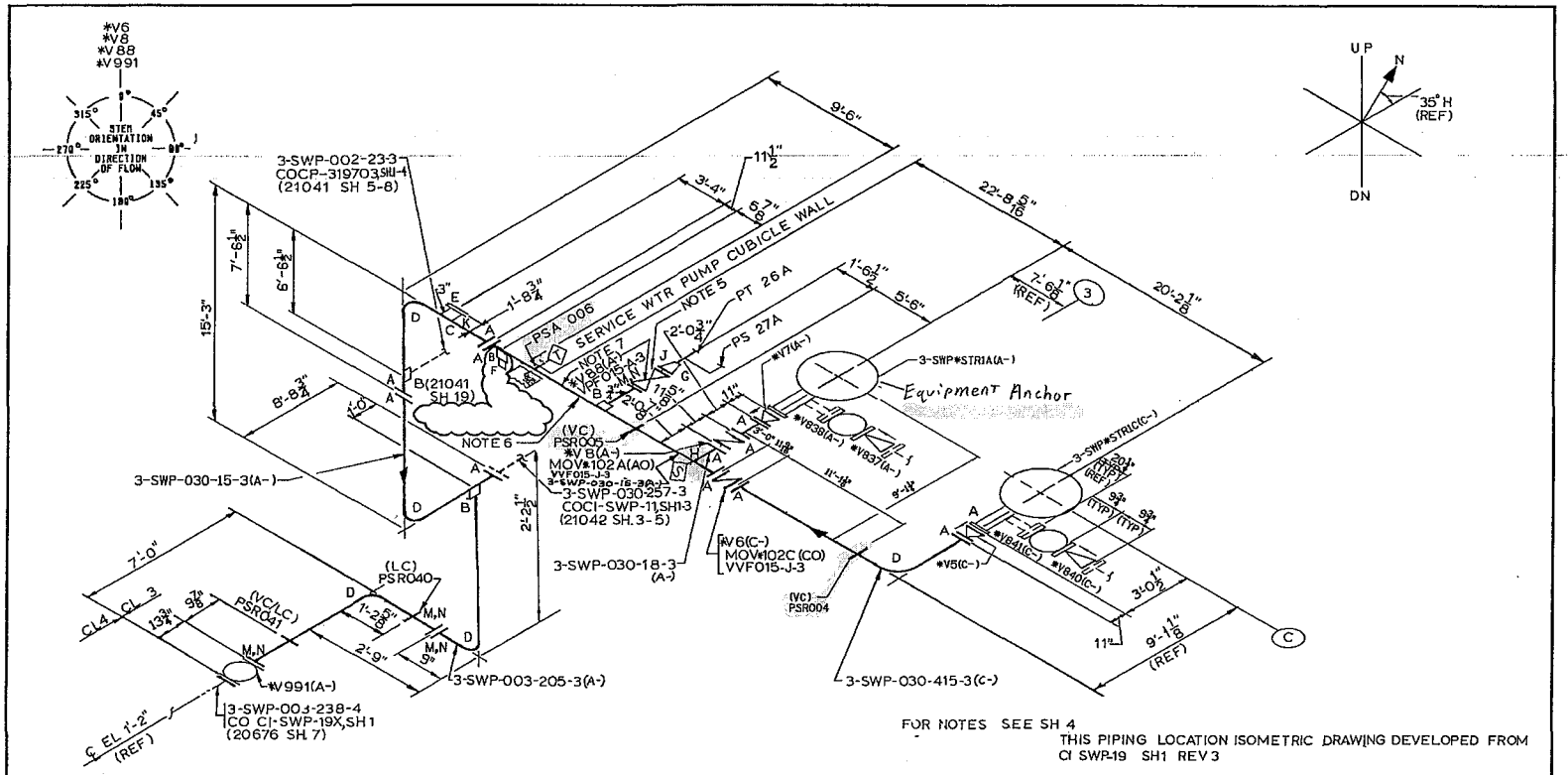
JOINT No	ACCEPTANCE INIT	ACCEPTANCE DATE	JOINT No	ACCEPTANCE INIT	ACCEPTANCE DATE
1	DELETED		16	DELETED	
2	DELETED		17	DELETED	
3	DELETED		18	DELETED	
4	DELETED		19	DELETED	
5	DELETED		20	DELETED	
6	DELETED		21	DELETED	
7	DELETED		22	DELETED	
8	DELETED		23	DELETED	
9	RH 5/14/20		24	DELETED	
10	DELETED		25	DELETED	
11	DELETED		26	DELETED	
12	DELETED		27	DELETED	
13	DELETED		28	DELETED	
14	DELETED		29	DELETED	
15	RH 5/14/20				

Dominion Nuclear Connecticut, Inc.
Millstone Power Station
Waterford, CT.

TITLE: FABRICATION INSTALLATION CONTROL DRAWING

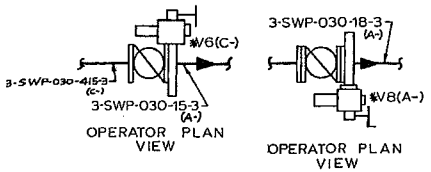
DESIGN DESCRIPTION (SIGNATURES ON FILE)	CAD REQUIREMENTS	REV
REVISED PER DC M03-17-01008 AND DVR 17-00350	DRAWING NO. 25212-21041	17
DSGN DNJ	SCALE: NONE	UNLESS OTHERWISE NOTED ON 16

S&W DWG. NO. 12179-CI-SWP-19 SH.1



FOR NOTES SEE SH 4

THIS PIPING LOCATION ISOMETRIC DRAWING DEVELOPED FROM CI SWP-19 SH1 REV 3



FITTING SCHEDULE			
		FTG IDENT LTR	FITTING DESCRIPTION
		A	SO FLG 125#
		B	BARSTOCK (HALFCPLG)
		C	PIPE TO PIPE
N	STUB END, LAP JOINT	D	90° LR ELB
M	FLG LAP JOINT 150#	E	BLIND FLG 150#
J	COMP ADPTR	F	PLUG (SPECIAL)
K	FLG SO 150#	G	FLANGE 150LB SW
~~L~~	~~90° ELB SB~~	H	SADDLE

STRESS RECONCILIATION PIPING LOCATION ISOMETRIC

FABRICATION INSTALLATION CONTROL DRAWING

ASME SECTION III, CODE CLASS 3

LINE DESIGNATION	PIPE CLASS
3-SWP-030-15-3(A-)	158
3-SWP-030-18-3(A-)	158
3-SWP-003-205-3(A-)	158
3-SWP-030-415-3(C-)	158

REFERENCE DWG NO(S)	ISSUE
12179-EP-19A,Q	
FSK-040A,EM-133A,EM-133D	
AX-19A,B,K, N-ME-04676	
BZ-19D,N-ME-03235,N-ME-0102	
N-ME-04026	

Dominion Nuclear Connecticut, Inc.
Millstone Power Station
Waterford, CT.

TITLE: FABRICATION INSTALLATION CONTROL DRAWING STRESS RECONCILIATION PIPING LOCATION ISOMETRIC

REVISION DESCRIPTION (SIGNATURES ON FILE)	CAD ID/COMMENTS	REV
REVISED PER DC MP3-17-00008 AND DCR 17-00059	DRAWING NO. 25212-21041	17
DSGN DWG	SCALE: NONE	UNLESS OTHERWISE NOTED SH 19

S&W DWG. NO. 12179-CI-SWP-19 SH.3

[redacted] (Services - 6)

From: [redacted] (Services - 6)
Sent: Friday, March 13, 2020 2:17 PM
To: [redacted] Dom En Nuclear CT, Inc. - 4)
Cc: [redacted]
Subject: Corrosion Rate Calculation

Tom,

Here is the complete corrosion rate calculation.

The corrosion rate in terms of current density (1.6e-5 A/cm^2) is from **EPRI Report "Predictive Model for Galvanic Corrosion," Report Number 1008184, December 2004.**

Table 4-2 (Page 4-7)

Table 4-2
Tafel Parameters Taken from Polarization Curves in Sea Water Chemistry

Material	T_a (mV/decade)	T_c (mV/decade)	I_{cor} (A/cm^2)	E_{cor} (mV)
Carbon Steel	60	110	1.6E-5	-690
316L Stainless Steel	130	260	6.3E-7	+10
Admiralty Brass	30	35	2.5E-6	-245
Copper	50	110	2.0E-5	-220
Titanium	410	680	1.6E-7	+650
AL6XN	280	730	6.3E-7	+210
90:10 Cu/Ni	60	85	1.8E-5	-250

The polarization plots are presented in Appendix A. The plots for titanium and AL6XN were very difficult to interpret, having a "noisy" trace with no clear minimum. This was improved slightly by "smoothing" the measurement results by an averaging technique for either seven or thirteen adjacent points, applied through the result set. Even so, the results for these metals given in Table 4-2 may be subject to large experimental errors. Interpretation of these plots is generally difficult with several cathodic processes taking place and with the possibility that reduction of O_2 may be mass-transfer controlled. The solution was sparged with air, and the vessel was well stirred/agitated to try and minimize mass transfer effects, but the efficiency of this procedure cannot be quantified.

$$CR\ \left(\frac{cm}{sec}\right) = \frac{i\left(\frac{A}{cm^2}\right) * EW\ \left(\frac{g}{eq}\right)}{F\left(A * \frac{sec}{eq}\right) * \rho\ \left(\frac{g}{cm^3}\right)} = \frac{1.6e-5\left(\frac{A}{cm^2}\right) * 27.92\ \left(\frac{g}{eq}\right)}{96500\left(A * \frac{sec}{eq}\right) * 7.87\ \left(\frac{g}{cm^3}\right)} = 5.88e\text{-}10\ \frac{cm}{sec}$$

Convert to in/30 days:

$$=5.88e\text{-}10\ \frac{cm}{sec} * \frac{1\ in}{2.54\ cm} * 3600\ \frac{sec}{hr} * 24\ \frac{hr}{day} * 30\ \frac{day}{month} = 0.0006\ \frac{in}{30\ days}$$

[redacted]
Dominion Energy
Innsbrook Technical Center
Phone: 804-273-4322
Tie-Line: 8-730-4322

CORRECTED FORM N-1 DATA REPORT FOR PIPING

(As Required by the Provisions of the ASME Code Rules) SHT 90 OF 119

1. Fabricated by SOUTHWEST FABRICATING & WELDING CO., INC. HOUSTON, TX. (Name and Address of Fabricator) Order No 03418

2. Fabricated for STONE & WEBSTER ENGINEERING CORP., BOSTON, MASS. (Name and Address) Order No P.O. 2280.000-450

3. Owner NORTHEAST UTILITIES SERVICE CO., MILLSTONE NUCLEAR POWER STA. UNIT 3, WATERFORD, CT. 4. Location of Plant

5. Piping System Identification SERVICE WATER PIPING: SERIAL # 5016 (Brief description of intended use, main coolant etc.)

(a) Drawing No. Q3418 SHT.107 & 107RR Prepared by SOUTHWEST FAB. & WELDING CO., INC.

6. Design Conditions of Piping ____ (Pressure) psi ____ (Temp.) °F

7. The material, design, construction, and workmanship complies with ASME Code Section III, Class 3

Edition 1971 , Addenda Date WINTER 1972 , Case No. -----

Remarks: Manufacturers' Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of this report SPOOL PIECE PER Q3418 SHT.107 (PC MK. # 3-SWP-19-2-7-3); (SER. #5016). (SOUTHWEST FAB. & WELDING CO., INC.).

8. Shop Hydrostatic Test N/A psi.

9. Description of piping inspected MK: 3-SWP-19-2-7-3; SA-516 GR-70 (SB402 #706), 30" (.500"W), 29'-1 5/8", 2'-0 5/8" LENGTHS; SA-350 LF-I, 30" CL-1 25 SO FF FLG. (3); SB-164 (MONEL), 1 3/4" OD x 2" LG. x 59/64" BORE BARSTOCK CPLG; SA515 GR-70, PL. RING 38 3/4" OD x 30 1/8" ID. x ½" THK; SA516 GR-70 30 ON 30 REINF. PAD 60" LG x 3/4" THK. x 69 3/4" ARC.

(include - mark no. - material spec. - nom. pipe size - schedule or thickness - length - fittings - flanges, etc.)

** RETURNED FROM FIELD FOR REPAIR OF FLG DAMAGE AS REQ'D.**

STONE & WEBSTER ENGR. CORP.
NORTHEAST UTILITIES SERVICE CO.
MILLSTONE NUCLEAR POWER STATION
UNIT # 3
P. O. 2280.000 - 450
SF & WCO S. O. Q3418
PC. MK NO. 3-SWP-19-2-7-3

CERTIFICATION OF DESIGN

Design information on file at

Stress analysis report on file at

Design specifications certified by (1) Prof. Eng. State Reg. No.

Stress analysis report certified by (1) Prof. Eng., State Reg. No.

(1) signature not required, list name only.

S. W. E. C. QQC INSPECTED '65

We certify that the statements made in this report are correct.

Date 6-27-79 Signed S.F.&W. CO., INC. (Fabricator) By (MSP) Joyce Hodgson

Certificate of Authorization Expires JULY 23, 1979 Certificate of Authorization No. N-1459

CERTIFICATE OF SHOP INSPECTION

* HARTFORD STEAM BOILER INSP. & INS. CO., HARTFORD, CT.

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of TEXAS and employed by * of *

have inspected the piping described in this Data Report on 6-27 to 79, and state that to the best of my knowledge and belief, the Manufacturer has constructed this piping in accordance with the applicable Subsections of ASME Code, Section III.

By signing this certificate, neither the Inspector nor his employer make any warranty, expressed or implied, concerning the piping described in this Data Report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date 6-28 19 79

(Inspector) Commissions TEXAS 805 (National Board, State, Province and No.)

7

ATTACHMENT 3

SCHEMATIC OF ASME BRANCH REINFORCEMENT WELD DETAILS

MILLSTONE POWER STATION UNIT 3
DOMINION ENERGY NUCLEAR CONNECTICUT, INC.

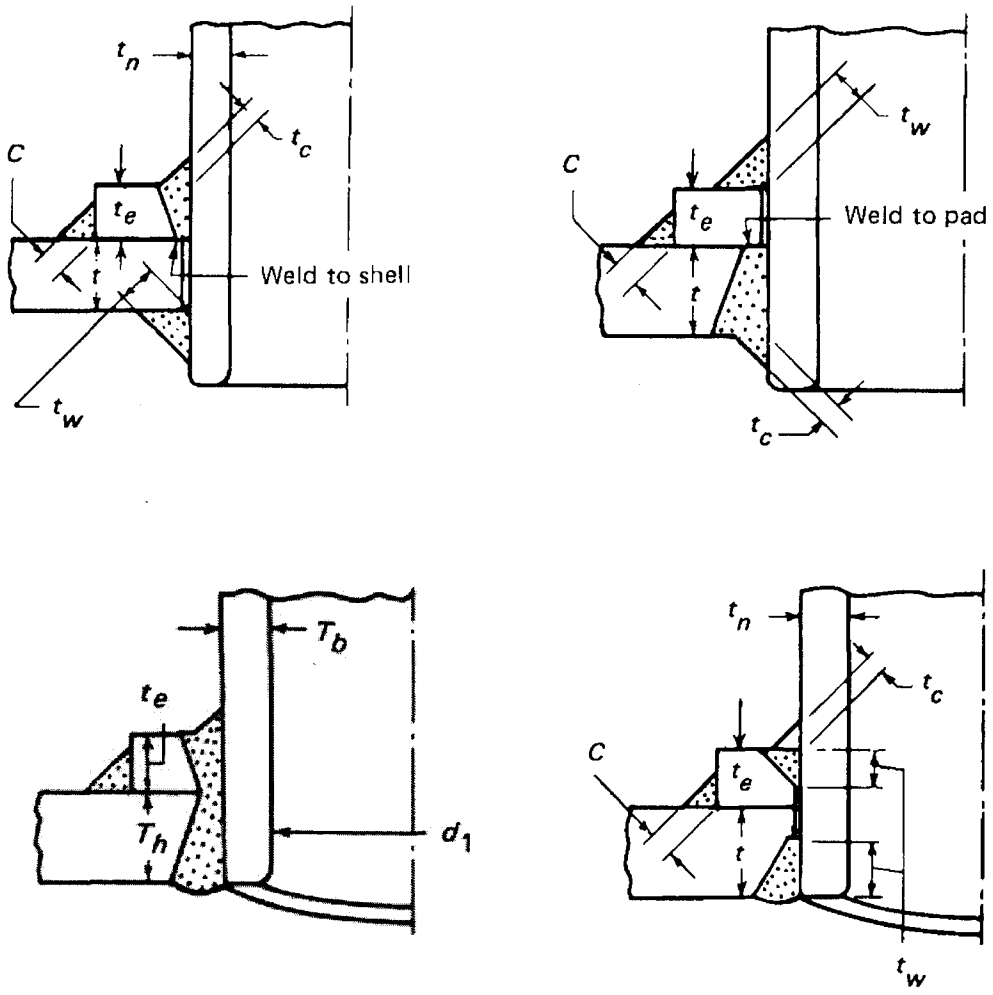


FIG. ND-4244(d)-1 SOME ACCEPTABLE TYPES OF WELDED NOZZLES, AND BRANCH AND PIPING CONNECTIONS - For Definition of Symbols, See ND-3352.4(d)