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Vice President, Nuclear Operations
803.345.4810

SCE&G®
A SCANA COMPANY

RC-18-0105
August 14, 2018

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

Dear Sir / Madam:

Subject: VIRGIL C. SUMMER NUCLEAR STATION (VCSNS) UNIT 1
DOCKET NO. 50-395
OPERATING LICENSE NO. NPF-12
RELIEF REQUEST RR-4-17, REQUEST TO UTILIZE CODE CASE N-513-3 'EVALUATION CRITERIA FOR TEMPORARY ACCEPTANCE OF FLAWS IN MODERATE ENERGY CLASS 2 OR 3 PIPING SECTION XI, DIVISION 1' FOR A SERVICE WATER SYSTEM FLANGE

In accordance with the provisions of 10 CFR 50.55a(z)(2), South Carolina Electric & Gas Company (SCE&G), acting for itself and as an agent for South Carolina Public Service Authority (Santee Cooper) requests an emergency relief request to use Code Case N-513-3, "Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping Section XI, Division 1" for the evaluation of a through-wall leak identified in a Class 3 Service Water piping flange.

SCE&G is requesting this relief until the conclusion of the Virgil C. Summer Nuclear Station (VCSNS), Unit 1 Fall 2018 refueling outage (RF-24). The repair will be implemented no later than the completion of the Fall 2018 refueling outage or before exceeding the temporary acceptance criteria of Code Case N-513-3 and this relief request, whichever comes first.

On August 13, 2018 a pin hole leak was discovered on the Service Water (SW) system on the downstream flanged portion of valve XVB03121B-SW. SCE&G requests the use of Code Case N-513-3 for the analysis of this flange to allow continued operation.

Enclosed is the relief request.

SCE&G requests NRC approval of the proposed alternative by August 15, 2018.

Should you have any questions, please call Michael S. Moore at 803-345-4752.

Very truly yours,

George A. Lippard

BAB/GAL/bd

Enclosures:
1) VCSNS Relief Request RR-4-17
2) Design Calculation SW050/03 Revision 0 "Through Wall Leak Evaluation"

c:

J.E. Addison	W. M. Cherry	NSRC
W.K. Kissam	C. Haney	RTS (CR-18-03296)
J. B. Archie	S. A. Williams	File (810.19-2)
J.H. Hamilton	NRC Resident Inspector	PRSF (RC-18-0105)
G.J. Lindamood	K. M. Sutton	

South Carolina Electric & Gas Co. (SCE&G)
Virgil C. Summer Nuclear Station Unit 1 (VCSNS)
Relief Request RR-4-17

1. Subject

VCSNS requires relief from Section XI requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. This request is based on the hardship of performing required ASME code repair/replacement activities to the downstream weld neck flange at valve XVB03121B-SW. The pipe flange is an 8-inch Service Water (SW) discharge line from the B-Train Emergency Diesel Generator (EDG) heat exchangers. This safety-related flange is classified as ASME Code Class 3.

There are two previously identified leaks in the 'A' SW system and two previously identified leaks in the 'B' SW system. The leak which is the subject of this relief request is part of the 'B' SW train and is fifth leak in the SW system. For the effects on flow margin with respect to system operability, leakage from the two 'B' Train SW leaks are combined. The leak, which is the subject of this Relief Request, is in the Diesel Generator Building, whereas all previous leaks were in the Intermediate Building. For this reason, the flooding effects from the previous leaks are not considered in this evaluation. The effects of all five leaks are considered for the effects on SW pond inventory with respect to system operability.

The first pinhole leak was identified in the 'B' SW system under CR-18-02364 on June 9, 2018. This leak was discovered approximately 10 inches downstream of XVB03123B-SW, Component Cooling Water (CCW) Heat Exchanger 'B' SW Return Valve. This leak was temporarily accepted in accordance with the requirements of Code Case N-513-3. The station completed the augmented examination requirements Code Case N-513-3. All five locations were satisfactory.

The second pinhole leak in the 'B' SW system was identified under CR-18-02706 on July 2, 2018. This leak was discovered approximately 13.75 inches downstream of the XVB03123B-SW CCW Heat Exchanger 'B' SW Return Valve. This leak is in a branch tee and was temporarily accepted via a relief request to use Code Case N-513-4. The station completed the augmented examination requirements Code Case N-513-4. All five locations were satisfactory.

The first pinhole leak on the 'A' SW system was identified under CR-18-02797 on July 10, 2018. This leak was discovered in the 'A' SW System on the branch tee connection downstream of XVB03123A-SW CCW Heat Exchanger 'A' SW Return Valve. During the Ultrasonic inspection of this flaw, a second flaw (non through-wall) was discovered 5.85 inches from the first flaw. The second flaw partially extends into the reinforced region of the branch tee. Both were temporarily accepted via a relief request to use Code Case N-513-4 and Generic Letter 90-05. The station completed the ten

augmented examination requirements of Code Case N-513-4 and Generic Letter 90-05. All ten locations were satisfactory.

The second leak in the 'A' SW system was identified under CR-18-02857 on July 12, 2018. This leak was found in the region of the leak found on July 10, 2018. This flaw was bounded by the evaluation performed on the leak from July 10, 2018.

2. ASME Code Component(s) Affected

ASME Code Class:	Code Class 3
Reference:	ASME Section XI, IWA-4000
Description:	Repair/Replacement Activities
Component:	Service Water (SW) System 8-inch Weld Neck Flange Downstream of XVB03121B-SW
Flange Material:	Carbon Steel SA-105

3. Applicable Code Edition and Addenda

ASME Code Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," 2007 Edition through 2008 Addenda. The station is in its 4th 10 year interval effective from January 1, 2014, through and including December 31, 2023.

4. Applicable Code Requirement

ASME Code Section XI, 2007 Edition through 2008 Addenda, Article IWA-4000, Repair/Replacement Activities.

5. Reason for Request

On August 13, 2018, at approximately 09:15, a pin hole leak was discovered approximately 0.75" downstream of XVB03121B-SW Diesel Generator Cooler B SW Return Valve. The leak is spraying onto an adjacent wall and floor at approximately 20 ml/minute.

VCSNS Technical Specifications discuss the limiting conditions for operation (LCOs) of the SW System in section 3.7.4. It states that at least two independent service water loops shall be OPERABLE in MODES 1,2,3, and 4. The action statement requires that with only one service water loop OPERABLE, restore at least two loops to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Code repair is considered a hardship without a compensating increase in the level of quality and safety. A Code repair would require a plant shutdown to replace the pipe flange. The flange is located between valve XVB03121B-SW and the service water pond. The flange cannot be isolated from other portions of the service water system.

This degraded condition is not in compliance with ASME Section XI, 2007 Edition through 2008 Addenda, IWA-4000.

6. Proposed Alternative and Basis for Use

In accordance with 10 CFR 50.55a(g)(4), this safety-related piping must meet the requirements applicable to components which are classified as ASME Code Class 3. V.C. Summer proposes a relief request from ASME Code Section XI, IWA 4000 by allowing an alternative to Code Case N-513-3. A Code repair requires shut down of VCSNS Unit 1 to replace the piping flange. Given the limited risk associated with the condition of the flange, code repair is considered a hardship without a compensating increase in the level of quality and safety.

In the application of code case N-513-3, the flaw being evaluated must fall within the scope of the document. This flaw meets all portions of the Section 1.0 scope with the exception of (C) where the flaw falls beyond the distance of (Ro*t)^0.5. A flaw evaluation using guidance from ASME Code Case N 513-3 and ASME BPVC, Section III, 2007 Edition through 2008 Addenda determined the flaw was acceptable in its current configuration.

All other requirements of code case N-513-3 will be met. A compensatory action of daily walkdowns of the area will be completed to quantify the leakage. UT examinations of no more than 30 day intervals will be performed around the degraded area to monitor flaw growth. An augmented examination will be performed in accordance with Section 5 of Code Case N-513-3. A code compliant repair will be completed during the next refueling outage which is scheduled to start on October 6, 2018.

Enclosure 2 contains the evaluation of the acceptability of the through wall leak and the UT inspection results. The UT inspection results were obtained by a Quality Control inspector who was qualified as a UT Level II inspector.

Further degradation is acceptable as long as the average thickness of the remaining material outside the hole is greater than 0.046" within a diameter of 2.0" of the hole, leakage from the subject leak remains below 11.5 gpm, and total 'B' Train SW System leakage remains below 61.8. GPM.

6.1 Flaw Characterization – The flaw has been classified as non-planar through wall and no evidence was found to indicate a "crack" type indication. The average thickness of the bounded flaw is 0.156" as determined from the UT measurements.

6.2 Structural Integrity - Per VCSNS Unit 1 Technical Specification (TS) 4.0.5, the structural integrity of an ASME component is determined in accordance with either the original construction code or the ASME Section XI Code, approved code cases or regulatory-approved methods of evaluation. No NRC approved methodology exists that allows for temporary acceptance of flaws for this condition. This flaw meets all portions of the NRC conditionally approved code case N-513-3 with the exception of Section (C) of the scope section where the flaw falls beyond the distance of (Ro*t)^0.5. A flaw evaluation using guidance from ASME Code Case N-513-3 and ASME BPVC, Section III, 2007 Edition through 2008 Addenda determined the flaw was acceptable in its current configuration. Design Calculation SW050/03 Rev. 0 "Through Wall Leak Evaluation" was conducted to evaluate the acceptability of the through wall leak. The evaluation results show the existing defect is structurally acceptable. Further degradation is acceptable as long as the average thickness of the remaining material outside the hole is greater than 0.046" within a diameter of 2.0" of the hole. See attached evaluation.

6.3 Flow Margin - The pin hole leak is located downstream of the 'B' Emergency Diesel Generator heat exchangers downstream of the discharge valve XVB03121B-SW on the discharge line to the SW pond. Therefore, a leak at this location does not affect the ability to provide cooling water to the EDG heat exchangers. The current leakage from the pin hole which is approximately than 20 ml/minute. A conservative estimate of flow through a leak from a 0.375 inch diameter hole at 20 psig would be approximately 11.5 gpm. The SW pump is designed to supply 16,800 gpm of flow. A flow of 11.5 gpm from leakage on the 'B' Train would not have a significant effect on the performance of the pump.

There are also four separate SW pinhole leaks downstream of the A and B CCW Heat Exchanger Return Valves (XVB03123A/B-SW). The upper limit of allowable leakage for these leaks is 50.3 gpm as defined in previous operability evaluations and associated relief requests. For this flow margin evaluation, it is assumed that all 50.3 gpm of leakage is from 'B' Train. This combined with the 11.5 gpm leakage downstream of the EDG Hx Return Valves would give a total of 61.8 gpm leakage from the SW System.

A recent routine code check valve test from STP-230.006J on the SW 'B' Train measured the total system flow to be 13,036 gpm (STTS# 1604423). The design minimum required post-accident flow for a train of SW is 12,237 gpm (SW DBD). This check valve testing alignment is comparable to the post-accident SW system alignment. Therefore, there is a flow margin of approximately of 800 gpm. This is a conservative approach since the 61.8 gpm leak rate would be located downstream of all cooling loads and throttle valves. A postulated leakage of 61.8 gpm would not adversely affect SW system flow margin.

The SW pond contains approximately 38.5 x 10^6 gallons of water and has the capability of being filled by a cross-tie valve from the circulating water system if water level drops below the alarm limit. A postulated leak of 61.8 gpm would not significantly affect the SW pond level.

6.4 Spray Concerns – The current small stream coming from the pin hole leak is directed toward the wall in the diesel building 427 foot elevation and is not currently adversely affecting any surrounding equipment. The leakage is oriented toward the wall and there is no active safety-related equipment that would be adversely impacted by the leakage. The system pressure is low at the defect location (20 psig or less), therefore, the only potential effect from the spray would be the open/close limit switches and the conduit/terminal box for the limit switches on XVB03121B-SW. The valve limit switches are only used for position indication because XVB03121B-SW is a manual valve and no position change is required for the safety-related function. If it is assumed that the existing defect opens to a 0.375 inch diameter hole (for conservativism), the orientation and location of the leak would lead to the resulting spray deflecting off the wall and pooling on the flow prior to affecting any equipment in the vicinity of the valve excluding the limit switches and associated conduit/terminal box for XVB03121B-SW. From visual observation, the closest equipment are the Diesel Generator Fuel Oil Transfer Pumps and these are approximately 15 feet away from the pin hole leak and on the other side of the valve. The spray would not have adequate velocity from the 3/8" hole at approximately 20 psig to adversely affect these components.

6.5 Flooding - Calculation DC03490-003 Rev 1 provides the DG building flooding evaluation. It assumes a 30 minute operator action and no floor drain capability or sump pump operation. The current leakage is negligible. If it is assumed that the existing defect opens to a 0.375 inch diameter hole (for conservativism), the discharge would be approximately 11.5 gpm (at design upset pressure of 20 psig for conservatism) and would increase the calculated flood level in the 400 foot elevation from 48.1 inches to 49.0 inches after 30 minutes which continues to be an acceptable flood level. The level in the 427 foot elevation is unaffected since the curb heights limit the water level in this elevation and any water cascading above these curbs will drain to the 400 foot level.

Under normal operating conditions, the DG building sump pumps have a 40 gpm capacity each. There are two redundant 100% capacity sump pumps which can be used during normal plant operations. The water from the spray will collect at the floor near the pipe and drain to a nearby floor drain which goes to the Emergency Diesel Generator Building sump pumps. Therefore, DG building sump pumps would have sufficient capacity to prevent building flooding from the postulated 11.5 gpm leak rate.

6.6 Extent of Condition –An Augmented Examination will be implemented in accordance with Section 5 of Code Case N-513-3.

6.7 Compensatory Monitoring Plan – Operations will quantify the leakage from the pin hole leak at least once every 24 hours until the leak is repaired. UT examinations of no more than 30 day intervals will be performed around the degraded area to characterize flaw growth. The monitoring plan will remain in place until the system is removed from service and repaired.

6.8 Conclusion - Although the structural integrity of the degraded flange cannot be demonstrated in accordance with a regulatory-approved methodology, it is concluded the integrity and functional requirements of the flange will be maintained. SW will continue to be capable of providing required cooling water flow to meet the required cooling loads including the EDG HXs. There will be no adverse impact on neighboring equipment due to either spray or flooding. VCSNS will implement the compensatory monitoring plan above to ensure any growth of the flaw is identified and assessed for its impact on structural integrity. A code compliant repair will be completed during the next refueling outage which is scheduled to start on October 6, 2018.

7. Duration of Proposed Alternative:

A code compliant repair will be completed during the next refueling outage which is scheduled to start on October 6, 2018. Therefore, the duration of the proposed alternative is approximately 2 months until repaired during the outage.

8. Precedents:

V.C. Summer Nuclear Station, Unit 1-Safety Evaluation Report for Relief from the Requirements of the ASME Code Regarding Service Water System Piping (CAC No. MF9082), [ML17031A015].

9. References:

1. ASME Code Section XI, Division 1, 2007 Edition through 2008 Addenda
2. Code Case N-513-3, "Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping," Section XI, Division 1, January 26, 2009
3. Virgil C. Summer, Unit 1, Relief Request RR-4-15, Request for Alternative to Implement Code Case N-513-4, 'Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping' [ML18184A560].
4. Virgil C. Summer Nuclear Station (VCSNS), Unit 1 - Relief Request RR-4-16, Request for Alternative to Implement Code Case N-513-4, 'Evaluation Criteria for Temporary Acceptance of Flaws In Moderate Energy Class 2 or 3 Piping' [ML18193B109].
5. South Carolina Electric and Gas Company Calculation Record, SW050/03, "Through Wall Leak Evaluation" Revision 0.

VIRGIL C. SUMMER NUCLEAR STATION (VCSNS) UNIT 1

ENCLOSURE 2

DESIGN CALCULATION SW050/03 REVISION 0 "THROUGH WALL LEAK EVALUATION"

Subject Code 560	SOUTH CAROLINA ELECTRIC AND GAS COMPANY CALCULATION RECORD			Page 1 of 4
Calculation Title Through Wall Leak Evaluation		Calculation Number SW050/03	Revision 0	Status A 8/13/18
Parent Document ECR72389	System SW	Safety Class ☐ NN ☐ QR ☒ SR	☐Partial Calc. Revision ☒Complete Calc. Revision	
Originator N. Glunt	Discipline PS	Organization SCE&G-DE	Date 8/13/18	XREF Number N/A

CALCULATION INFORMATION

Content Description: Evaluation of the acceptability of a through wall leak in the 8" Service Water line downstream of valve XVB03121B-SW.

Affected Components/Calculations/Documents:
SW050 and DC05600-034

Piping Reconciliation Completed per QA-CAR-0089-18: ☐This Revision ☐ Previous Revision ☒ N/A

Contains Preliminary Data/Assumptions: ☒ No ☐ Yes, Affected Pages: _____

Computer Program Used: ☐ No
☐ Yes, Validated per _____ computer program validation process (others)
vendors name
☒ Yes, Validated in accordance with SAP-1040 (Ref. 3.11)
☐ Yes, Validated [ES-0412]
☐ Computer Program Validation Calculation

D

VERIFICATION ☐ Continued, Attachment

Scope: Verify correct inputs, methodology, computations, and completeness of scope.

Verifier: B. Starbuck
Assigned by: J. Galloway

N. Glunt 8/13/18
Engineering Personnel /Date

8/13/18 Verifier/Date	Owner's Acceptance Review N/A Responsible Engineer/Date Required for all engineering work performed by contractor personnel not enrolled in the VCSNS Engineering Training Program
8/13/18 Approval/Date	RECORDS To Records Mgmt: _____ Initials/Date

A

Distribution: Calc File (Original)

SOUTH CAROLINA ELECTRIC & GAS COMPANY REVISION SUMMARY	Page 2 of 4

Calculation Number
SW050/03

Revision Number.	Summary Description
0	Initial Issue to accept through pipe wall flaw utilizing ASME Code Case N-513-3.

PURPOSE

The purpose of this calculation is to document the evaluation of the acceptability of a through wall leak in the flanged portion of valve XVB03121B-SW.

REFERENCES

1. NRC Generic Letter 90-05
2. ASME Code Case N-513-3
3. ASME B&PV Code, Section III, 1971 Edition with Sumer 1973 Addenda.
4. Drawing 1MS-22-261, Rev 12
5. Drawing 302-222, Sheet 3, Rev 31
6. Calculation SW050, Rev 3.1
7. Calculation SW050/02, Rev 0
8. EIR 82492
9. Catalog, Ladish Fittings No. 55
10. EPRI TR-103198-T1, "A Method to Predict Cavitation and the Extent of Damage in Power Plant Piping"
11. NRC Reg. Guide 1.147, Rev 18

ATTACHMENTS

1. MATHCAD N-513-3 Evaluation – 2 pages
2. UT inspection results of Flaw (WO #1814690-001) – 3 pages

COMPUTER PROGRAMS

MATHCAD 14

ASSUMPTIONS

None.

EVALUATION

A leak was discovered in the weld neck flange downstream of valve XVB03121B-SW in the Service Water Piping System. A similar leak was previously evaluated in the weld neck flange downstream of valve XVB03121A-SW in SW050/02 (Reference 7).

The piping was reviewed for minimum pipe wall thickness using hoop stress and longitudinal stress. This is documented in EIR 82492 (Reference 8). The results of the minimum wall thickness calculation determined that the hoop stress is bounding and the minimum wall thickness is 0.019" at the weld neck flange. The weld neck flange is tapered with the weld neck increasing in thickness towards the back facing (Reference 9). The wall thickness calculations utilize the thinner attached pipe dimensions (8" Sch. 40) with a conservative design pressure of 65 psi. The allowable stress used in the minimum wall thickness calculation is based on the piping SA106 Gr. B material which is bounding vs. the flange material of SA105. These considerations ensure the evaluation is conservative.

The flaw will be evaluated utilizing the ASME Code Case N-513-3 (Reference 2) and must fall within the scope of the requirements listed in Section 1 of N-513-3. The flaw meets the requirement of the Section 1.0 Scope of N-513-3 with the exception of (c) where the flaw is beyond the distance of $(R_o*t)^{0.5}$ from the pipe to flange weld centerline. Therefore a subsequent relief request will be required by Licensing.

Continuing forward with Section 2, "Procedure", of N-513-3 (Reference 2):

(a) The flaw geometry has been characterized and is included in Attachment 2.
(b) The flaw is classified as Non-Planar Through Wall. Attachment 2 does not suggest there is a "crack" type indication. The flaw is identified as a "pinhole" leak with a localized thinned region.
(c) There is only a single flaw identified and the remaining pipe wall and weld are nominal.
(d) Flaw Evaluation shall be performed – See Attachment 1
(e) Frequent periodic inspections of no more than 30 day intervals shall be used to determine if the flaw is growing and determine a timeframe as which the flaw may be no longer acceptable. This method is recommended over using a flaw growth evaluation due to the nature of the erosion which is difficult to predict (Reference 10).
(f) This calculation does not include an evaluation of the effects of the water spray. That is outside of the scope of this evaluation.
(g) The results provided are the limit of the flaw size. Any further growth would have to be reanalyzed.
(h) Per the NRC stipulations for the use of N-513-3, a repair must be made at the next outage.
(i) This evaluation and the UT examination are documented in accordance with IWA-6300. Licensing is requesting an emergency relief request in order to apply the N-513-3 code case in the weld neck flange beyond the provisions of Section (1), Paragraph (c) of Code Case N-513-3.

Outside of the scope of this calculation, augmented volumetric examination or physical measurement to assess degradation of the affected system shall be performed to identify and detect other susceptible flaw locations per N-513-3.

RESULTS

The through wall flaw is acceptable. Further degradation is acceptable as long as the average thickness of the remaining material is greater than 0.046 inches, within a diameter of 2 inches. Note that the average thickness is 0.156 inches as determined from the UT measurements recorded in Attachment 2.

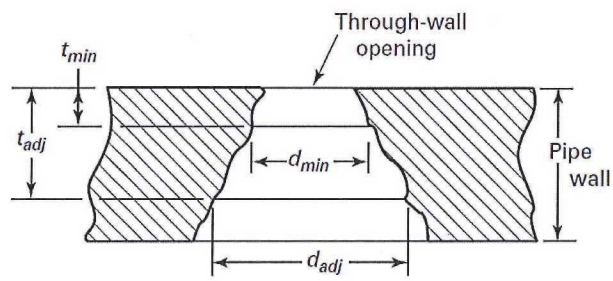
Daily walkdowns of the area are recommended to ensure any spray evaluations are still valid. This calculation is only applicable for the duration up until the next refueling outage (RF24, Fall 2018), where the flaw must be repaired.

ASME Code Case N-513-3
Non-Planar Flaw Evaluation

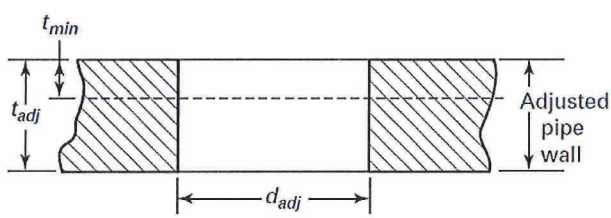
$OD_{pipe} := 8.625in$ $t_{nom} := 0.322in$ $p := 65psi$ $S_a := 15ksi$ $R_m := \frac{OD_{pipe} - t_{nom}}{2}$

Pressure of 65 psi is used for conservatism, Normal is 16 psi and Upset is 20 psi.

Illustration of Adjusted Wall Thickness and Equivalent Hole Diameter



(a) Adjusted Wall Thickness



(b) Equivalent Hole Representation

ASME Code Case N-513-3 Equation 4

$$t_{min} = \frac{pD_o}{2(S + 0.4p)} \quad (4)$$

where

p = maximum operating pressure at flaw location
S = allowable stress at operating temperature

$$t_{min} := \frac{p \cdot OD_{pipe}}{2 \cdot (S_a + 0.4 \cdot p)} = 0.019 \cdot in$$

For through-wall leakage along portion of the thinned wall:

ASME Code Case N-513-3 Equation 8

$$d_{adj} \leq \frac{1.5\sqrt{Rt_{adj}}(t_{adj} - t_{\min})}{t_{\min}} \qquad (8)$$

$t_{adj} := 0.067in$ The value was selected to be greater than t_min and less than nominal.

$$d_a := \frac{1.5\cdot\sqrt{R_m\cdot t_{adj}}\cdot(t_{adj} - t_{min})}{t_{min}} \qquad d_a = 2.05\cdot in$$

d_a must be greater than or equal to d_adj

$d_a = 2.05\cdot in$ vs $d_{adj} := 2.0in$

Equation 8 was iterative until d_a yielded a result greater than 2in. At this size, the diameter would encompass the first two readiangs in all directions around the pinhole leak shown in Attachment 2.

ASME Code Case N-513-3 Equation 9

$$t_{c,avg} \geq 0.353 d_{adj}\sqrt{\frac{p}{S}} \qquad (9)$$

$$t_c := 0.353\cdot d_{adj}\cdot\sqrt{\frac{p}{S_a}} \qquad t_c = 0.046\cdot in$$

Therefore, t_c_avg (the average wall thickness measurements within a measurement diameter around the flaw of 2in) must be greater than or equal to 0.046in.

Taking the average of data points A, B, E, F, I, J, K, L and including the pinhole yields an average of 0.156in. See Attachment 2 for UT data points.

$t_{cavg} := 0.156in$

t_cavg is greater than t_c, therefore Equation 9 is satisfied.

QSP-516
ATTACHMENT I
PAGE 1 OF 1
REVISION 8

ULTRASONIC THICKNESS DETERMINATION REPORT

SITE: VCS unit 1 WORK REQUEST #: 1814690-001 DATE: 8/13/18

SYSTEM: SW DRAWING/ISO #: n/a LOCATION: DB-427

CODE/CLASS: 3 SURFACE CONDITION: Cleaned AREA OF INTEREST: Pinhole

PIPE SIZE: 8" NOMINAL THICKNESS: n/a JOINT DESIGN: Fitting

BASE METAL SPECS: Carbon Steel MINIMUM ALLOWABLE THICKNESS: n/a

INSTRUMENT MODEL #: 38 DL Plus SERIAL #: 120492708 COUPLANT BATCH #: 15D018

CALIBRATION STANDARD #: UT-101 TRANSDUCER: S/N 621056

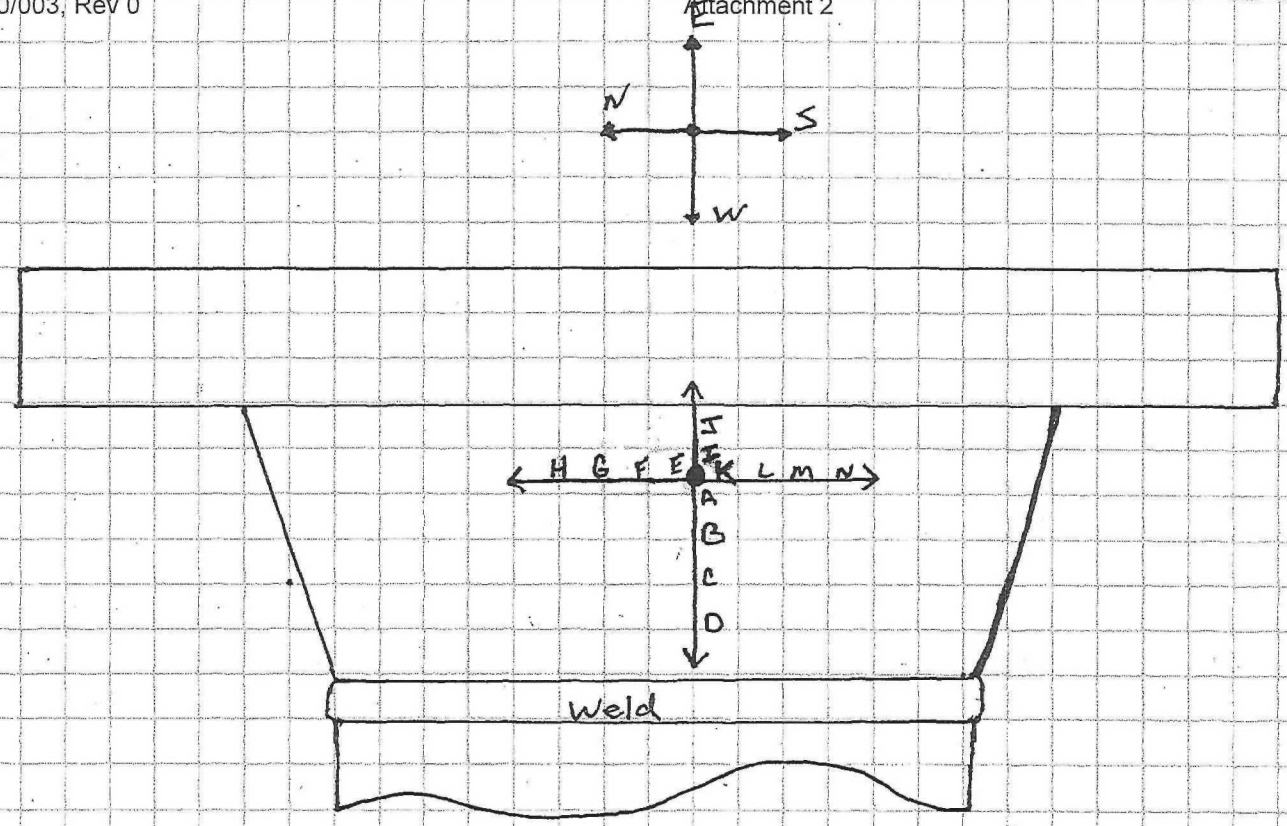
LOCATION NUMBER	ACTUAL THICKNESS	SKETCH
		See attached drawing.

Per the provided acceptance criteria, this test is: SAT ☐ UNSAT ☐ INFO ONLY ☑

REMARKS: Best effort exam.

Inspector: [signature] Level: II Date: 8/13/18

Inspector: Level: Date:



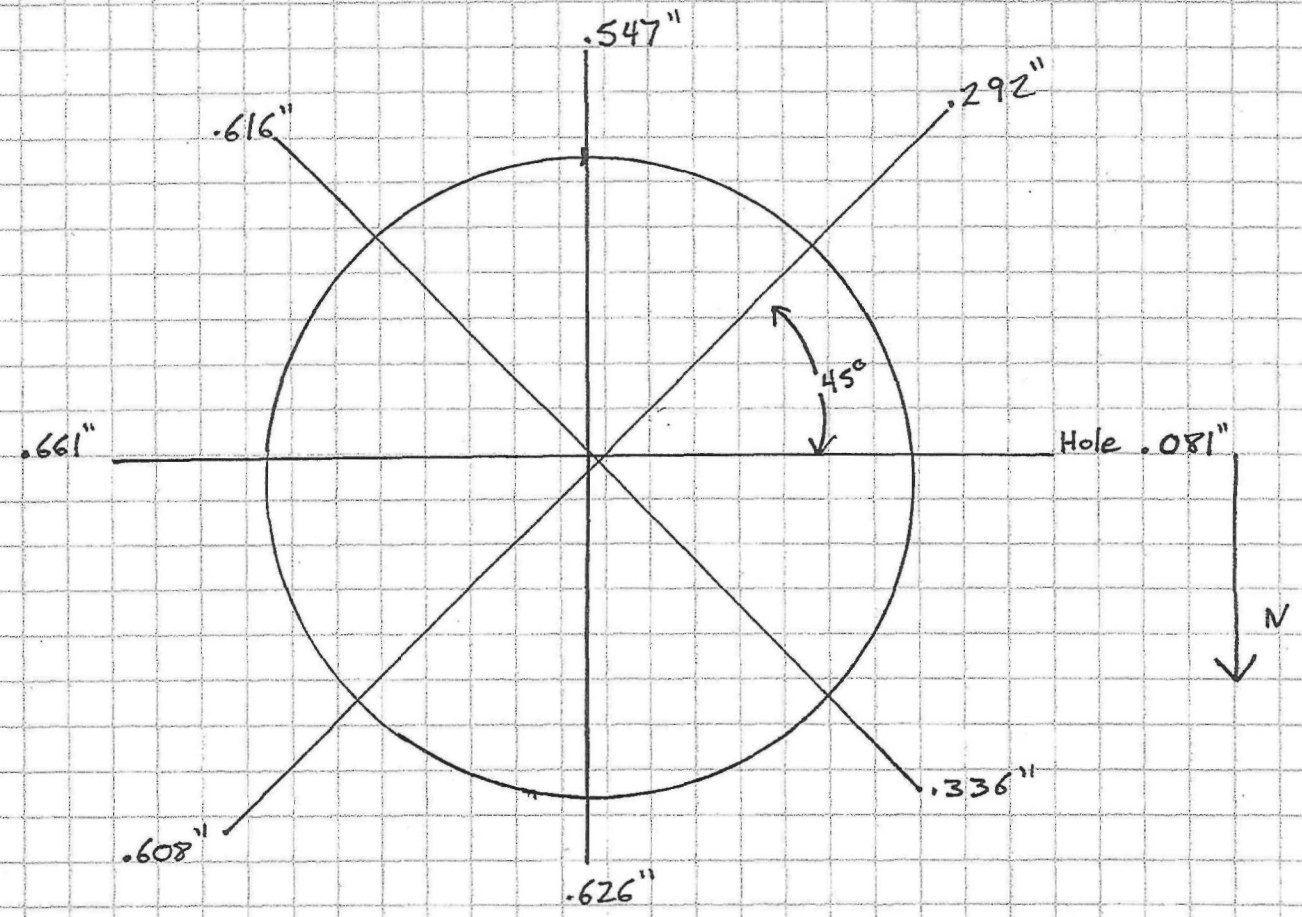
Letter Spacing = .5"

A. .101
B. .345
C. .266
D. .416
E. .081
F. .124
G. .385
H. .364
I. .083
* J. .324
K. .052
L. .290
M. .318
N. .291

Area out side of the cross pattern was also scanned to make sure the flaw was not growing in the diagonals.

Pin hole leak is 2" from weld and .75" from flang.

* Letter "J" data is on the 0.5" spacing.



Scaned full circumference and documented data every 45 degrees.

VERIFICATION RECORD: CALCULATION

Calculation # SW050/03 Revision 0

The following questions, as a minimum should be answered for calculation verification.

Yes	N/A	
☒	☐	Have inputs, including codes, standards, regulations, requirements, procedures, data and engineering methodology been correctly selected and applied?
☒	☐	Has the calculation been developed in accordance with applicable station procedures (e.g., ES-0412).
☒	☐	Is the plant design basis/criteria maintained?
☐	☒	Have assumptions been identified, especially those requiring later confirmation?
☒	☐	Have references been properly identified and complete?
☒	☐	Have the calculation, results, tables and figures been reviewed with regard to numerical accuracy, units and consistency?
☒	☐	Has the calculation been developed/revised in a clear and understandable manner as to not require recourse to the originator?
☒	☐	Is the output reasonable compared to the input?
☒	☐	Do the diagrams or models depicted represent the physical situation correctly and incorporate necessary features for a correct analysis?
☒	☐	Has the calculation cover page been completed in an accurate manner?
☒	☐	Are the sign conventions used in figures and equations consistent?
☒	☐	Is consistent nomenclature used throughout the calculation (e.g., figures, tables)?
☒	☐	Are symbols used on figures and in the text defined?
☐	☒	Are concurrent in-process revisions been addressed and coordinated with this revision?
☐	☒	Has the Calculation Index been updated? Calculation has been reserved and will be updated accordingly.
☐	☒	Additional considerations (see attached TWR)?

BJS
8/13/18

VERIFICATION RECORD: CALCULATION

Calculation # SW050/03 Revision 0

CALCULATIONS UTILIZING COMPUTER PROGRAMS:

Yes	N/A	
☒	☐	Has the program been appropriately defined, including the version?
☒	☐	Is the basic methodology used by the program appropriate for the calculation?
☒	☐	Has the appropriate computer program been used?
☒	☐	Has the calculation been performed within the known limits of the program?
☒	☐	Has the computer program been verified and validated in accordance with VCS-SAP-1040? A
☒	☐	Has the program been defined, controlled, and benchmarked so that the results reported are traceable to a particular version of the program and a particular set of input data?
☒	☐	Have limits for the program been defined, as appropriate?
☒	☐	Comments have been included and resolved.
☒	☐	Is the Validation Data set for the application complete, and provide repeatable results?

Bryan Starbuck — Verifier's Printed Name

Verifier's Signature

8/13/18 — Date