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U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

Subject: Duke Energy Corporation
Catawba Nuclear Station, Unit 1
Docket Number 50-413
Request for Relief Number 02-003
Alignment Requirements When Component Inside Surfaces Are Inaccessible

Pursuant to 10 CFR 50.4 and 10 CFR 50.55a(g)(5)(iii), Catawba Nuclear Station requests a one-time relief from ASME Section XI IWA-7200 which references ASME Section III ND-4233. As detailed in the attachment, Catawba is requesting approval to accept a pipe weld joint with a 5/32 inch mismatch around the top of the pipe. The ASME Section III ND-4233 maximum allowed mismatch is 3/32 inches.

An engineering evaluation of the existing condition was performed and concluded that the current configuration is structurally acceptable and the system will perform its design basis function.

Catawba is requesting that NRC review and approve the attached Request for Relief No. 02-003 at your earliest available opportunity.

There are no regulatory commitments contained in this letter or its attachment.

If you have any questions concerning this subject, please call G. K. Strickland at (803) 831-3585.

Very truly yours,

Gary R. Peterson

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Attachment

xc (with attachment):

L.A. Reyes, Regional Administrator
U.S. Nuclear Regulatory Commission, Region II
Atlanta Federal Center
61 Forsyth St., SW, Suite 23T85
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D.J. Roberts, Senior Resident Inspector
U.S. Nuclear Regulatory Commission
Catawba Nuclear Station

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Catawba Nuclear Station
Request for Relief No. 02-003

Request for Relief No. 02-003

Unit: 1

Component: Nuclear Service Water Piping (RN System) weld joint 1RN182-33

ASME Code Classification: 3

Code Requirements

The applicable inservice inspection code for Catawba Nuclear Station is ASME XI, 1989 Edition. The general requirements for replacement activities are specified by Article IWA-7000. Subarticle IWA-7200 states:

> Any items to be used for replacement shall meet the following requirements unless the alternative of (c) below is adopted:
> (1) the applicable Construction Code to which the original item was constructed and
> (2) the existing design requirements

The applicable construction code for Catawba Nuclear Station is ASME III, 1974 Edition including the 1974 Summer Addenda. Subsubarticle ND 4230 includes the rules for fitting and aligning. In paragraph ND-4233, *Alignment Requirements When Component Inside Surfaces Are Inaccessible*, the Code specifies:

> When the inside surfaces of components are inaccessible for welding or fairing in accordance with ND-4232.1, the inside diameters shall match each other within 1/16 in. When the components are aligned concentrically, a uniform mismatch of 1/32 in. all around the joint can result as shown in Fig. ND-4233-1 sketch (a). However, other variables not associated with the diameter of the component often result in alignments that are offset rather than concentric. In these cases, the maximum misalignment at any one point around the joint shall not exceed 3/32 in., as shown in Fig ND-4233-1 sketch (b). Should component tolerances on diameter, wall thickness and out of roundness result in inside diameter variations which do not meet these limits, the inside diameters shall be counterbored, sized or ground to produce a bore within these limits.

Background

During March, 2002, a modification to change out piping from the RN supply to the Control Room Area (YC) Chiller, fitup requirements of a welded joint from the original construction code were not satisfied. This butt welded joint joins two horizontal sections of 24" standard wall pipe. The pipe on one side of the joint was new, the other side – existing. The weld is located on a supply header, approximately 26.5" from the 8" branch line which supplies cooling water to the A train, Control Room Area Chiller Condensers. The piping material is carbon steel (SA106 Grade B). The design pressure of the system is 150 psig and the design temperature is 150°F.

The circumferential butt weld joint 1RN182-33 was installed with a 5/32" mismatch that extended for about 18" around the top of the piping. (See Figure 1.) The internal joint surfaces at the bottom of the piping were flush, ie no observable mismatch. The root pass was made using the GTAW process, the fill passes made using a SMAW process. A slight buildup on the outside surface was faired into the adjacent base metal using a 3:1 taper. Visual and surface examinations were performed on both the root pass and

final pass. This is a Duke Class C, ASME Class 3 weld and is required to meet the requirements of ASME Section III, Subsection ND. In accordance with ND-4233, the maximum allowed mismatch at any one point around the circumference of the welded joint is 3/32".

Therefore, in accordance with 10CFR50.55a(g)(5)(iii), Duke Energy Corporation requests relief from the requirements of subparagraph IWA-7200 of the ASME Code Section XI, for the replacement of piping associated with weld joint 1RN182-33 in the Nuclear Service Water System.

The piping joint is located in the Unit 1, A train, RN essential header supplying the Control Room Area Chiller Condensers. The function of the supply is to remove heat in the YC Chiller condenser section. In turn, the YC system supports the cooling operation of the Control Room Area Ventilation (VC) System. A general description for the RN, YC and VC systems is provided below.

In the Nuclear Service Water System (RN), each unit has two trains of essential components (those necessary to shut down a reactor and maintain it in a shutdown condition).and one train of nonessential components. Each RN essential header provides flow to a redundant set of safety related components and systems. (Control Room Area Chiller Condensers A and B are shared between units, so they are fed by Unit 1 essential headers only).

The Control Room Area Chilled Water (YC) System has two redundant trains (A and B). Each train consists of a compression tank to provide water surge (from thermal expansion and contraction of the water inventory) protection, a chilled water pump, a centrifugal water chiller, piping, valves, and controls. Each water chiller has its own refrigeration system. The YC water exchanges heat to the refrigerant in the machines evaporator section and is cooled to the desired temperature. The refrigerant exchanges heat in the machines condenser section to the condenser water. Condenser water is provided by the Nuclear Service Water System (RN).

The Control Room Area Ventilation (VC) System has two redundant trains (A and B). Each train consists of four subsystems. The control room subsystem maintains the control room temperature and working in conjunction with the control room area pressurization and filtration subsystem provides a habitable environment for the control room. The control room area subsystem provides heating and cooling for the electrical penetration rooms, battery rooms, cable rooms, motor control center rooms and mechanical equipment rooms. The switchgear rooms subsystem provides heating and cooling for the four essential switchgear rooms.

Proposed Action:

An engineering evaluation of the existing condition was performed and has demonstrated that the current configuration is structurally acceptable. No changes to the existing joint configuration will be pursued.

Basis for the Proposed Action:

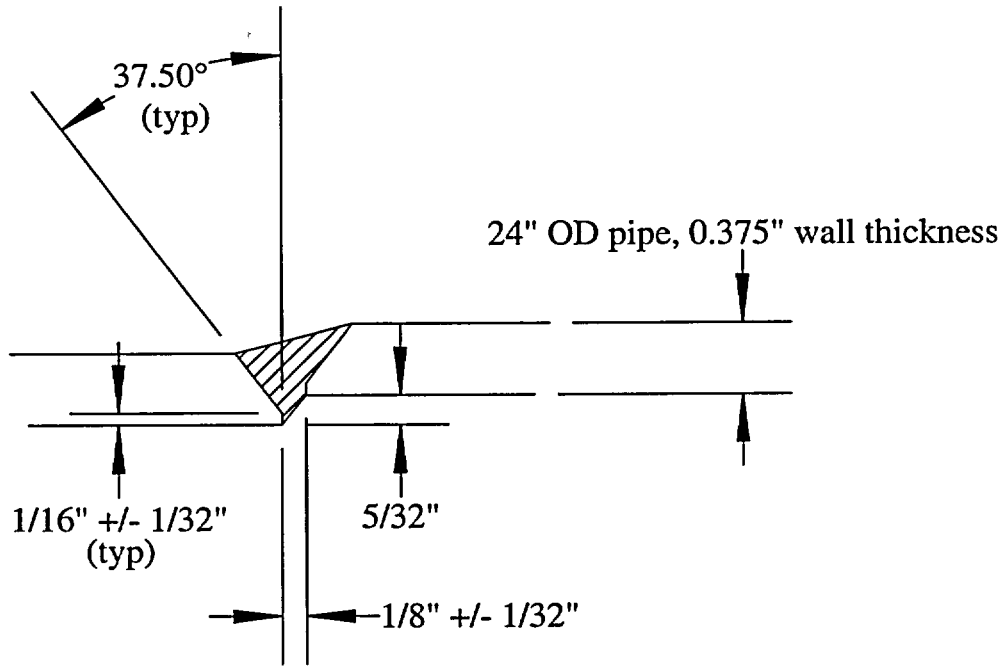
Nominal stresses are low at this location primarily due to low deadweight, pressure, thermal and other design loadings. (See Table 1.) Vibrational stresses from normal operation are also low. Changes in stress concentration and stress intensification factors for the mismatch are not significant considering the margin between existing design and allowable stresses. An engineering evaluation has concluded that considering a penalty for the stress raiser (in terms of increased stress indices and an increased stress intensification factor) created by the mismatch, all ASME III, ND 3600 design requirements remain satisfied.

Consideration of repair was performed but rejected since the residual stresses from a forced fitup may counteract reduction in stresses from an elimination of stress concentration effects. Temporary welded attachments are typically used to force the circumferential shape necessary to achieve fitup. Residual stresses are developed in the joint after completion of the weld as the load is removed from these

attachments. In this particular case, these residual stresses may be more detrimental than the stress concentration effects from the mismatch.

The evaluation of the existing configuration has also considered erosion / corrosion effects. The RN system at Catawba has been susceptible to wall thinning and pitting. An established plant program for corrosion monitors wall thinning of piping components to ensure the structural integrity of the piping. Sample locations within the system are ultrasonically examined for wall thickness measurements. Each location consists of a grid where values are determined. Wall thickness values are then extrapolated to other parts of the system based on geometrical similarities and projected corrosion rates. Projected wall thicknesses have been and will continue to be considered in the evaluation of the joint mismatch.

Flow accelerated corrosion (FAC) at the localized region of mismatch is also not a concern since the RN design temperature is 150°F and FAC is not typically a significant concern at temperatures below 200°F. In addition, the flow velocity on the 24 inch RN header under normal operating conditions is less than 4 ft/sec. Low velocities and low water temperature preclude the piping from any detrimental effects of FAC.



Weld 1RN182-33

(maximum mismatch at top of pipe over 18" arc length)

Figure 1

Table 1

Tabulation of Existing Stresses at Weld 1RN182-33 Location (based on stress intensification factor = 1.0)		
ASME III, ND 3600 Equation	Existing Stress (psi)	Allowable Stress (psi)
8	2660	15000
9	2795	18000
9E / 9F	2914	27000
10	1117	22500