CATEGORY 1

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50-270 Oconee Nuclear Station, Unit 2, Duke Power Co. 05000270
50-287 Oconee Nuclear Station, Unit 3, Duke Power Co. 05000287
50-369 William B. McGuire Nuclear Station, Unit 1, Duke Powe 05000369
50-370 William B. McGuire Nuclear Station, Unit 2, Duke Powe 05000370
50-413 Catawba Nuclear Station, Unit 1, Duke Power Co. 05000413
50-414 Catawba Nuclear Station, Unit 2, Duke Power Co. 05000414
AUTH.NAME AUTHOR AFFILIATION
TUCKMAN,M.S. Duke Power Co.
RECIP.NAME RECIPIENT AFFILIATION
Records Management Branch (Document Control Desk)

SUBJECT: Requests relief from requirements of ASME B&PV Code for Oconee,McGuire & Catawba Nuclear Stations.Relief is requested from ultrasonic exam requirements of Section XI, 1989 Edition,App III,Suppl 4(b)(1) III-4410 Beam Angle.

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CATEGORY 1 DOCUMENT

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September 29, 1998

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

ATTENTION: Document Control Desk

SUBJECT: Duke Energy Corporation

Oconee Nuclear Station - Units 1, 2, & 3
Docket Nos. 50-269, 50-270, and 50-287

McGuire Nuclear Station - Units 1 & 2
Docket Nos. 50-369 and 50-370

Catawba Nuclear Station - Units 1 & 2
Docket Nos. 50-413 and 50-414

Request for Relief from the Requirements of the ASME Boiler and Pressure Vessel Code, Section XI .
Duke Energy Corporation Serial Number 98-GO-0005

Pursuant to 10 CFR 50.55a(a)(3)(ii), Duke Energy Corporation requests relief from the requirements of the ASME Boiler and Pressure Vessel Code, for Oconee Units 1, 2 and 3; McGuire Units 1 and 2; and Catawba Units 1 and 2. Relief is requested from the ultrasonic examination requirements of Section XI, 1989 Edition, Appendix III, Supplement 4(b)(1) III-4410 Beam Angle.

A detailed description and justification for Request for Relief 98-GO-0005 is included as the attachment to this letter. Duke Energy Corporation requests timely NRC review and approval of this request. Questions regarding this matter should be directed to J. S. Warren at (704) 382-4986.

Very truly yours,

M. S. Tuckman

M. S. Tuckman

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MST/JSW

Attachment

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S. M. Shaeffer, NRC Senior Resident Inspector (MNS)
D. J. Roberts, NRC Senior Resident Inspector (CNS)

DUKE ENERGY CORPORATION
Oconee Units 1, 2 and 3
McGuire Units 1 and 2
Catawba Units 1 and 2

10-YEAR INTERVAL REQUEST FOR RELIEF NO. 98-GO-0005

Pursuant to 10CFR50.55a (a) (3) (ii), Duke Energy Corporation has determined that compliance with the specified code requirements results in hardship or unusual difficulty and conformance with the examination requirements of ASME Section XI is not practical. This requirement would present hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly information is being submitted in support of our determination and a relief is being sought from the applicable ASME Section XI requirements.

I. **System/Components for Which Relief is Requested:** All Category B-F Pressure Retaining Dissimilar Metal Welds.

Item Numbers:
B5.10
B5.40
B5.70
B5.100
B5.130

Category B-J Pressure Retaining Welds in Piping. (All austenitic stainless steel welds with single sided access).

Item Numbers:
B9.11
B9.31

Category C-F-1 Pressure Retaining Welds in Austenitic Stainless Steel or High Alloy Piping. (All welds with single sided access).

Item Numbers:
C5.11
C5.21

II. **Code Requirement:** ASME Section XI, 1989 Edition, Appendix III, Supplement 4 (b) (1) III-4410 Beam Angle - The actual beam angle in the examination part shall be 40 deg. or greater for shear wave at the I.D. surface, and 35 deg. or greater for refracted longitudinal wave at the I.D. surface. The beam angle in the examination part shall be determined for each pipe size, schedule, and material to be examined for each plant. The beam angle measurements shall be used to assure coverage of the required examination volume by extending the calibration and examination distance as required.

III. **Code Requirement from Which Relief is Requested:** Relief is requested from the requirement to measure the actual beam angle in the examination part when refracted longitudinal waves are used to examine dissimilar metal welds and similar metal austenitic stainless steel welds having single sided access.

IV. **Basis For Relief:** The ultrasonic examination of dissimilar metal welds and similar metal austenitic welds with single sided access requires the use of dual element, refracted longitudinal wave search units. These search units provide superior penetration and improved signal to noise ratio over shear wave search units. The enhanced signal to noise ratio is due to a quasi-focusing effect at the beam intersection as shown in Figure 1. There are, however, three qualifying factors in using these search units:

- They have a limited range of sensitivity which is as a rule 1/2 to 2 times the focal distance. For piping examination, the designed focal distance is usually 3/4t, where "t" is the nominal pipe thickness.

- The beam angle varies with the sound path distance. See Figure 2 as an example.

- The mode conversion which occurs when a longitudinal wave strikes the inside surface of a component at any angle other than a right angle to the surface. As shown in Figure 3, part of the longitudinal wave energy mode converts into a shear wave at the inside surface.

Beam angle measurements in the examination part are conducted as shown in Figure 4. This technique requires reflecting the sound beam off the inside surface and is the only practical technique by which an ultrasonic beam angle can be measured in piping installed in a nuclear power plant. It can be used with shear wave angles greater than 33.5 deg., but is impractical when using dual element, refracted longitudinal wave search units. Because of the focusing effect, mode conversion and beam angle variation, the beam angle cannot be measured using the reflected sound energy.

V. **Alternative Method for Measuring Beam Angle:** Duke Energy ultrasonic procedures NDE-600 and NDE-610 will be revised to require measurement of the beam angle using a reference block of similar chemical analysis, metallurgical structure and tensile properties as the material on the side of the weld joint from which the examination will be performed.

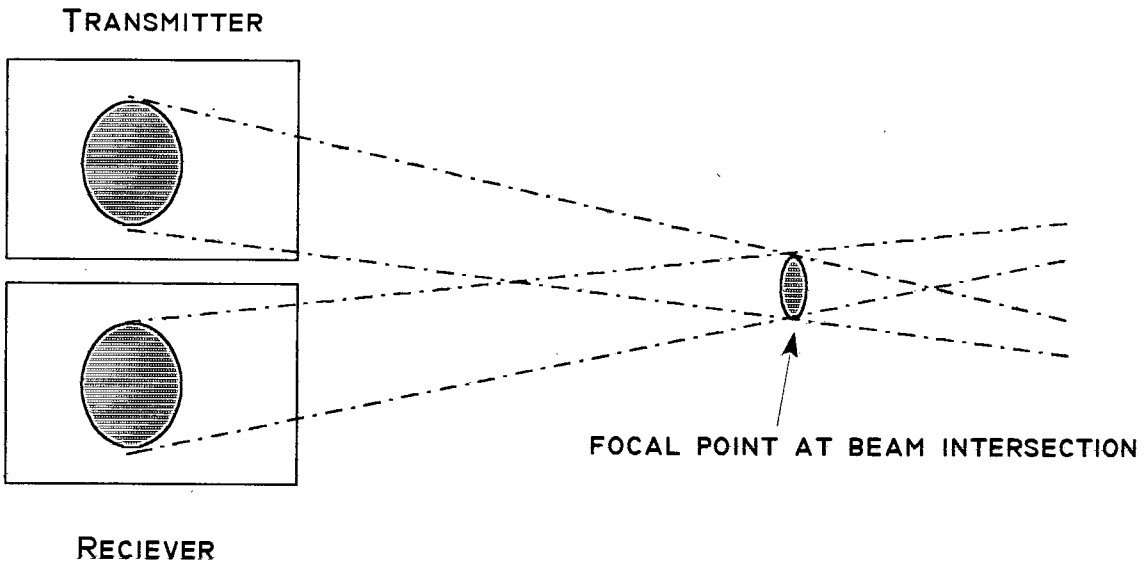
The reference block will contain 1/8 inch (3mm) diameter side drilled holes covering as a minimum the sound path range from 1/2 to 2 times the focal distance as shown in Figure 5. The beam angle deviation along the sound path shall be plotted on a chart as shown in Figure 2. The beam angle at a sound path distance equal to the pipe inside surface shall be 35 deg. or greater.

VI. **Justification for the Granting of Relief:** The use of refracted longitudinal wave transducers provides superior penetration and improved signal to noise ratio when examining dissimilar metal welds and similar metal welds having single sided access. The proposed alternative is the only practical method of measuring the beam angle of refracted longitudinal wave transducers.

VII. **Implementation:** The revised procedures will be used for the remainder of the 10 year interval at Oconee Units 1, 2 and 3; McGuire Units 1 and 2; Catawba Units 1 and 2.

Evaluated By James J. Mc Gullen Date 9/2/98

Reviewed By R. Kevin Rhyne Date 9/2/98

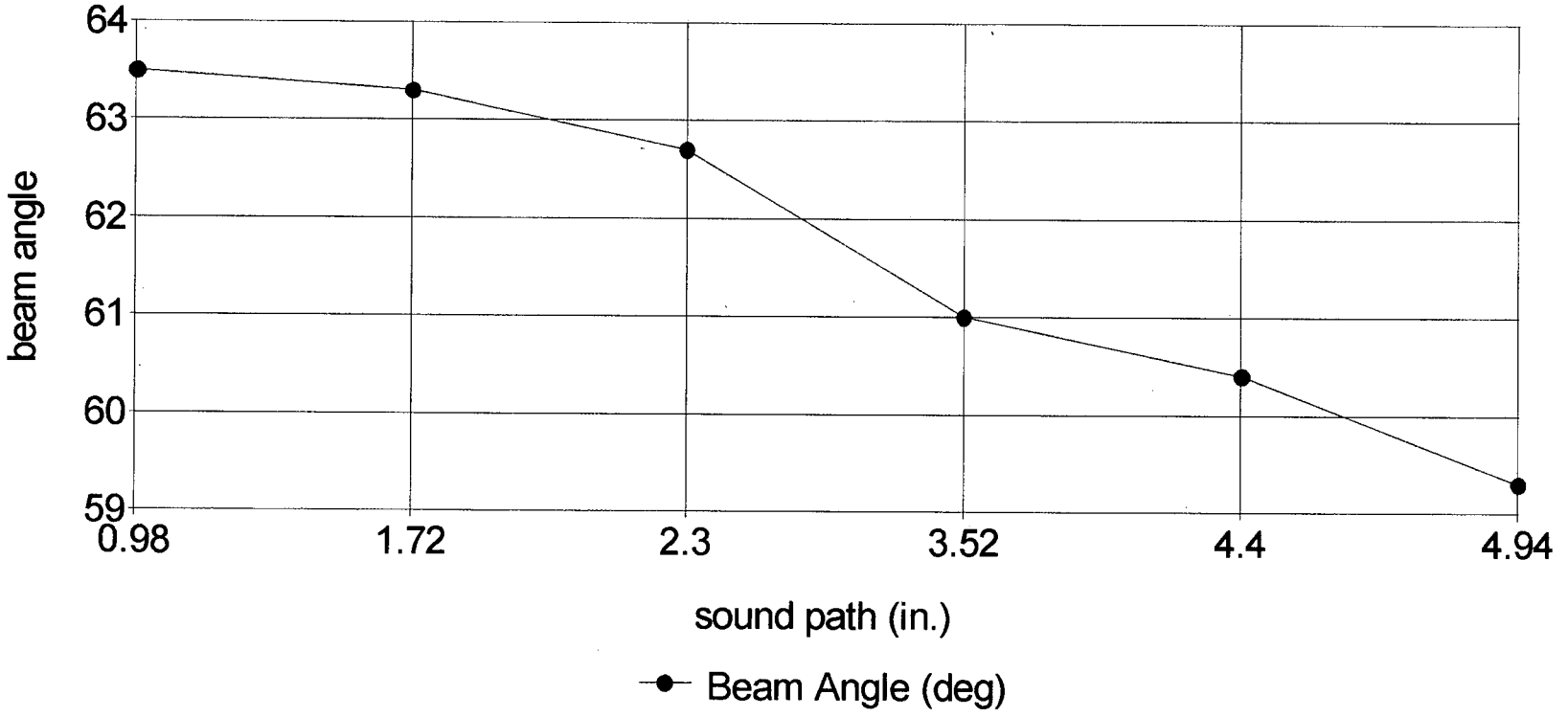


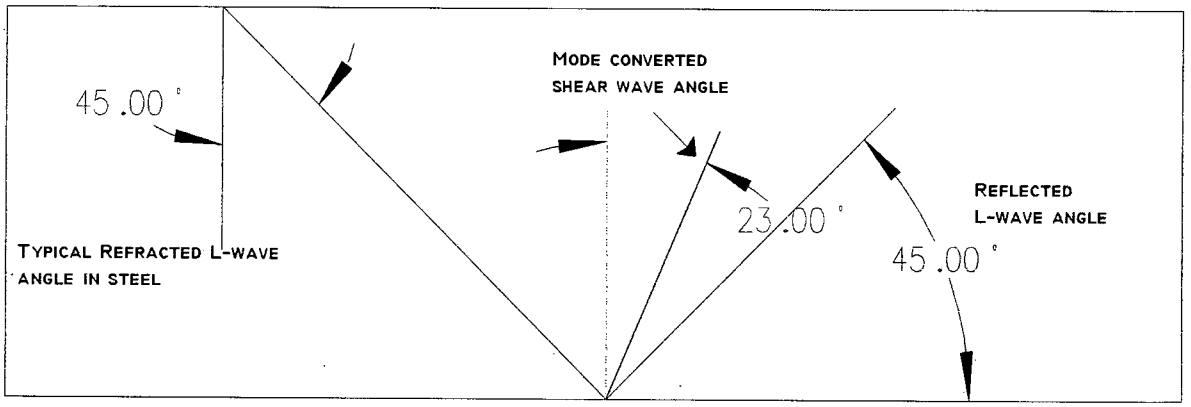
TYPICAL RL SEARCH UNIT CONSTRUCTION
SIMPLIFIED VIEW

FIGURE 1

Angle vs Sound Path for 60° RL Probe

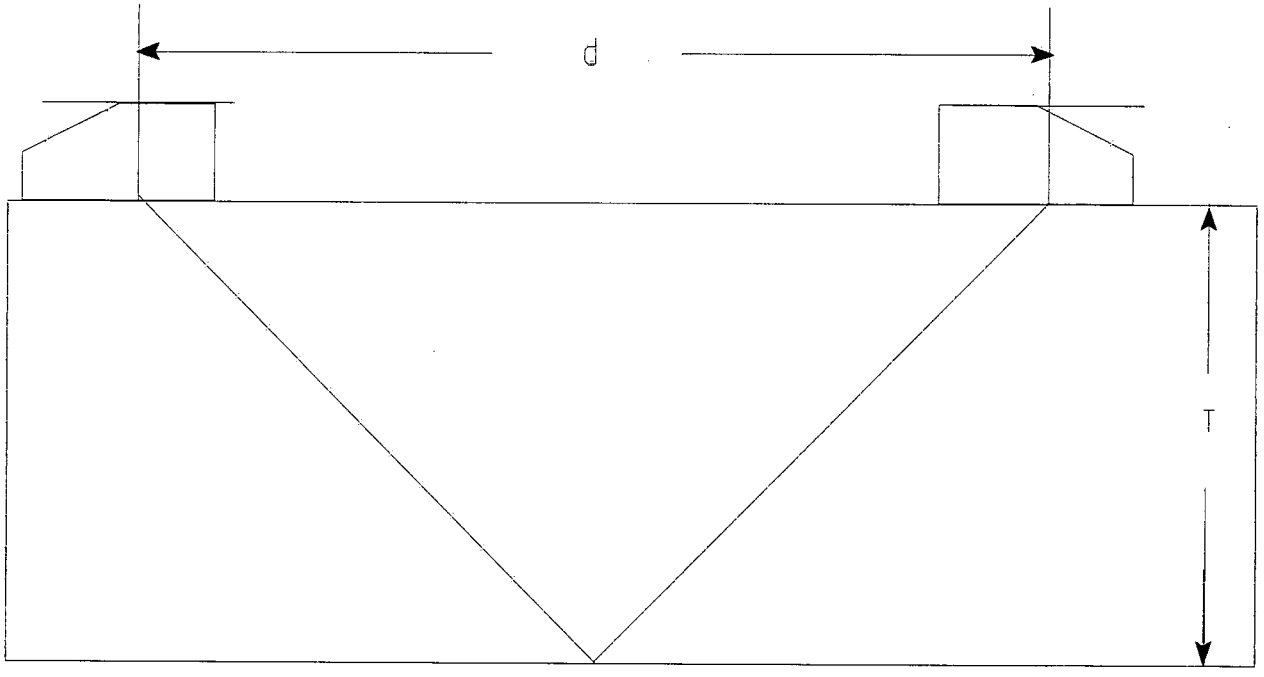
Figure 2





LONGITUDINAL-TO-SHEAR WAVE MODE CONVERSION

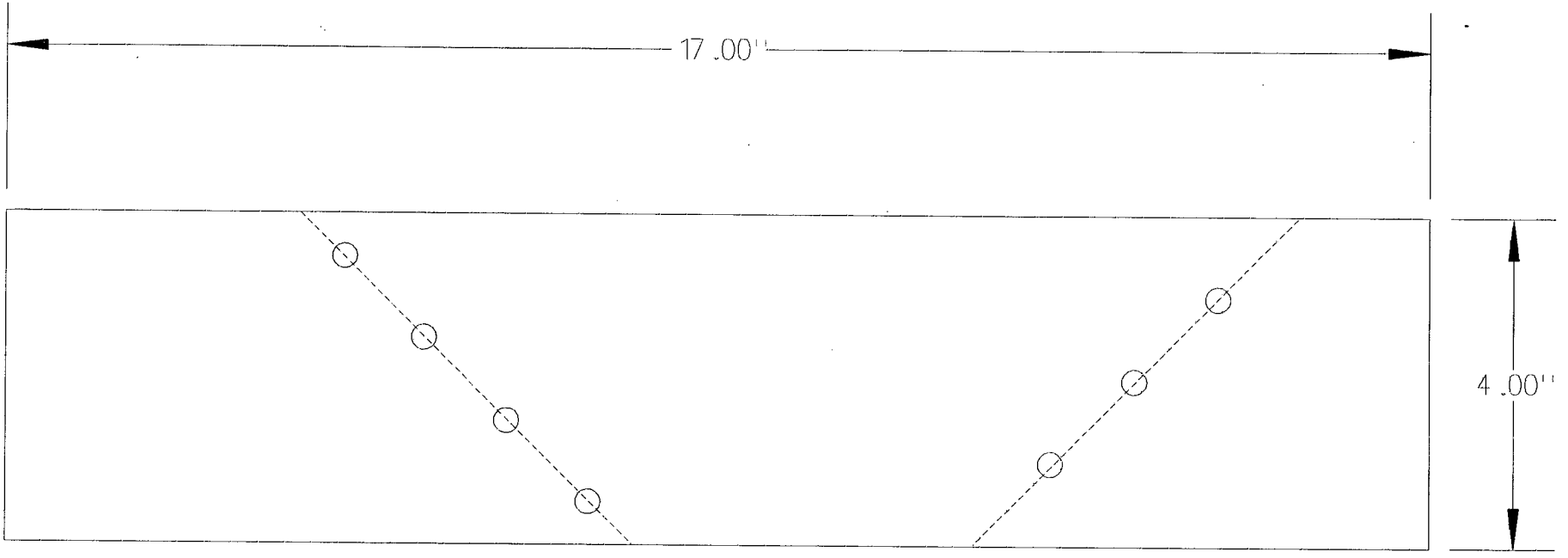
FIGURE 3



BEAM ANGLE MEASUREMENT METHOD

TWO SEARCH UNITS ARE USED IN A PITCH-CATCH MODE.
THE RECEIVER SEARCH UNIT IS MANIPULATED TO OBTAIN A PEAK AMPLITUDE SIGNAL.
THE DISTANCE BETWEEN THE SEARCH UNIT INDEX POINTS IS MEASURED AND KNOWING THE THICKNESS OF THE PIPE, THE BEAM ANGLE CAN BE DETERMINED.

FIGURE 4



TYPICAL REFERENCE BLOCK LAYOUT FOR MEASURING RL PROBE ANGLE

FIGURE 5