VERMONT YANKEE
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REPLY TO:
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TELEPHONE 617-872-8100

May 15, 1984
FVY 84-45

United States Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Office of Nuclear Reactor Regulation
Mr. Domenic B. Vassallo, Chief
Operating Reactors Branch No. 2
Division of Licensing

References: (a) License No. DPR-28 (Docket No. 50-271)
(b) Letter, VYNPC to USNRC, FVY 84-22, dated March 13, 1984
(c) Letter, VYNPC to USNRC, FVY 84-27, dated March 23, 1984

Subject: Vermont Yankee Recirculation and RHR System Weld Joint Inspection Program for the 1984 Refueling Outage

Dear Sir:

By Reference (b), we provided you with our program for inspection of the Recirculation and other Reactor Coolant Boundary Piping Systems during our 1984 refueling outage. This program also includes our justification for the adequacy of weld overlays applied during the 1983 refueling outage for a second cycle of operation.

During a recent telephone discussion with Mr. V. Rooney of your staff, he requested additional information regarding the structural adequacy of our weld overlays. This information is provided in Enclosure 1.

We trust that this information will enable you to conclude that a second cycle of operation with weld overlays is justified; however, should you have any questions, please contact us.

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION

JB Sinclair

J. B. Sinclair
Licensing Engineer

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ENCLOSURE 1

Vermont Yankee Additional Information

Regarding Weld Joint Overlays

PURPOSE: Demonstrate structural integrity of weld overlays applied at the 1983 refueling outage

CRITERIA: ASME Section XI, 1983 Edition/w 1983 Addenda Table IWB-3641-1

METHOD: To verify weld overlay thickness sizing, apply the following steps:

a. Establish $\frac{Pm + Pb}{Sm}$ ratio for actual pipewall thickness.

b. Reduce the $\frac{Pm + Pb}{Sm}$ ratio proportional to the increase in wall thickness t due to the addition of actual weld overlay thickness Δt.

c. Recalculate allowable a/t corresponding to the adjusted Pm + Pb due to weld overlay considering a 360° crack.

d. Compare c. to crack depth assuming through wall crack of actual pipe wall thickness.

RESULTS:

I. Sweepolet to Riser Welds-

A. Weld with maximum pressure + deadweight + seismic (OBE) stress is 45 (GE Report 22A2615, VY Recirculation Design Report)

Pm + Pb = 16.7 KSI based on 0.53 wall thickness

Actual wall from UT measurement = 0.66 = a
(From weld overlay data sheets.)

$\therefore$ Pm + Pb = $16.7 \frac{(.53)}{(.66)} = 13.4$ KSI

and $\frac{Pm + Pb}{Sm} = \frac{13.4}{16.9} = 0.79$

Weld overlay thickness = 0.44 in. (weld overlay data sheets)

Repaired thickness = t_r = a + t = .66 + .44 = 1.10 in.

$a/t_r = \frac{.66}{1.10} = 0.6$

Reduce the stress ratio by the proportion of increased wall thickness in the repaired pipe.

$$(0.79)(0.6) = 0.474 = \frac{Pm + Pb}{Sm}$$

For this ratio (a/t) allowable from Table IWB-3641 exceeds 0.63.

Therefore, $\therefore a/t_r = 0.6 <$ (a/t) allowable

B. Verify integrity of second most highly stressed weld by the same procedure (sweep to riser).

Weld 30 Pm + Pb = 13.4 KSI (based on t = 0.53)

Actual wall = 0.67 in.

$$\therefore Pm + Pb = 13.4 \frac{(.53)}{(.67)} = 10.6 \text{ KSI}$$

$$\frac{Pm + Pb}{Sm} = \frac{10.6}{16.9} = 0.63$$

Overlay thickness = 0.44

Repaired thickness = 1.11 in.

$$a/t_r = \frac{0.67}{1.11} = 0.60$$

Reduce stress ratio

$$(0.63)(0.6) = 0.38 = \frac{Pm + Pb}{Sm}$$

Allowable a/t $>$ 0.63

(a/t) allowable 0.63 $>$ $a/t_r = 0.6$

C. The maximum stress in the remainder of the sweepolet to riser welds is 11.9 KSI. Conservatively evaluate the joint with the thinnest overlay to this applied stress:

Weld 42 Pm + Pb = 11.9 KSI

Actual Wall = 0.64 in. = a

$$\therefore Pm + Pb = 11.9 \frac{(.53)}{(.64)} = 9.8 \text{ KSI}$$

$$\frac{Pm + Pb}{Sm} = \frac{9.8}{16.9} = 0.58$$

Overlay thickness = 0.33

Repaired thickness = 0.64 + 0.33 = 0.97

$$a/t_r = \frac{.64}{.97} = 0.66$$

Reduce stress ratio

$$\left[\frac{Pm + Pb}{Sm}\right]_{Final} = (0.66)(0.58) = 0.38$$

Allowable (a/t) = 0.73 (Figure 1)

$a/t_r = 0.66 < a/t_{allowable} = 0.73$

II. Elbow Overlays - Apply maximum stress to joint with thinnest overlay*.
ISI weld joint 18 has maximum stress: 9.1 KSI
ISI weld joint 29 has thinnest overlay.

Weld 18, 29 Pm + Pb = 9.1 KSI (Including elbow stress intensification which is not applicable at weld.)

Actual wall = 0.63 in. = a

$$\frac{Pm + Pb}{Sm} = \frac{9.1}{16.9} = 0.53$$

Overlay thickness = 0.23 in.

Repaired thickness = 0.23 + 0.63 = 0.86

$$a/t_r = \frac{.63}{.86} = 0.73$$

Reduce stress ratio

$$\left[\frac{Pm + Pb}{Sm}\right]_{Final} = (0.73)(.53) = 0.39$$

Allowable (a/t) = 0.75 (Figure 1)

$\therefore a/t_r = 0.73 < (a/t)_{allowable} = 0.75$

* Joint 32 has a mini-overlay and is excluded from this calculation.

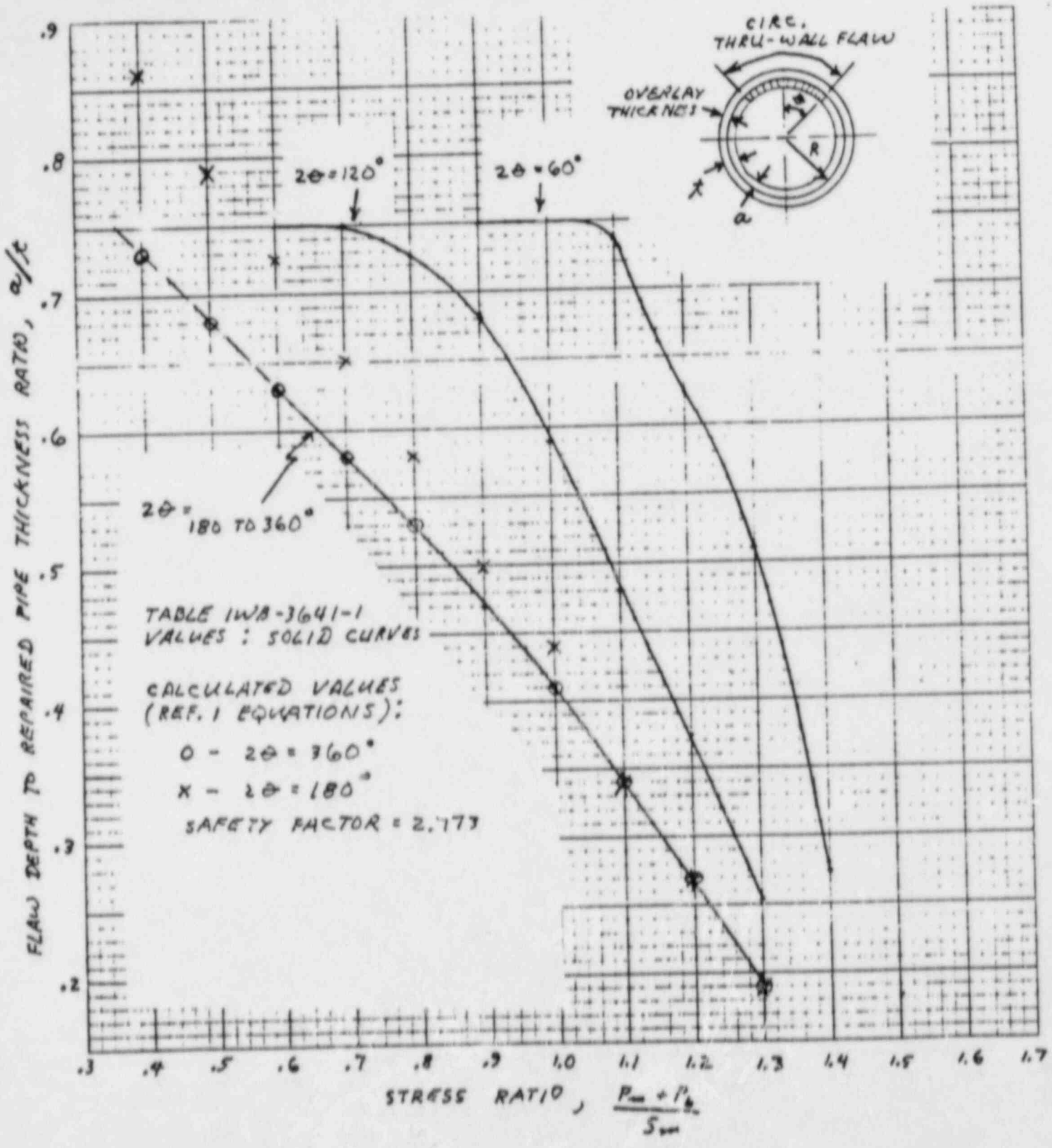

FIGURE 1. CIRCUMFFRENTIAL FLAW SIZE LIMITS VERSUS STRESS