ATTACHMENT 1

Relief Request ISI-3-21

Evaluation of the Acceptability of Embedded Flaw Repair of the Indication in Reactor Vessel Head Penetration No. 56 at SONGS Unit 3

LTR-PAFM-04-81 October 2004

Evaluation of the Acceptability of Embedded Flaw Repair of the Indication in Reactor Vessel Head Penetration No. 56 at SONGS Unit 3

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1.0 INTRODUCTION

Four indications have been discovered in the SONGS Unit 3 reactor vessel head penetration tubes. Consideration is being given to using the embedded flaw repair method for each indication. These indications are all located on the OD of the CEDM penetration tubes, in the vicinity of the J-groove weld as it intersects with the tube. All but one of these indications [1] fall within the repair guidelines approved by the NRC in an SER dated July 3, 2003, as documented in WCAP-15987-NP, Rev 2-NP-A [2].

The one indication which does not fall within the guidelines is in penetration 56, and has the following dimensions:

- Depth = 0.513 in.
- Length = 1.96 in.
- Thickness of tube = 0.661 in.

This indication has a depth to thickness ratio of 0.776, which slightly exceeds the limit used in the topical report of 0.750. This limit is used in Section XI to ensure protection against leakage, rather than a calculated limit. In this report, calculations have been completed to show that the ASME code margins can be maintained with much deeper flaws. This evaluation has been carried out to determine whether it is acceptable to use the embedded flaw repair technique on this indication.

1.1 ASME CODE ACCEPTANCE CRITERIA

The evaluation procedures and acceptance criteria for indications in austenitic piping are contained in paragraph IWB 3640 of ASME Section XI [3]. Although there are no specific guidelines presently in Section XI for repair of head penetrations, the approach of IWB 3640 will be using here.

The first step in the evaluation of the embedded flaw repair will be to determine the maximum allowable flaw which could remain in the head penetration, and which would meet the acceptance margins of Section XI. This flaw size was determined using plastic limit load methodology, as discussed in Appendix C of Section XI.

The applicability of the limit load expression of Section XI was investigated by the Working Group on Pipe Flaw Evaluation, by collection and study of all the pipe fracture experiments to date (about 3000). It was determined that the limit load expressions become progressively more conservative as the radius to thickness ratio of the pipe gets smaller. Conversely, for thin walled pipes, the expression can become non-conservative, so a limitation has been added to Section XI, Appendix C to limit the application of Appendix C to pipes with radius to thickness ratios less than 15. The radius to thickness ratio of the SONGS 3 CEDM tubes is about 2.6, so the expressions apply directly.

In paragraph IWB 3640 of the Code [3], the allowable flaw sizes are defined based on failure load safety margins. For both axial and circumferential flaws, these margins are 2.7 for service level A, 2.4 for service level B, 1.8 for service level C, and 1.3 for service level D. These margins are consistent with those used in the Topical Report [2], which has been approved. The failure loads, and consequently the allowable flaw sizes, are large for austenitic stainless steel base metal and the Alloy 600 material since they both have high fracture toughness.

The evaluation process of Section XI continues with a flaw growth analysis, including the requirements for fatigue and stress corrosion cracking. Since the embedded flaw repair will seal the indication from the environment, only fatigue crack growth is appropriate to consider. The methodology for the sub-critical crack growth analysis is described in detail in Section 3, and is unchanged from the previously approved analytical methodology.

1.2 GEOMETRY AND SOURCES OF DATA

The geometry of a typical reactor vessel head penetration is shown in Figure 1-1, along with a sectional schematic of the types of indications which were found. The head thickness for SONGS 3 is 7.625 inches. The head penetration geometries are shown in Table 1-1.

The fatigue crack growth evaluations to be discussed here are based on a detailed three dimensional elastic-plastic finite element analysis completed for the SONGS 2 and 3 head penetrations [4], as will be discussed further in the next section.

Table 1-1 Head Penetration Geometries

Location	CEDM Tube Thickness (inch)	CEDM Tube OD (inch)
CEDM	0.661	4.05

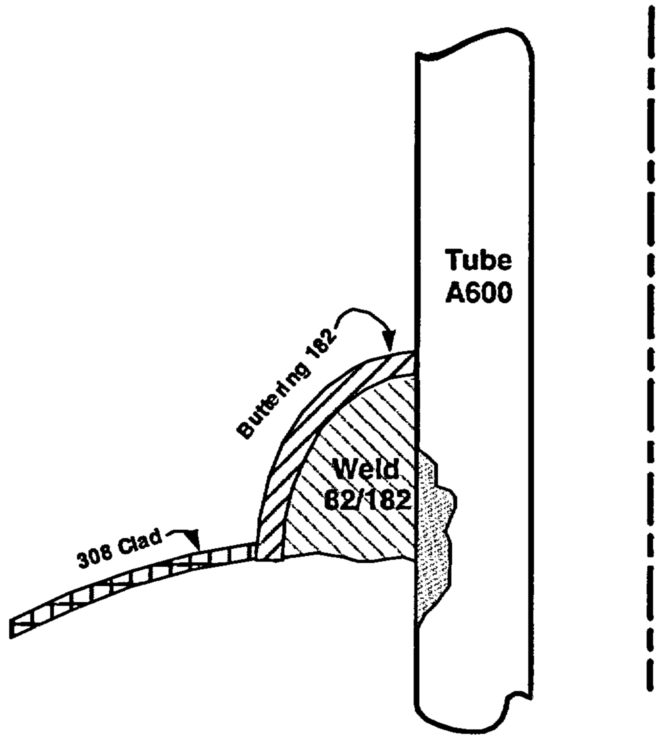

Figure 1-1 Typical Configuration of Head Penetration, Showing Indications

2. LOADING CONDITIONS AND STRESS ANALYSIS

2.1 TRANSIENT SELECTION

The requirement for an evaluation of a flaw using the rules of Section XI is that the governing transient for normal and upset conditions be chosen, as well as the governing emergency and faulted condition. As described in Section 1, this is necessary because two separate evaluations are required, utilizing different safety margins. This is to account for the lower probability of occurrence for emergency and faulted transients.

There are many head penetrations in a reactor vessel upper head, and so the highest stressed penetration was chosen for analysis. This is a conservative assumption, since penetration 56 is at an angle of 34.9 degrees, as compared to the outermost penetration, which is at 49.7 degrees.

The thermal transients that occur in the upper head region are relatively mild, because most of the water in the head region has already passed through the core region. The flow in the upper head region is low compared to other regions of the reactor vessel, which also helps to mute thermal transients.

The transients that occur in a typical Combustion Engineering plant are shown in Table 2-1. The detailed analysis was completed on only four transients, because those four were deemed to have the largest contribution to fatigue.

The governing mode of failure for the head penetrations is ductile limit load, so the secondary stresses (thermal and residual) have no impact. The governing transients for the allowable flaw size calculation will then be those with the highest pressure, and those are listed below:

- Level A and B : Reactor Trip
- Level C and D: Large Steam Break

2.2 STRESS RESULTS

The stresses in the closure head region were determined with three dimensional elastic-plastic finite element models, using isoparametric elements [4]. The finite element model and the sections chosen for analysis are shown in Figure 2-1.

The region of the head penetration that has the highest stresses is that nearest the attachment weld (cuts 3 and 6). Of these two locations, cut 3 has higher stresses, and therefore that location was chosen for the analysis. This is an inherent conservatism in the analysis, as will be discussed further below.

Table 2-1 Summary of Reactor Vessel Transients: Typical Combustion Engineering Plant		
Number	**Transient Identification**	**Number of Occurre nces**
	Normal Conditions	
1	**Heatup and cooldown at 100°F/hr**	500
2	**Load follow cycles (Unit loading and unloading at 5% of full power/min)**	15,000 (5000 used)
3	**Step load increase and decrease of 10% of full power**	10,000
4	Steady state fluctuations	3,000,000
	Upset Conditions	
5	Loss of load, without immediate turbine or reactor trip	40
6	Loss of flow (partial loss of flow, one pump only)	40
7	**Reactor trip**	400
	Test Conditions	
8	Primary side hydrostatic leak test conditions	200
9	Cold hydrostatic test @ 3105 psig	10
	Emergency Faulted Conditions	
10	Large loss of coolant accident (LOCA)	1
11	Large steam line break (LSB) (other transients described in Section 4)	1
12	Safe shutdown earthquake	1
13	Loss of secondary pressure (emergency)	5

Note: Transients 1, 2, 3 & 7 were used in the analysis.

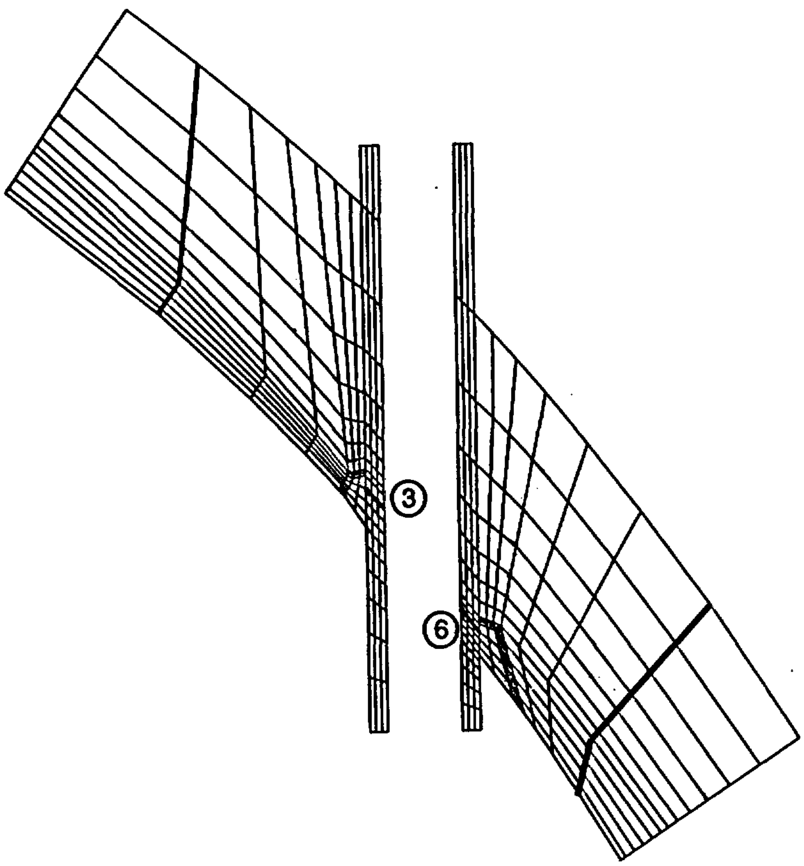

Figure 2-1 Finite Element Model, with Analytical Cross Sections Identified

3.0 FRACTURE ANALYSIS METHODS AND MATERIAL PROPERTIES

The fracture evaluation was carried out using the approach suggested by Section XI Appendix C [3], and is consistent with the approach used in the approved Topical Report [2].

3.1 STRESS INTENSITY FACTOR CALCULATIONS

One of the key elements of a fracture evaluation is the determination of the driving force or stress intensity factor (K_I). This was done using equations available in the literature. The stress profile was approximated by a cubic polynomial:

$$s(x) = A_0 + A_1 x + A_2 x^2 + A_3 x^3$$

where:

x	=	coordinate distance into the wall, inch
σ	=	stress perpendicular to the plane of the crack, ksi
Ai	=	coefficients of the cubic fit

The stress intensity factor calculation for an embedded flaw was taken from the work by Shah and Kobayashi [5] which is applicable to an embedded flaw in a semi-infinite medium, subjected to an arbitrary stress profile.

$$K_I = \frac{M_o}{I}\left[\frac{\pi b}{a}\right]^{0.5}\left(b^2\cos^2\theta + a^2\sin^2\theta\right)^{0.25}\left[\frac{c}{E(k)} - \frac{k^2 b \sin\theta}{\left(1+k^2\right)E(k) - k'^2 K(k)}\right]$$

where:

M_o	=	applied bending moment
I	=	moment of inertia
b	=	semi-minor axis of the ellipse
a	=	semi-major axis of the ellipse
?	=	angle in the parametric equations of the ellipse
c	=	distance from centerline of the wall to centerline of the flaw
E(k)	=	complete elliptic integral of the second kind
K(k)	=	complete elliptic integral of the first kind
k, k'	=	modulus and complimentary modulus of Jacobian elliptic functions

This expression has been shown to be applicable to embedded flaws in a thick-walled pressure vessel, through the use of finite element models with actual cracks modeled, as shown in a paper by Lee and Bamford [6].

3.2 FRACTURE TOUGHNESS

The other key element in a fracture evaluation is the fracture toughness of the material. The fracture toughness has been taken directly from the work by Brown and Mills [7], because no reference values are yet available in Section XI, for Ni-Cr-Fe alloys. The fracture toughness for the Alloy 600 is at least equivalent to that of 304 or 316 stainless steel, which guarantees that any possible failure will be by ductile limit load.

3.3 FATIGUE CRACK GROWTH PREDICTION

The analysis procedure involves postulating a flaw in the head penetration, subject to a series of design loads. The fatigue loadings in the head penetration region are very mild. The applied loads include pressure, thermal transients and residual stresses. The thermal transients used for this evaluation are the plant heatup and cooldown, load follow cycles, step load increase/decrease, and reactor trip. The complete list of design transients for this location is provided in Table 2-1, but the transients used in the evaluation comprise the limiting ones for fatigue crack growth.

The cycles were distributed evenly over the entire plant design life (40 years). The stress intensity factor range, ΔK_I, that controls fatigue crack growth, depends on the geometry of the crack, its surrounding structure and the range of applied stresses in the region of the postulated crack. Once ΔK_I is calculated, the fatigue crack growth due to a particular stress cycle can be determined using a crack growth rate reference curve applicable to the material of the head penetration nozzle.

The crack growth rate (CGR) reference curves for these nickel base alloys have not been developed for Section XI in the Code, therefore information available from the literature was used. Based on the results reported in Reference 8, a crack growth rate curve was developed for application in the air environment for Alloy 600 material, as shown below.

$$\frac{da}{dN} = CS_R \Delta K^n$$

$$C = 4.835\times10^{-14} + 1.622\times10^{-16}T - 1.490\times10^{-18}T^2 + 4.355\times10^{-21}T^3$$

$$S_R = [1 - 0.82R]^{-2.2}$$

$$n = 4.1$$

where:

T	=	Average temperature of the transient, (°C).
ΔK	=	Stress intensity factor range, (MPa $\sqrt{m}$).
R	=	Stress Intensity Ratio, (Kmin/Kmax).
da/dN	=	Fatigue crack growth rate (m/cycle).

The crack growth rate reference curve in air for the repair weld Alloy 52 is not available. There are 4 tests on Alloy 52 in PWR water environment. The available data in reference [8] showed

Alloy 52 and Alloy 600 have the same growth rate in PWR Water environment. Therefore, Alloy 600 growth rate in air can be used as the Alloy 52 growth rate in air.

Once the incremental crack growth corresponding to a specific transient, for a small time period, is calculated, it is added to the original crack size, and the analysis continues to the next time period and/or thermal transient. The procedure is repeated in this manner until all the significant analytical thermal transients and cycles known to occur in a given period of operation have been analyzed.

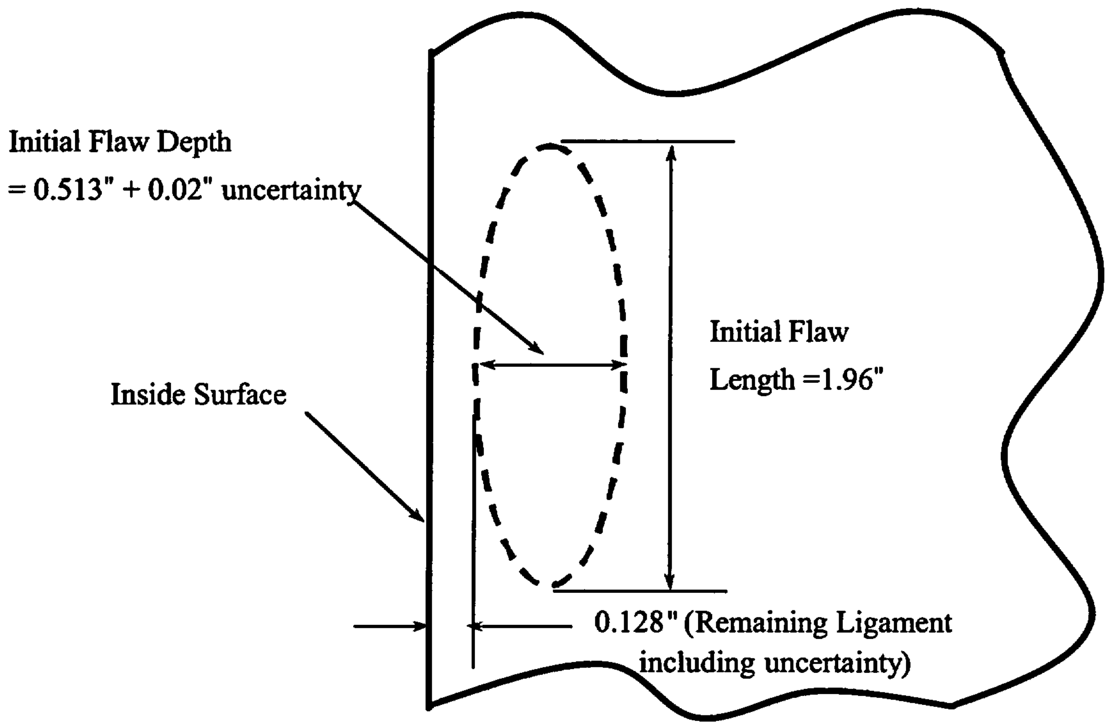

Figure 3-1 Sketch of Model Used for Fatigue Crack Growth Evaluation, for Propagation Near the Tube Inside Surface

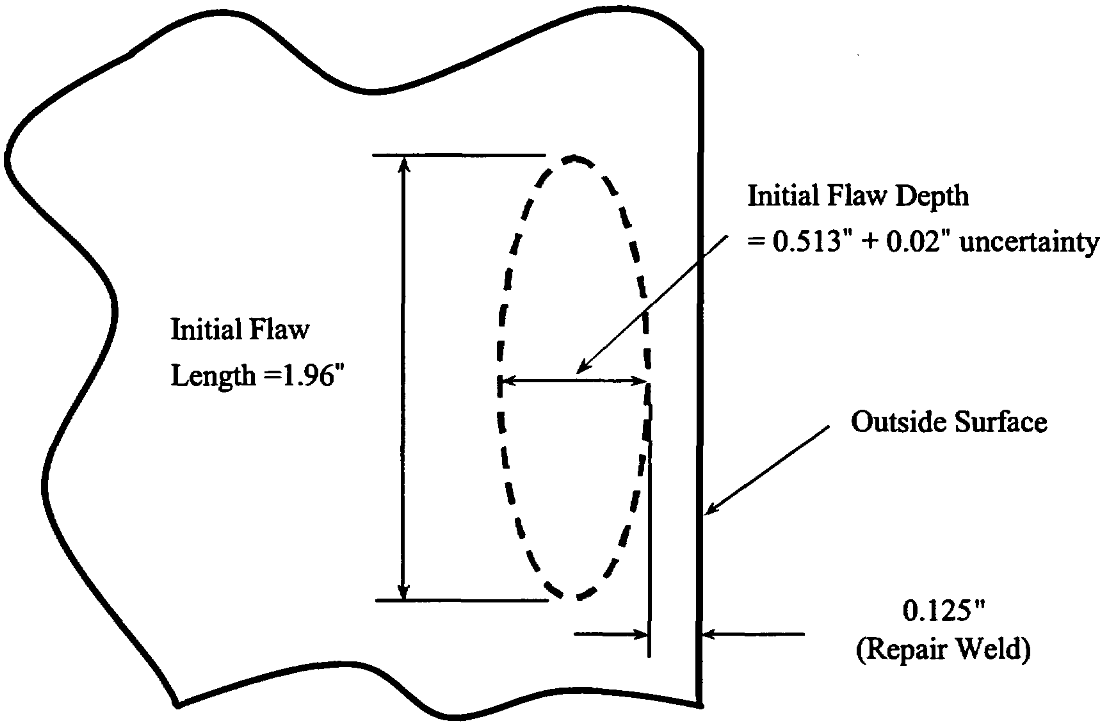

Figure 3-2 Sketch of Model Used for Crack Propagation Through the Embedded Flaw Repair Weld

4.0 FRACTURE EVALUATION RESULTS

4.1 ALLOWABLE FLAW SIZE DETERMINATION

The first step in the evaluation is to compare the actual flaw depth to the maximum allowable depth necessary to maintain the ASME Code margins. To do this we will use the calculation model for the plastic limit load for an axial surface flaw, as given in Section XI Appendix C. In making this calculation we have used the actual yield strength and ultimate tensile strength of the tube material from the Certified Material Test Report [9].

The aspect ratio of the indication, length/depth is about 3.8, so a value of 4.0 was used in the calculation. The results are shown in Figure 4-1, for Level A conditions, and show that the allowable depth, maintaining the ASME Code margin of 2.7, is 89.5 percent of the wall thickness. The results for Level B conditions are slightly more limiting, even though the code margin for Level B is only 2.4. The pressure is slightly higher for some upset conditions, so the allowable depth is 89% of the wall thickness (Figure 4-2).

The next step in the evaluation is to determine the useful life of the repair. This involves a fatigue crack growth evaluation to predict the future growth of the flaw in the remaining ligament of the penetration material, as well as a similar evaluation to predict the growth of the flaw into the embedded flaw repair weld. No stress corrosion cracking calculations are necessary because the embedded flaw repair seals the flaw from the environment.

4.2 FATIGUE CRACK GROWTH RESULTS

Results were obtained for two different situations, the first being crack growth into the remaining ligament of the tube, and the second being growth into the embedded flaw repair weld. The first case is illustrated by the sketch in Figure 3-1, and the second is illustrated by the sketch in Figure 3-2.

In the first case, the objective was to determine the future growth of the existing indication after the embedded flaw repair is applied. Since the flaw will be sealed from the primary water environment, the only mechanism of growth is fatigue. Two different aspect ratios were used in the evaluation, to show the sensitivity of the results to flaw shape. The aspect ratio is defined in this case as the ratio of the flaw length to the flaw width. The aspect ratio of four corresponds to the indication as found, while the aspect ratio of 50 is a very conservative upper bound.

The depth of the flaw was assumed to be the as-detected depth of the indication, plus an uncertainty. The upper bound on the uncertainty is 0.020 inch, as determined by an extensive review of the NDE methodology used in this examination. At SONGS, the calibration block had a notch that was 0.129" from the ID surface. This notch measured as 0.148" using the TOFD calibration. The indication in nozzle #56 measured as 0.148" using the same calibration. This results shows that at this point on the curve, the uncertainty of the TOFD measurement is 0.019". Accordingly, a 0.020" uncertainty is appropriate to apply for engineering analysis of this indication.

The crack growth results for the first case, growth into the remaining ligament, are shown below, and show that the crack growth is very small.

Crack Growth into the Remaining Ligament (0.128 in)					
	Initial Half Crack Depth (inch)	Half Crack Depth (inch) After			
		3 year	6 year	10 year	15 year
Aspect ratio = 4	0.2665	0.2722	0.2778	0.2854	0.2949
Aspect ratio = 50	0.2665	0.2742	0.2818	0.2920	0.3048

	Initial Half Crack Depth (inch)	Crack Growth (inch) After			
		3 year	6 year	10 year	15 year
Aspect ratio = 4	0.2665	0.0057	0.0113	0.0189	0.0284
Aspect ratio = 50	0.2665	0.0076	0.0153	0.0255	0.0383

A second crack growth calculation was carried out to predict crack growth that might occur in the embedded flaw repair weld itself. The methodology used is the same as that used for the first case, except that the growth prediction is in the opposite direction. The results of this calculation also show that the growth is very small, and are tabulated below.

Crack Growth into the Repair Weld (0.125 in)					
	Initial Half Crack Depth (inch)	Half Crack Depth (inch) After			
		3 year	6 year	10 year	15 year
Aspect ratio = 4	0.2665	0.2701	0.2736	0.2784	0.2851
Aspect ratio = 50	0.2665	0.2713	0.2760	0.2824	0.2904

	Initial Half Crack Depth (inch)	Crack Growth (inch) After			
		3 year	6 year	10 year	15 year
Aspect ratio = 4	0.2665	0.0036	0.0071	0.0119	0.0186
Aspect ratio = 50	0.2665	0.0048	0.0095	0.0159	0.0239

4.3 CONSERVATISMS IN THE EVALUATION

The fracture evaluation was based on the stresses in the outermost penetration, at an angle of 49.7 degrees, which are known to be higher than those of the actual penetration, which is at 34.9 degrees. Also, the stresses on the uphill side of the penetration were used (cut 3) as opposed to the lower stresses on the downhill side (cut 6), where the indication is actually located.

The indication was modeled with an aspect ratio (length/depth) of 4, which is slightly more conservative that the actual aspect ratio of 3.8. Acceptable results were also obtained for a much more conservative aspect ratio of 50. Uncertainty in the NDE measurements was also added to the indication size for the evaluation, both for the crack growth and the final allowable flaw size, adding further conservatism, as shown in Figure 4-3.

4.4 RESULTS AND DISCUSSION

The indication in penetration 56 has been evaluated for potential repair using the embedded flaw repair technique. The as-found indication is slightly larger than the maximum size evaluated in the Topical Report, WCAP-15987-NP, in that it has a nominal depth of 77.6 percent of the thickness as compared to the 75 percent value used in the WCAP. Investigation of the actual margins required by the ASME Code Section XI shows that the indication could be as deep as 89 percent of the wall thickness and still meet the Code margins.

The fatigue crack growth results were developed including the upper bound inspection uncertainty of 0.020 inch. The results show that the indication would grow by only a small amount into the remaining ligament for the coming years. The indication will grow about 0.0113 inch in six years, about 0.0189 inch in ten years and still remains within the acceptable limit of 89 percent of the wall. For potential growth through the embedded flaw repair weld, the flaw will grow a distance of 0.0071 inches into the repair weld in six years, and 0.0119 inches into the repair weld in ten years.

These results are incorporated into the allowable flaw depth in Figure 4-3, where the results with the maximum uncertainties are shown. With the maximum uncertainty, the indication remains within the ASME Code margins for at least 14 years. The longer assumed flaw remains within the acceptable margins for at least 10 years.

Using the best estimate indication size for the as-found indication (77.6 percent of the wall thickness) with an aspect ratio of four, the indication would remain within the Code margins for a very long period of time, in excess of 18 years. Therefore it may be concluded that the existing indication in penetration 56 is acceptable to repair using the embedded flaw repair method.

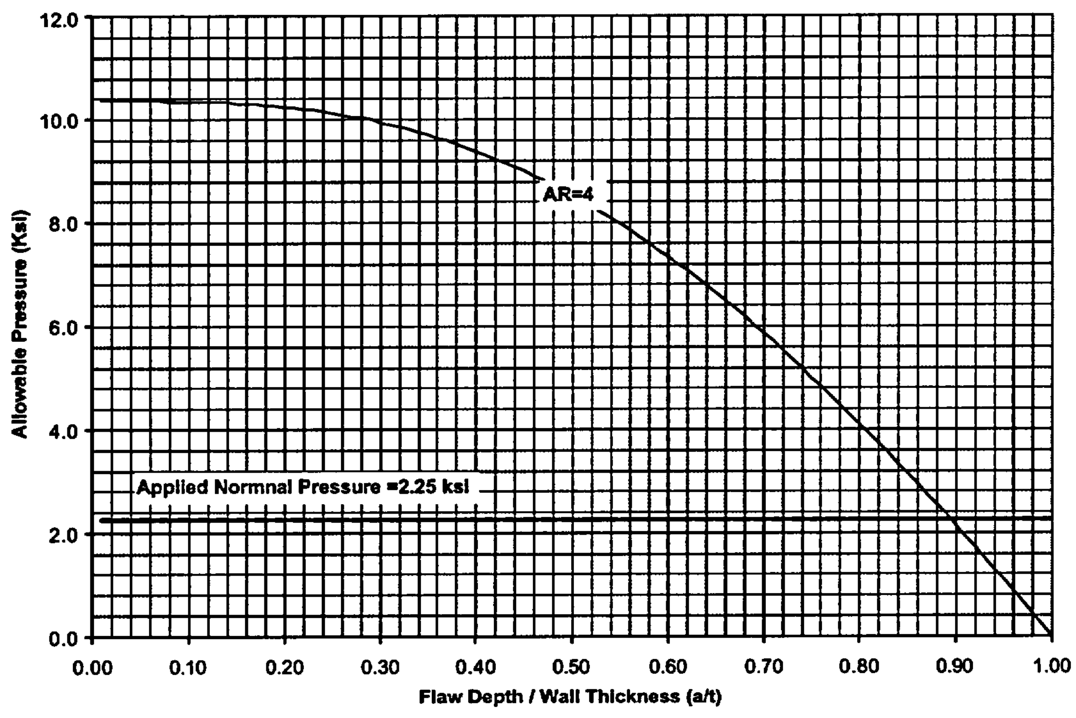

Figure 4-1 Allowable Axial Part-Through Flaw Depth for CEDM 56, Level A Conditions (SF = 2.7)

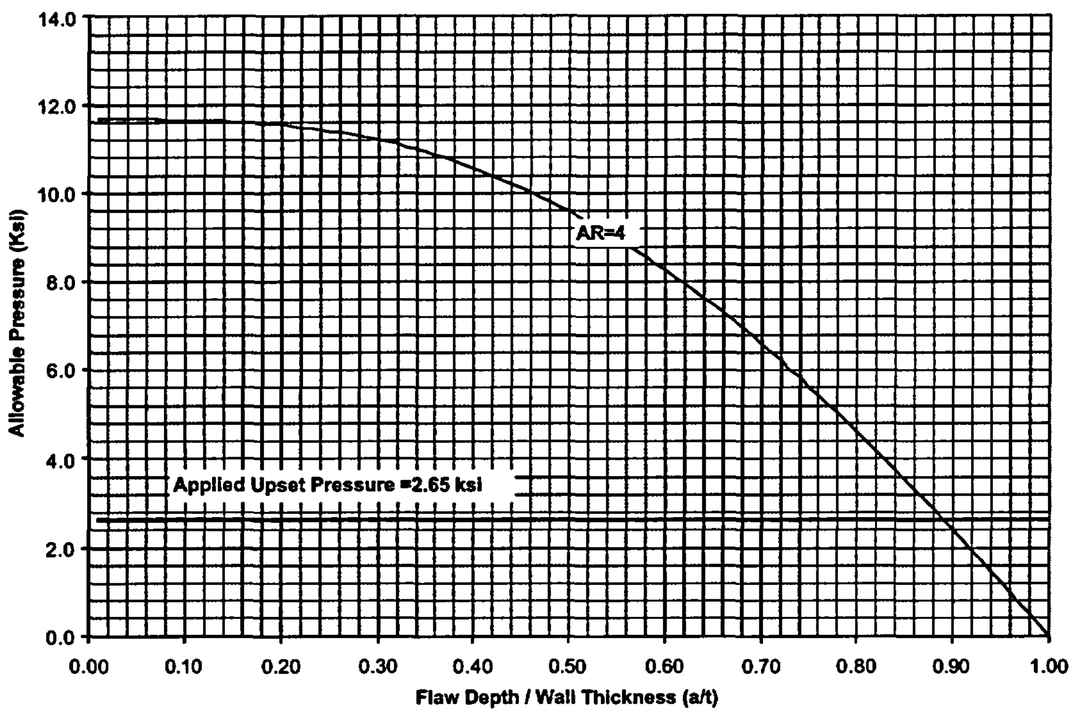

Figure 4-2 Allowable Axial Part-Through Flaw Depth for CEDM 56, Level B Conditions (SF = 2.4) [Limiting Case]

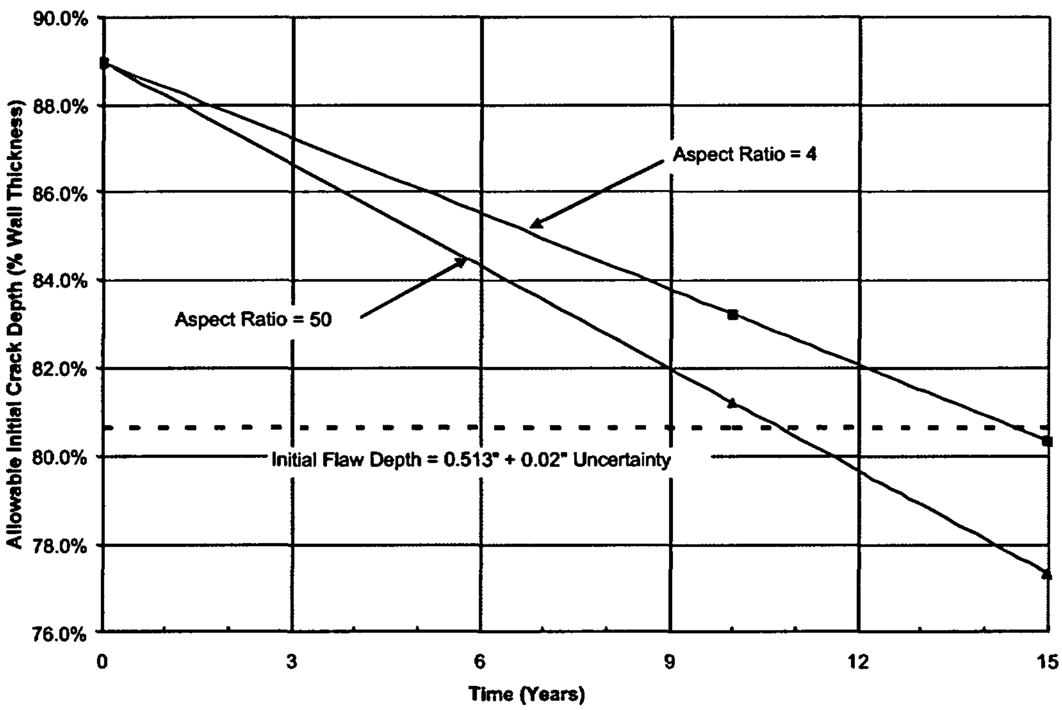

Figure 4-3 Results of Allowable flaw Size Calculation, Including Fatigue Crack Growth, and Consideration of Uncertainties

5.0 REFERENCES

1. Westinghouse Ultrasonic Report Sheet, File Number CONO-3-OH01-056-01, dated 10/8/04.

2. Bamford, W.H., et.al., "Technical Basis for the Embedded Flaw Process for Repair of Reactor vessel Head Penetrations," Westinghouse Electric Co. WCAP-15987-NP, Rev. 2-NP-A, December 2003.

3. ASME Code Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," editions as used in reference 2.

4. Gross. D.J., et al, "SONGS 2 and 3 CEDM/ICI Stress Analysis," Dominion Engineering, Inc. Report R-3640-00-1, November 1998.

5. Shah, R.C. and Kobayashi, A.S., "Stress Intensity Factor for an Elliptical Crack Under Arbitrary Loading," Engineering Fracture Mechanics, Vol. 3, 1981, pp. 71-96.

6. Lee, Y.S. and Bamford, W.H., "Stress Intensity Factor Solutions for a Longitudinal Buried Elliptical Flaw in a Cylinder Under Arbitrary Loads," presented at ASME Pressure Vessel and Piping Conference, Portland, Oregon, June 1983. Paper 83-PVP-92.

7. Brown, C.M., and Mills, W.J., "Fracture Toughness, Tensile and Stress Corrosion Cracking Properties of Alloy 600, Alloy 690, and Their Welds in Water," in Proceedings of Corrosion 96, Paper 90.

8. NUREG/CR-6721, ANL-01/07, "Effects of Alloy Chemistry, Cold Work, and Water Chemistry on Corrosion Fatigue and Stress Corrosion Cracking of Nickel Alloys and Welds," April 2001.

9. Standard Steel Metallurgical Department Certified Test Report Heat No. R-1948 dated March 27, 1975.

ATTACHMENT 2

Relief Request ISI-3-21

Determination of Acceptance Criterion to Establish that No Significant Change in Control Element Drive Mechanism (CEDM) # 56 Indication has Occurred

ATTACHMENT 2
Relief Request ISI-3-21
Determination of Acceptance Criterion to Establish that No Significant Change in Control Element Drive Mechanism (CEDM) # 56 Indication has Occurred

Measurement uncertainties of the axial and radial position of an indication can result from tool motion, transducer design, calibration, and data scan rates. Axial sampling data is taken every 0.040 inch, which is considered to approximate the axial position uncertainty. The measured depth of a crack tip using time of flight tip diffraction (TOFD) techniques depends on the differential time of travel for ultrasound in the penetration material. Transducer size and spacing, crystal characteristics, sampling rate, transducer position relative to the target indication, calibration settings, and distance (depth) of the indication itself all contribute to the uncertainty in depth measurements. In general, the uncertainty in absolute depth measurement can be relatively large. Nevertheless, it is possible to limit the uncertainty contributions from the specific transducer and calibrations by careful comparison and adjustment of the system output relative to a precisely known calibration standard.

During the San Onofre Nuclear Generating Station (SONGS) Unit 3 inspection, a calibration standard with indications of known depth was used. This standard included several manufactured notches. One of these calibration notches compared directly to the indication found in CEDM #56. This calibration notch originated on the inside diameter (ID) surface and had the following dimensions:

- Axial Length 0.5035 inch
- Width 0.0094 inch
- Depth 0.1285 inch (the tip is at the same relative position as an OD flaw 0.533 inch deep)

The inspection tool is calibration checked periodically during the CEDM inspection. Ten comparisons between the indicated depth and the calibration notch were made. The deviations ranged from -0.009 to +0.020 where "+" errors would reflect an underestimate of an OD originating flaw's depth. (The calibration check prior to inspection of CEDM # 56 during Cycle 13 had a recorded deviation of +0.001 from the calibration standard). It was concluded from this calibration data, that a reasonable and conservative estimate of the maximum underestimated depth error associated with the indication found in CEDM # 56 was 0.020 inch.

A similar calibration standard will be fabricated to support the Cycle 14 refueling examination of CEDM # 56. Calibration notches having a depth similar to the indication in CEDM # 56 will be included. These notches will be used to establish calibration settings that can be expected to replicate the resolution and repeatability of the Cycle 13 measurements. Based on the Cycle 13 measurement repeatability, the expected consistency between the Cycle 13 and Cycle 14 indication depth measurements is +/- 0.020 inch.

An increase of the measured depth of the indication in CEDM # 56 of greater than 0.020 inch would reflect a significant possibility that there has been an actual change to the indication. Confirmed changes in the CEDM # 56 indication would mean that it is a flaw. If, during the Cycle 14 inspections, the indication depth in CEDM # 56 exceeds 0.533 (0.513 + 0.020) inch, SCE would initiate additional repairs to reduce or eliminate flaws exceeding 75 percent through wall in accordance with proposed relief request ISI-3-22, or an equivalent, approved repair method. If the measured indication depth does not exceed 0.533 (0.513 + 0.020) inch then there is no change in the level of quality and safety since the last inspection, which supports operation during Cycle 14 with the existing repairs.

In addition to the repeatability study above, a direct comparison of the TOFD measurement for the indication in CEDM # 56 and the calibration notch was made. The CEDM # 56 indication, measured at 0.513 inch, was farther from the ID surface than the calibration notch at 0.532 inch. This established an upper bound for the indication depth independent of any bias, accuracy or repeatability issues.

In any case, the 0.020 inch value remains as the repeatability range for a given reflector. It is important to recognize that this is different than the accuracy, which has another factor to be considered.

The calibration standard has notches nominally 20 percent and 60 percent through wall from the ID and outside diameter (OD) surfaces (approximately 0.13 inch and 0.39 inch). During calibration, the operator is allowed to make setup adjustments to achieve agreement within +/- 0.050 inch for each calibration standard notch. One calibration variable is the software input for transducer spacing. The software is preprogrammed to use a nominal transducer spacing of 0.790 inch for the depth calculation algorithm used with the circumferentially shooting TOFD PCS24 probe. Accuracy of this algorithm has been confirmed experimentally to be correct within a few mils of the actual depth.

If the operator does not obtain the required accuracy on the calibration block, he is allowed to adjust the software input for transducer spacing. In cycle 13, such an adjustment was made and the spacing was changed to 0.700 inch, whereas in Cycle 12 the standard 0.790 inch value was used. This can introduce a measurement bias (within the allowed +/- 0.050 inch calibration tolerances) into the depth determination that would make all measurements deeper relative to the Cycle 12 measurements. The analysts can change the spacing back to the original value for the analysis process. Had this modification been accounted for, assessment of the depth change in Cycle 13 relative to the Cycle 12 measured depth would likely have concluded no growth had occurred and the indication was not primary water stress corrosion cracking.

During the Cycle 14 inspections the following acceptance criterion and probe requirements are established as discussed below:

An increase of the measured depth of the indication in CEDM # 56 of greater than 0.020 inch would reflect a significant possibility that there has been an actual change to the indication. Confirmed changes in the CEDM # 56 indication would mean that it is a flaw. If, during the Cycle 14 inspections, the indication depth in CEDM # 56 exceeds 0.533 (0.513 + 0.020) inch, SCE would initiate additional repairs to reduce or eliminate flaws exceeding 75 percent through wall in accordance with proposed relief request ISI-3-22, or an equivalent, approved repair method. If the measured indication depth does not exceed 0.533 (0.513 + 0.020) inch then there is no change in the level of quality and safety since the last inspection, which supports operation during Cycle 14 with the existing repairs.

The examination will be repeated with the same probe design and with the nominal transducer spacing value of 0.790 inch. This will provide a more consistent measurement basis for evaluation of any changes.