FPL

10 CFR §50.55a
L-2005-168
SEP 2 3 2005

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Subject: Turkey Point Nuclear Plant Unit 3
Docket No. 50-250
10 CFR 50.55a Request for Temporary Non-Code Repair
Spent Fuel Pool Cooling Line (Request No. 6)

Title 10 of the Code of Federal Regulations (10 CFR), Section 50.55a(g) requires that nuclear power facility components must meet the requirements contained in specific editions of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code or Code), Section XI, for Inservice Inspection, and Repair and Replacement Programs. Specifically, the ASME Code, Section XI, Article IWA-4000 applies to flaws requiring repair. Pursuant to 10 CFR 50.55a(a)(3)(ii) Florida Power & Light (FPL) requests approval to deviate from the requirements of Article IWA-4000.

On April 19, 2005, a through-wall flaw was detected in a Unit 3 spent fuel pool (SFP) cooling system line. FPL is preparing to perform a permanent ASME Code repair. Until the permanent repair is made, FPL would like to install a temporary non-Code repair to limit leakage from the line. In addition, since the SFP cooling system is not redundant, FPL would like to employ the same temporary non-Code repair, if the permanent repair could not be completed within the projected time at the time the permanent repair is implemented. The continued use of the non-Code repair would allow restoration of the SFP cooling system so that pool temperatures do not rise excessively.

The non-Code repair of the SFP cooling line will be temporary. FPL considers the continued use of the non-Code repair in the event the permanent repair cannot be completed in time to be a prudent contingency measure. The housekeeping burden until the permanent repair is implemented is a hardship and the inability to continue use of the non-Code repair would create a hardship in that the SFP water temperature would increase to the point of boiling without cooling. FPL requests approval of a deviation from the provisions of the ASME Code, Section XI, Article IWA-4000 in that compliance would result in hardship without a compensating increase in the level of quality or safety. The basis for the acceptability of the deviation is contained in Enclosure 1. Enclosure 2 contains additional information regarding repair plans, and flaw examination and evaluation.

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FPL is requesting approval for the deviation such that the temporary non-Code repair can be expeditiously implemented and be utilized until the permanent repair is complete. While the permanent repair is currently scheduled for December 2005, it will be completed no later than the next Unit 3 refueling outage currently scheduled for March 2006.

If there are any questions regarding the information contained in this submission, please contact Mr. Walter Parker at 305-246-6632.

Very truly yours,

Terry O. Jones

Terry O. Jones
Vice President
Turkey Point Nuclear Plant

Enclosures: 1) 10 CFR 50.55a Request
2) Additional Information

cc: Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Nuclear Plant

Florida Power & Light Letter No. L-2005-168
10 CFR 50.55a Request for Temporary Non-Code Repair
Spent Fuel Pool Cooling Line (Request No. 6)
Enclosure 1

1.0 Introduction

Pursuant to 10 CFR 50.55a(a)(3)(ii), Florida Power & Light (FPL) requests approval to deviate from the requirements of Article IWA-4000 of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code or Code).

On April 19, 2005, a through-wall flaw was detected in a Unit 3 spent fuel pool (SFP) cooling system line. FPL is preparing to perform a permanent ASME Code repair. Until the repair is made, FPL would like to install a temporary non-Code repair to limit leakage from the line. In addition, since the SFP cooling system is not redundant, FPL would employ the same temporary non-Code repair if the permanent repair cannot be completed within the projected time at the time the permanent repair is implemented. The non-Code repair will reduce the housekeeping burden due to leakage and then, if necessary, allow restoration of the SFP cooling system in order that pool temperatures do not rise excessively if the permanent repair cannot be completed during the initial repair attempt.

2.0 ASME Code Component Affected

The affected pipe section is at the discharge of the SFP cooling system heat exchanger to the Unit 3 SFP.

The pipe is 8 inch seamless fabricated from ASTM A 312, Type 304 Stainless Steel, Schedule 10S. Design code of record: USAS ANSI B31.1. Code Class 3.

Design temp and pressure: 212°F and 150 psig.

3.0 Applicable Code Edition and Addenda

ASME Code, Section XI, 1998 through 2000 Addenda for the repair/replacement program.

4.0 Applicable Code Requirement for Which a Deviation is Requested

ASME Code, Section XI, Article IWA-4000

Section XI of the ASME Code specifies Code-acceptable repair methods for flaws that exceed Code-acceptable limits in piping that is in service. A Code repair is required to restore the

structural integrity of the flawed piping, independent of the operational mode of the plant when the flaw is detected.

5.0 Reason for Request

5.1 Flaw Detection and Hardship Determination

On April 19, 2005, a through-wall flaw was detected in a Unit 3 SFP cooling system line. Leakage from the flaw was approximately 6 cubic centimeters per minute (cc/min) at the time of discovery. The leak rate is gradually increasing. FPL employed ASME Code Case N-513, as approved by the NRC in Regulatory Guide 1.147 and cited in 10 CFR 50.55a(b)(2)(xiii)(A), to evaluate the acceptability of the flaw for continued service until a repair could be made.

FPL intends to perform a permanent Code repair to the affected section of the leaking SFP cooling system line. FPL intends to employ the temporary non-Code repair to minimize leakage until the permanent repair is made. During the implementation of the permanent repair, in the event the repair cannot be completed in the time available, FPL would continue to employ the temporary non-Code repair so that the SFP cooling system could be returned to operation.

The Unit 3 SFP cooling system is not redundant. It must be removed from service in order to drain the leaking portion of the discharge line to perform a permanent repair. The limited amount of time available to complete the repair is judged to be adequate; however, FPL considers the continued use of the temporary non-Code repair, as a contingency, to be a prudent compensatory measure to ensure continued cooling of the Unit 3 SFP. The non-Code repair consists of a mechanical gasketed clamp that is designed for the service conditions of the piping system. The evaluation of a bounding flaw with the clamp in place assures the structural integrity of the pipe until the permanent repair is complete. Since this type of repair is not allowed by the ASME Code, FPL requests permission to deviate from the Code. The temporary non-Code repair will be employed until the permanent repair is made and will continue to be used in the event the permanent repair cannot be completed in time at the time of the initial repair attempt.

FPL will continue daily visual inspections to monitor any leakage from the temporary repair until the permanent repair is completed.

Until the permanent repair is made, the temporary non-Code repair will minimize leakage and reduce the housekeeping burden. The inability to employ the temporary non-Code repair creates a hardship without a compensating increase in the level of quality or safety in that additional worker dose is necessary to address housekeeping needs due to leakage. In addition, the continued use of the non-Code repair will allow restoration of the SFP cooling system in order that pool temperatures do not rise excessively. If the permanent repair could not be completed in time to avoid excessive pool temperature, then compliance with the Code would create a hardship without a compensating increase in the level of quality or safety in that the SFP water temperature could increase to the point of boiling without cooling. The estimated time for the SFP water to reach boiling is 67 hours in December 2005. The estimated time for the pool water to reach the administrative limit of 170°F is 40 hours. The estimates of the time to perform the various Code repairs vary from 20 to 40 hours. Additional information on repair options is contained in Section 1.0 of Enclosure 2.

5.2 Root Cause Determination and Flaw Characterization

Pinhole Leak Requiring Repair

- The Unit 3 Spent Fuel Pit heat exchanger room is located at elevation 18' and the main entrance door for this room is made of grating steel that exposes the piping within the room to moisture and salt-laden corrosive outdoor environment.
- The flaw in the stainless steel 8-inch pipe is pinhole size (approximately 1/64-inch diameter) and located at the bottom side of the pipe.
- The flaw is local in extent (i.e., not circumferential) and is OD-initiated.
- The flaw is located ½ inch downstream from the flange butt weld for valve 3-820, the SFP heat exchanger outlet valve.
- Leakage volume was minimal at discovery (approximately 6 cc/min).

Based on the above, the cause of pipe wall degradation is judged to be chloride-induced outside diameter (OD)-initiated stress corrosion cracking (SCC). The flaw initiated from the base of the pit that formed on the OD surface of the pipe (pitting is commonly associated with the SCC phenomena).

FPL has performed non-destructive examinations (NDE) in accordance with ASME Code Case N-513 and is monitoring leak rate daily. Visual inspection and dye-penetrant examination in the area of the flaw did not detect additional flaws or general wastage. The flaw remains bounded by the flaw evaluation discussed in Section 5.3 for a pinhole leak.

Potential Repair-Induced Flaw

FPL's repair process is designed to ensure a reliable permanent Code repair is achieved. However, there is a remote possibility that performing the branch connection repair method (see Repair Option 1 in Section 1.1 of Enclosure 2) might result in burn-through of the thin-wall Schedule 10S pipe during the welding process.

In order to provide a contingency should this occur with the need to restore operation of the SFP cooling system, FPL has evaluated a bounding case for a potential burn-through. Since guidance for evaluation of non-planar through-wall flaws is not provided in Code Case N-513, an alternate wall thinning criteria was developed using the "Limits of Reinforcement" rules in Paragraph NB-3640 of the ASME Code, 1989 Edition.

5.3 Flaw Evaluation

Pinhole Leak

A flaw evaluation was performed in accordance with ASME Code Case N-513. The evaluation used the "through-wall flaw" approach and assumed the pinhole leak to have a planar flaw length of 0.25 inch in the axial or circumferential direction. The analysis yielded an allowable flaw size of 4.93 inches in the axial direction and 14.86 inches in the circumferential direction. Flaw growth to the next refueling outage in March 2006 is predicted as negligible in both the axial and circumferential directions. Therefore, there is adequate margin to the allowable flaw size.

Burn-Through During Repair

An approach using "Limits of Reinforcement" described in the ASME Code Section III was used to approximate an allowable through-wall hole diameter. Through-wall pit sizes up to approximately 3.65 inches in diameter can be tolerated for a nominal pipe thickness of 0.148 inch without exceeding ASME Code margins. This is much greater than the assumed pinhole flaw size and bounds the flaw size of a potential burn-through for the installation of a 2-inch diameter branch connection. Flaw growth to the next refueling outage in March 2006 with a larger initial flaw size of 3.65 inches is predicted as negligible in both the axial and circumferential directions. Section 4.0 in Enclosure 2 provides additional detail regarding this approach.

The area around the burn-through hole will be examined to verify adequate wall thickness and be properly prepared prior to installation of the temporary non-Code repair.

6.0 Duration of Proposed Alternative

The permanent repair will be completed no later than the next Unit 3 refueling outage currently scheduled for March 2006.

Florida Power & Light letter L-2005-168
Enclosure 2
Additional Information

1.0 Permanent Repair Options

The following three Code repair options are planned. Option 1 below is the primary repair option however, the final recommendation will be based on conclusions of NDE inspections performed along with the actual spent fuel pool heatup rate at the time of the repair.

1.1 Option 1 (Figure 1) is to add a 2-inch diameter welded branch connection at the through-wall pinhole leak. The branch connection with a welded plug will act as the new pressure boundary at the attachment profile. All selected materials are compatible with SFP cooling system class and service. The time estimate for completion of this repair option is 20 hours.

1.2 Option 2 (Figure 2) is the installation of a pipe spool piece to replace the affected portion of the 8-inch diameter piping. The spool piece will be shop prepared. This replacement section of pipe will be pre-sized and will be designed to minimize required field welding (one slip-on flange). All selected materials are designed to be compatible with SFP cooling system class and service. The time estimate for completion of this repair option is 40 hours.

1.3 Option 3 is a gas tungsten arc (GTAW) open root weld repair at through-wall holes on thin wall pipe. The GTAW process uses an open root technique with a maximum root opening of 5/32 inch for an open root butt joint with no limitation on the length of the grind-out. This repair method is also appropriate, if conditions warrant, to be performed on the existing through-wall pinhole location with proper pipe prep-work, or may be performed following a pipe wall burn-through created during welding. The time estimate for completion of this repair option is 20 hours.

NDE, as specified by the ASME Code, will be performed during any of the repairs described above.

2.0 Temporary Non-Code Repair Method

The selected design for the temporary non-Code repair contingency employs commercial grade materials able to withstand expected operating pressure and temperature conditions should a burn-through be created on the Schedule 10S 8-inch diameter stainless steel pipe during welding for the Code repair activity. The non-Code component is a simplified pipe clamp (Figure 3) designed to fit over a through-wall hole. The clamp and bolting material is robust and able to withstand any anticipated operating condition.

3.0 Pre-Repair Non-Destructive Examination

A pre-repair visual assessment and PT, has characterized the flaw as a pinhole size, rounded indication less than 1/32 inch in diameter, that is located approximately ½ inch from the weld toe in the weld's heat affected zone. This indication is located at the bottom of the horizontal run pipe. Unlike a developed crack, propagation of the discovered pinhole on the 8-inch pipe is highly unlikely based on the following four considerations:

1. Pipe wall degradation due to boric acid corrosion is not a concern since pipe material is austenitic stainless steel (ASTM A 312 Type 304) that is highly resistant to this failure mode.

2. Flow-induced pipe wall degradation is not a concern since hydraulic shear load near the pipe wall is at its minimal value (i.e., low fluid velocity).

3. Flaw propagation for a pinhole flaw is unlike crack flaws. A pinhole flaw is well defined and finite.

4. The piping at the flaw location is not subject to fatigue-type or vibratory loading as it is remote from rotating equipment.

Augmented inspection in accordance with ASME Code Case N-513 was performed. No additional flaws were found.

Additional NDE will be performed at the flaw area after the piping is removed from service immediately prior to repair.

4.0 Alternate Approach for Non-Planar Through-wall Flaws

Guidance for evaluation of non-planar through-wall flaws is not provided in Code Case N-513. An alternate wall thinning criteria was developed using the "Limits of Reinforcement" rules in Paragraph NB-3640 of the ASME Code. The model used is illustrated in Figure 4.

Referring to Figure 4, Area A_1 (which is between the thinned area and the limits of reinforcement) should be balanced by Area A_2 (which is within the thinned area) in which case the following equation can be written:

$$1.5\sqrt{R_m t_{nom}}\,(t_{nom} - t_{min}) = L_m (t_{min} - t_p) \qquad (1)$$

or rearranging:

$$L_m = 1.5\sqrt{R_m t_{nom}}\frac{(t_{nom} - t_{min})}{(t_{min} - t_p)} \qquad (2)$$

where:

L_m = diameter of defect, in
R_m = mean pipe radius, in
t_{nom} = nominal pipe wall thickness, in
t_{min} = minimum allowable thickness, in
t_p = remaining thickness under pit, in.

This model conservatively assumes that all areas within the region less than t_{nom} in thickness are at the "pit" remaining thickness t_p. The minimum required wall thickness, t_{min}, is calculated from:

$$t_{min} = \frac{pD_o}{2(S + 0.4p)} \qquad (3)$$

where:

p = maximum operating pressure (150 psig)
D_o = outside diameter (8.625 in)
S = allowable stress (17,800 psi).

Thus, t_{min} = 0.0362 inch.

By setting $t_p = 0$ in Equation 2 (through-wall pit), the allowable hole diameter may be determined for a range of nominal pipe wall thicknesses (see Figure 5). It can be seen that through-wall pit sizes up to approximately 3.65 inches in diameter can be tolerated for a nominal pipe thickness of 0.148 inch without exceeding ASME Code margins. This is much greater than the assumed flaw size.

Flaw growth with a larger initial flaw size of 3.65 inches is predicted as negligible in both the axial and circumferential directions.

CODE REPAIR – WELDED BRANCH CONNECTION

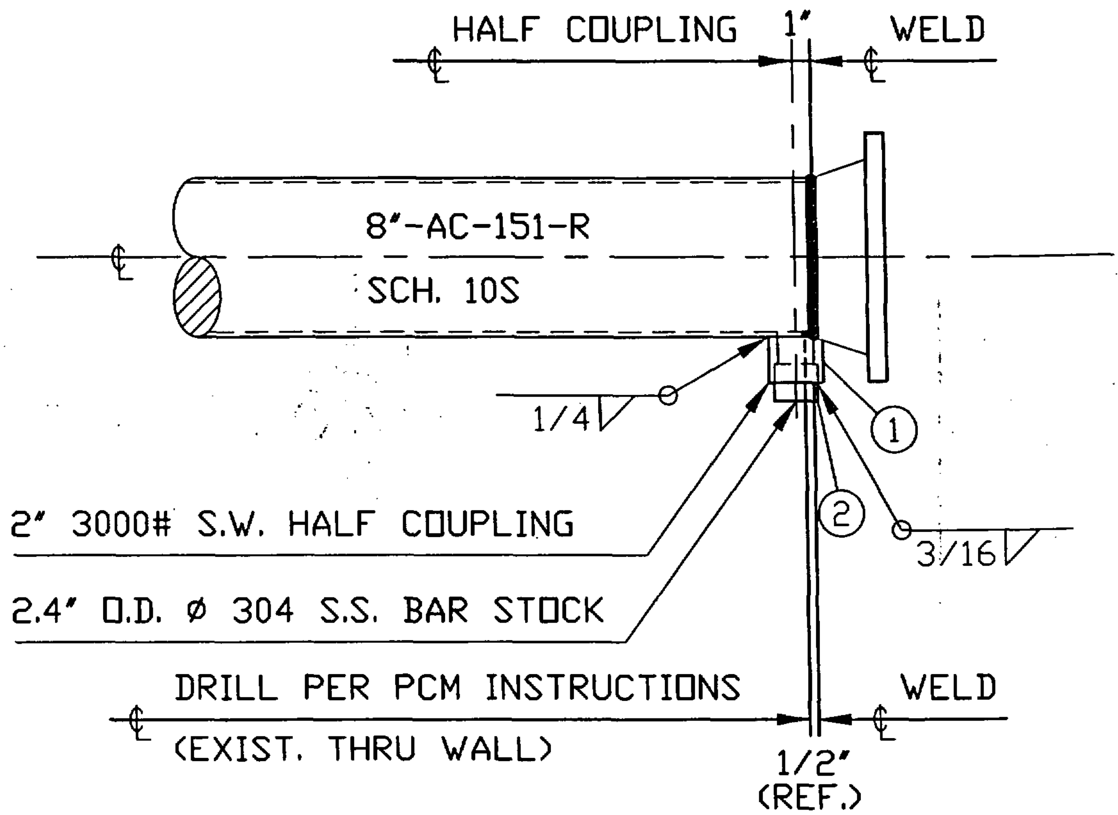

Figure 1

CODE REPAIR
REPLACEMENT PIPE SPOOL

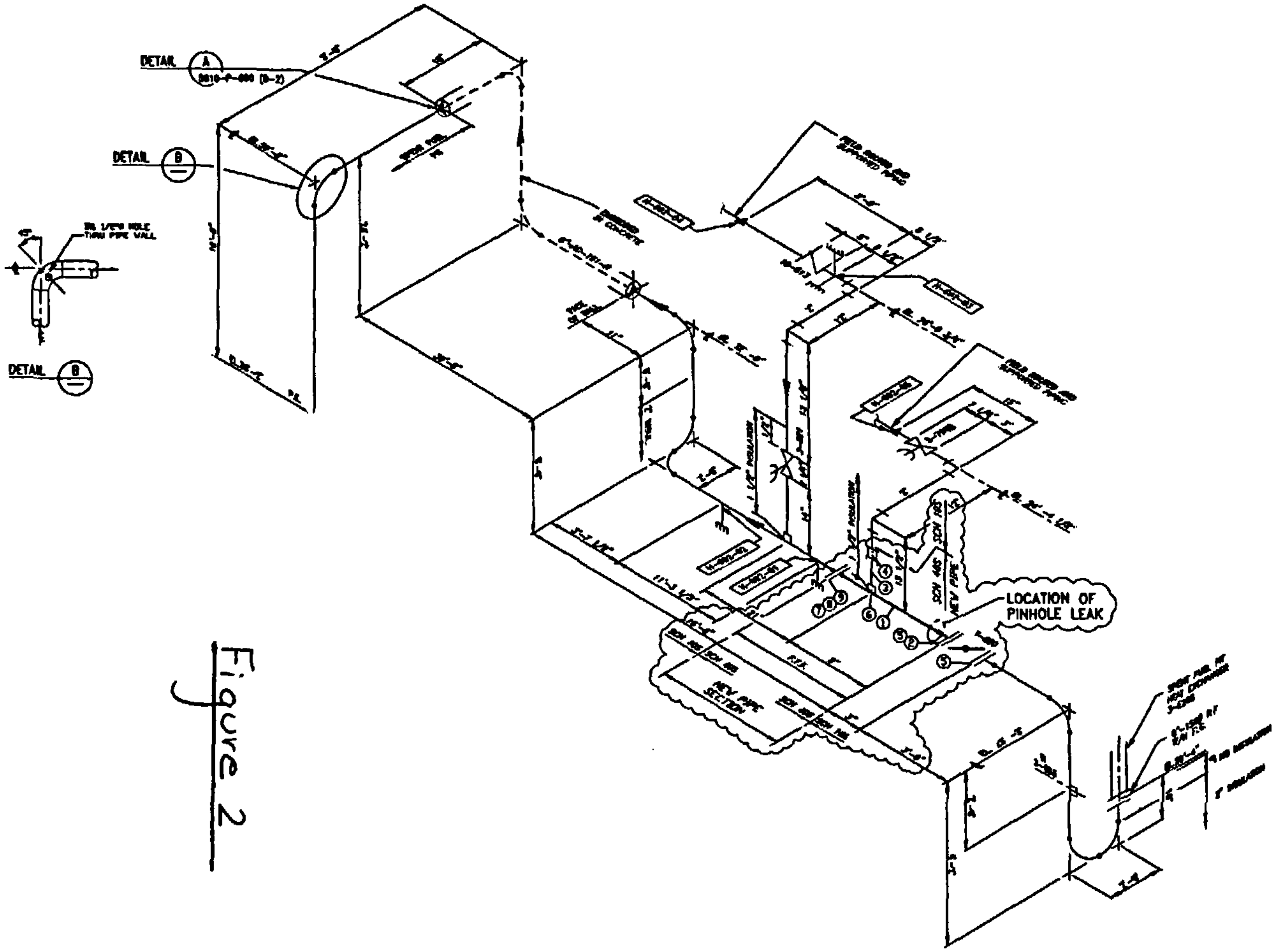

Figure 2

BILL OF MATERIALS

MARK	QTY	SIZE	SCH/RATING	COMPONENT DESCRIPTION	CLASS/NTS	NOTE/PN
1	[illegible] LF	8"	40	PIPE	CLASS 151	C. NOTE 1
2	1	8"	150	R.F. W/N FLANGE	CLASS 151	C. NOTE 1
3	2 LF	8"	40	PIPE	CLASS 151	C. NOTE 1
4	1	8"	3000	S.W. COUPLING	CLASS 151	C. NOTE 1
5	1	8"	150	GASKET	CLASS 151	C. NOTE 1
6	1	8"	3000	S.W. HALF COUPLING	CLASS 151	C. NOTE 1
7	2	8"	150	R.F. S.O. FLANGE	CLASS 151	C. NOTE 1
8	1	8"	150	R.S. FLG. GASKET	CLASS 151	C. NOTE 1
9	8	3/4"	-	STUD BOLTS X 4 1/4" W/ NUTS	CLASS 151	C. NOTE 1

CONSTRUCTION NOTES

1. FOR PIPING MATERIAL AND INSTALLATION SPECIFICATIONS REFERENCE SPEC MN-3.11 AND 5177-M-52
2. IF PIPING IS REPLACED FOR THIS CONTINGENCY A CRN SHALL BE WRITTEN TO UPDATE P&ID FOR PIPE SCHEDULE

NOTES:

1. THIS DRAWING MADE FROM ISOMETRIC NO. [illegible]
2. INSULATION AS NOTED
3. SYSTEM DESIGN PRESSURE [illegible] PSIG
   DESIGN TEMPERATURE [illegible]°F
   PEAK PRESSURE [illegible] PSIG
   MAX OPERATING TEMPERATURE [illegible]°F
4. FOR P&ID SEE DRAWING [illegible] SHEET 1
5. PIPING 8" SCH [illegible] A312 TYPE 304
   8" SCH [illegible] A312 TYPE 304
6. LOCATION: AUX BUILDING
7. FOR PIPE SUPPORT DETAILS SEE DRAWING SERIES NO. 5610-H-[illegible]
8. THE PIPING AND SUPPORTS SHOWN ON THIS DRAWING ARE SAFETY RELATED

VALVE WEIGHTS:

VALVE TAG NO.	WT.	VALVE TAG NO.	WT.
3-[illegible]	150	3-[illegible]	150
3-[illegible]	[illegible]	10-[illegible]	160

REV	DATE	REVISION	BY	CH	APP	APP
1		~~ISSUED AS-BUILT PER PC/M 95-119~~				
0	5/8/89	~~ISSUED AS-BUILT FOR PC/M 85-147 AND ISSUED INTO THE FPL SYSTEM~~	INITIALS ON FILE			

FPL

TURKEY POINT NUCLEAR UNIT 3
PIPING ISOMETRIC
SPENT FUEL PIT COOLING SYSTEM
HEAT EXCHANGER 3-E208
DISCHARGE TO SPENT FUEL PIT

FLORIDA POWER & LIGHT
DRAWING NUMBER ~~5610-P-692~~
SYS 033
REV 1
SHEET 1

NON-CODE REPAIR
PIPE CLAMP

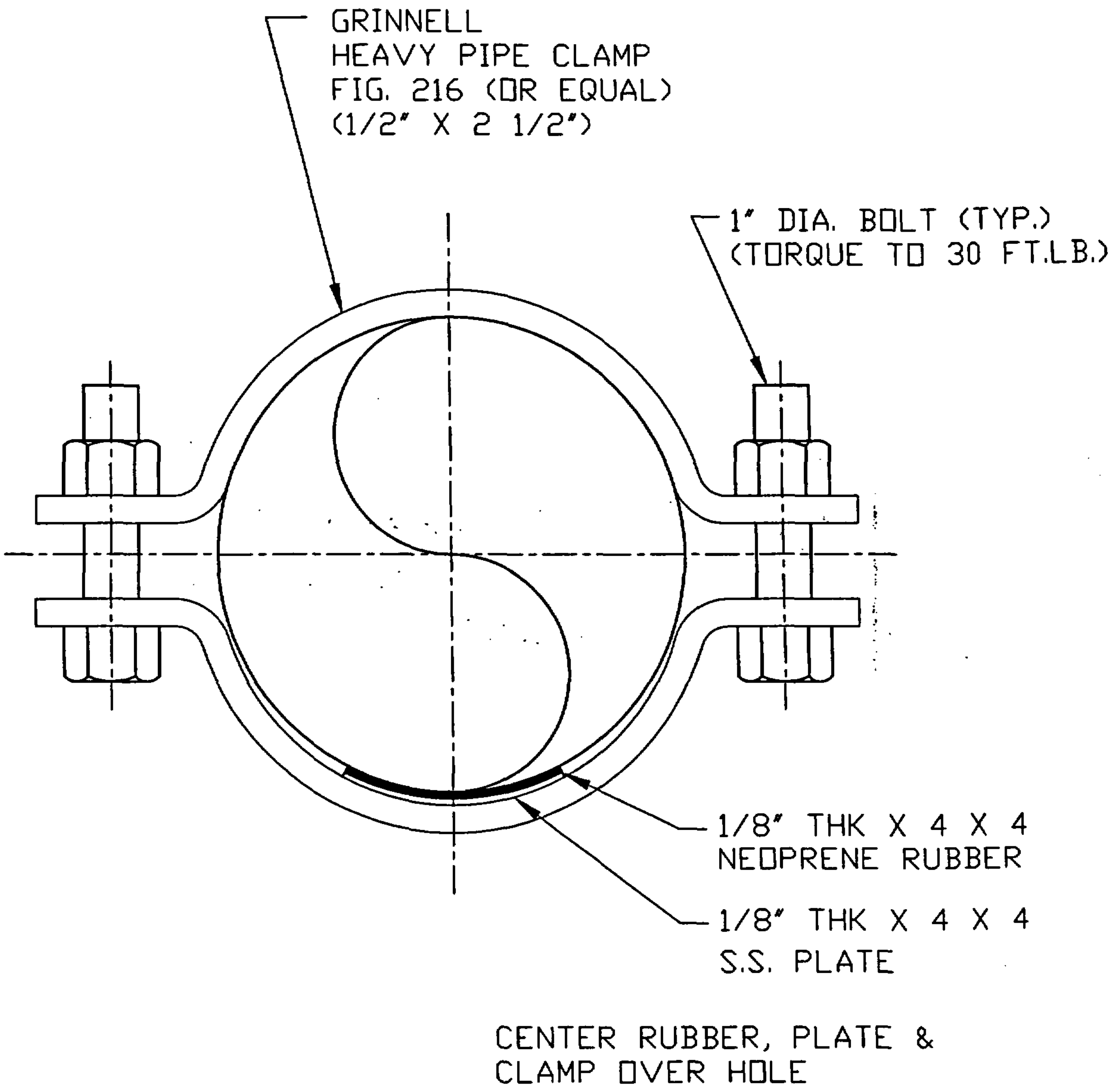

Figure 3

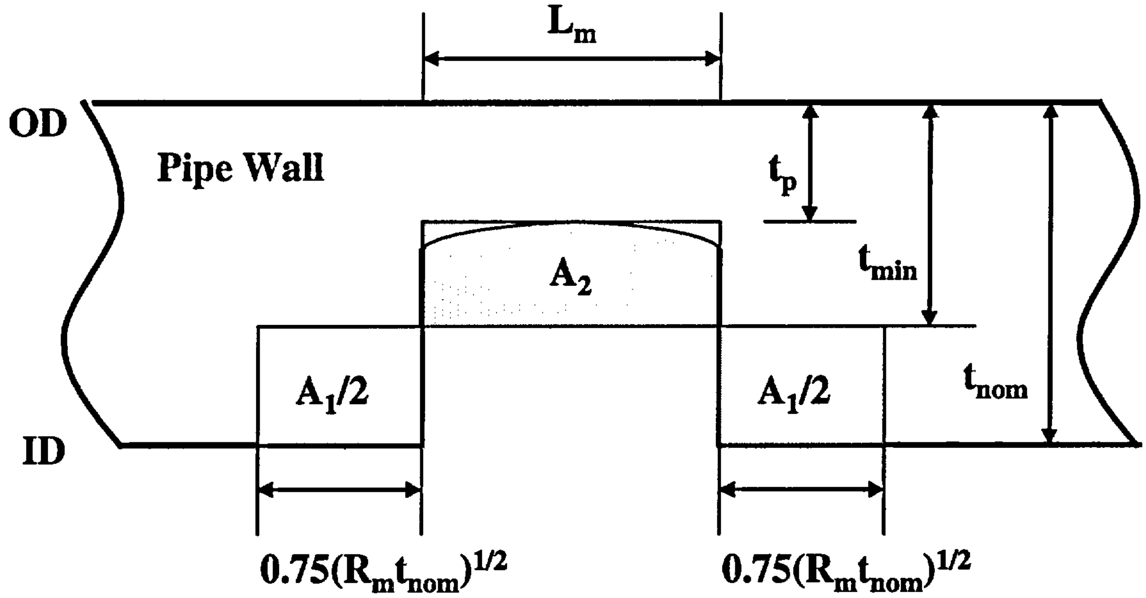

Figure 4: Model for Development of Allowable Non-Planar Flaws

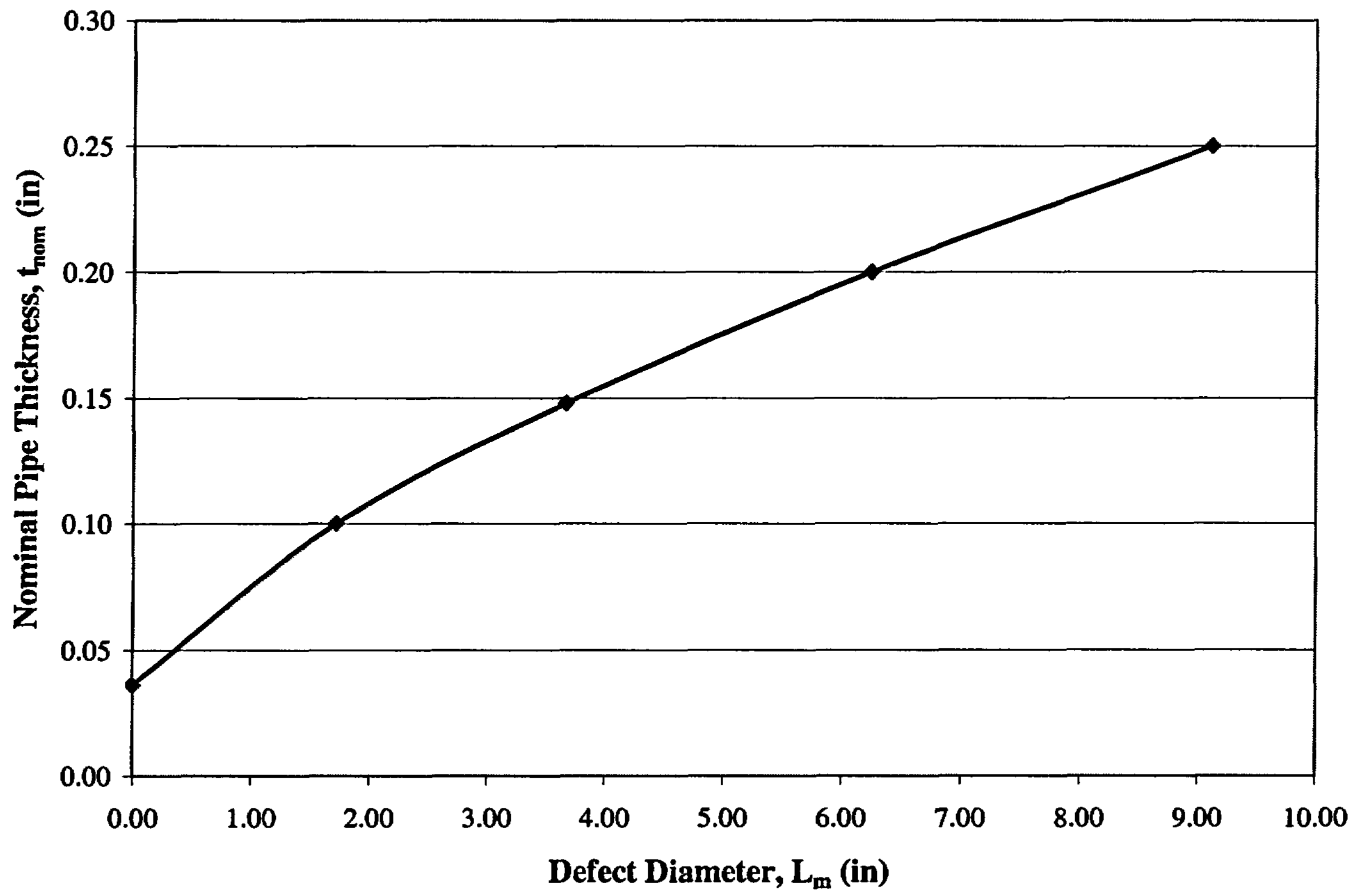

Figure 5: Allowable Non-Planar Flaws for Various Nominal Wall Thicknesses