FPL

FEB 2 5 2003

L-2003-045
EA-03-09(IV)(F)(2)

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

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Order (EA-03-009) Relaxation Request
Proposed Alternative Inspection for Reactor Vessel Level Monitoring System (RVLMS) Penetrations # 59 and # 60

On February 11, 2003 the NRC issued Order (EA-03-009) requiring specific inspections of the reactor pressure vessel (RPV) head and associated penetration nozzles at pressurized water reactors (PWRs). Pursuant to the procedure specified in Section IV, paragraph F of the Order, FPL hereby requests relaxation to implement an alternative to the requirements specified in Section IV, paragraph C.(1)(b)(i) or Section IV, paragraph C.(1)(b)(ii) for Turkey Point Unit 3 and Unit 4 for the Reactor Vessel Level Monitoring System (RVLMS) Penetrations # 59 and # 60. As demonstrated in the attachment hereto, the requested relaxation meets item IV.F.(2) of the Order, as compliance with this Order for the specific nozzles # 59 and # 60 would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety.

Approval of the requested relaxation is requested as soon as possible to support the Turkey Point Unit 3 refueling outage scheduled for March 1, 2003. FPL will provide a complete response to the Order as required within 20 days from the date of the Order. Due to the impending refueling outage for Turkey Point Unit 3 and the timing of the Order, it was necessary to complete and submit the subject relaxation request prior to providing a complete response to the Order.

Please contact Walter Parker at (305) 246-6632 if there are any questions about the relaxation.

Very truly yours,

William Jefferson, Jr.
Vice President
Turkey Point Plant

Attachment

cc: Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant
Florida Department of Health and Rehabilitative Services

A101

TURKEY POINT UNITS 3 and 4 RELAXATION REQUEST FROM US NRC ORDER EA-03-009

PROPOSED ALTERNATIVE INSPECTION FOR REACTOR VESSEL REACTOR VESSEL LEVEL MONITORING SYSTEM HEAD PENETRATIONS # 59 AND # 60

"Hardship or Unusual Difficulty without Compensating Increase in Level of Quality or Safety"

1. ASME COMPONENTS AFFECTED

Turkey Point (PTN) Unit 3 and Unit 4 each have two reactor pressure vessel (RPV) head penetrations modified for the reactor vessel level measurement system (RVLMS), Penetrations # 59 and #60, ASME Class 1.
For Turkey Point Units 3 and 4 the Order Inspection Category in accordance with Section (IV.A.) is currently determined as "high" based on 18.3 EDY for Unit 3, and 18.6 EDY for Unit 4, at the next refueling outage[1] (RFO).

FPL Drawing No. 5610-M-400-57, Sheet 1, Rev. 2 (PTN-3)
FPL Drawing No. 5610-M-400-57, Sheet 3, Rev. 0 (PTN-4)
FPL Drawing No. 5177-125-M-401-1-1 Rev. 1 (PTN- 3 & 4)
FPL Drawing No. 5177-125-M-401-2-1 Rev. 1 (PTN- 3 & 4)

2. US NRC ORDER EA-03-009 APPLICABLE EXAMINATION REQUIREMENTS:

The NRC issued an Order[2] on Februay 11, 2003 establishing interim inspection requirements for reactor pressure vessel heads of pressurized water reactors. Section IV.C. of the Order states the following :

All Licensees shall perform inspections of the RPV head using the following techniques and frequencies :
(1) For those plants in the High category, RPV head and head penetration nozzle inspections shall be performed using the following techniques every refueling outage.
(a) Bare metal visual examination of 100% of the RPV head surface

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[1] FPL letter L-2002-185, "St. Lucie Units 1 and 2, Docket Nos. 50-335, 50-389, Turkey Point Units 3 and 4, Docket Nos. 50-250 and 50-251, Response to NRC Bulletin 2002-02, Reactor Pressure Vessel Head Penetration Nozzle Inspection Programs," R. S. Kundalkar to NRC, September 11, 2002.

[2] US NRC Letter EA-03-009, "Issuance of Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors," from Samuel J. Collins (NRC) to all Pressurized Water Reactor Licensees, Dated February 11, 2003.

(including 360° around each RPV head penetration nozzle), AND
(b) Either:
(i) Ultrasonic testing of each RPV head penetration nozzle (i.e., nozzle base material) from two (2) inches above the J-groove weld to the bottom of the nozzle and an assessment to determine if leakage has occurred into the interference fit zone, OR

(ii) Eddy current testing or dye penetrant testing of the wetted surface of each J-groove weld and RPV head penetration nozzle base material to at least two (2) inches above the J-groove weld.

Specifically, partial relaxation is requested from part IV.C.(1)(b)(i) or IV.C.(1)(b)(ii) of the Order for penetrations #59 and #60 at Turkey Point Units 3 and 4 as follows:

1. Not to perform non-destructive examination (NDE) of the RPV head penetration nozzle base material inside the tube from 2 inches above the J-groove weld to the bottom of the penetration.

2. Not to perform NDE of the RPV head penetration nozzle base material outside surface from one inch below the J-groove weld to the bottom of the penetration.

Relaxation is requested for one eighteen-month operating cycle for each unit.

3. REASON FOR REQUEST:

Pursuant to Order Section IV(F)(2) "Compliance with the Order for specific nozzles would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety", FPL is requesting this relaxation for Turkey Point Units 3 and 4. Turkey Points Units 3 and 4 appear to have a unique Reactor Vessel Level Monitoring System (RVLMS). The RPV head penetrations # 59 and # 60 were unused part length control rod drive mechanisms (CRDMs) that were modified to install reactor vessel level measurement system (RVLMS) probes (Figure 1). To laterally support each RVLMS probe guide, a 3.5 inch diameter plate, with a 1.487 inch diameter hole, was welded to the bottom of the RPV head penetration inside the RPV head (Figure 2). The welded support plate prevents access to the inside of the RPV head penetration nozzle to perform NDE from under the RPV head as required in part IV.C.(1)(b)(i) or IV.C.(1)(b)(ii) of the Order. Access to the inside of the RPV head penetration nozzle to perform NDE from the top of the RPV head is prevented by the approximately 22 foot RVLMS liner tube that can not be removed without cutting a full penetration pressure boundary weld at the top of the CRDM rod travel housing. If this liner tube is removed, there is no certainty that it can be replaced.

4. PROPOSED ALTERNATIVE AND BASIS FOR USE:

The proposed alternate examination is to perform a surface examination (dye penetrant or eddy current testing) of the J-groove weld and one inch of the outside surface of the base material below the weld for RPV head penetrations #59 and #60 for PTN-3 and 4.

BASIS FOR RELAXATION:

Gaining access to perform examination of the inside surface of the RVLMS modified RPV head penetrations (#59 and #60) will result in a hardship due to unusual difficulty without a compensating increase in the level of quality and safety.

Specifically, removal of the RVLMS support plate would require a hardware change by manual grinding to remove the attaching fillet welds (6 inch minimum per support plate) shown in Figures 1 and 2. After the RPV nozzle inspection, the support plate would have to be re-welded into position. This manual operation would be in a high radiation field at the RPV head ID surface with poor access; among a dense concentration of CRDM guide sleeves and funnels surrounding one side and the high hillside slope of the RPV head on the other side. The manual operation would also have to be carefully performed to avoid damage to the RPV head penetration end surface to a point that would require rework to re-weld the support plate.

Additionally, removal of the RVLMS guide sleeve to perform an inspection from the top of the RPV head penetration would also require a hardware change by cutting out a full penetration pressure boundary weld to remove the RVLMS guide sleeve. This would result in an opening in the CRDM rod travel housing that is smaller in diameter, and approximately 20 feet from the area of interest, for inspection in the RPV penetration. Currently, NDE inspection equipment and delivery systems are not available to do a top down inspection of a RPV head penetration nozzle with access through a smaller diameter opening, and to inspect the nozzle area over 20 feet away. To utilize existing equipment for a top down inspection, an additional cut in the CRDM housing would have to be made.

The dose to perform the manual RVLMS support plate removal and reinstallation for penetrations # 59 and #60 is estimated at 15-30 man rem. This constitutes a hardship due to ALARA concerns. The total dose estimate for the automated ultrasonic inspection of the remaining 64 RPV head penetrations, and bare metal inspection on top of the RPV head surface, is 5.36 man rem.

The complete bare metal visual inspection of the PTN 3 and 4 RPV head surface around the 66 RPV head penetrations will provide reasonable assurance as to the presence of any through wall flaws in a penetration tube material, and any

wastage of the RVP head material resulting from leakage. As identified in MRP-75[3] Appendix B, the probability of visually detecting leakage from a through wall flaw (originating in the ID nozzle material), which is a pre-existing condition for circumferential crack initiation, is extremely high. This is based on a generic interference fit analysis[3] and all field results to date. Since the fall of 2002, it has been postulated that a PWSCC flaw that initiated in the J-groove attachment weld may extend to a circumferential flaw in the nozzle material, without evidence of leakage on the top of the RPV head in the early stages. To address that concern for penetrations #59 and #60, the surface examination of the J-groove weld surface is proposed. The combination of a bare metal visual inspection on the top of the RVP head, and the surface examination of the J-groove welds, will provide an acceptable level of safety that a circumferential flaw that could lead to ejection has not initiated in penetrations #59 and #60 and that leakage has not occurred into the interference fit zone.

The weld surface examination area will include the J-groove weld and one (1) inch of the penetration tube base material adjacent to the J-groove weld. FPL has determined that the surface examination of only the weld, and the one (1) inch below into the tube surface, provides an acceptable alternative inspection without compromising the level of safety. This was determined using plant specific flaw analysis data [4] that it would take an axial crack with a crack tip one (1) inch below the weld (a non pressure boundary flaw), approximately 2.6 EFPY to extend to a point of contacting the pressure boundary J-groove weld. Since relief is being sought for only one operating cycle (1.5 EFPY), this is conservatively bounding. The evaluation uses plant specific stresses and operating temperature and the MRP-55 [5] crack growth rate predictions. The expected accumulated radiation dose to perform the proposed surface examinations is in the range of 0.5 to 1 rem. Preparing the entire outer surface of the penetration for examination would increase the exposure without a corresponding increase in safety.

The ultrasonic inspection results of the other 64 RPV head penetrations will also provide an indication as to the integrity of penetrations #59 and #60. The two alloy 600 RPV head penetrations modified for RVLMS (penetrations #59 and #60) at both PTN 3 and 4 are made from material heat # NX5940. At PTN-3, there are a total of 12 penetrations with this heat (including the 2 RVLMS

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[3] "PWR Reactor Pressure Vessel (RPV) Upper Head Penetrations Inspection Plan (MRP-75), Revision 1", Electric Power Research Institute (EPRI), Palo Alto, CA: 2002. 1007337.

[4] "Structural Integrity Evaluation of Reactor Vessel Upper Head Penetrations to Support Continued Operations: Turkey Point Units 3&4," Westinghouse Electric Company LLC WCAP 16027-P, Rev. 0, Draft, February 2003.

[5] "Material Reliability Program (MRP) Crack Growth Rates for Evaluating Primary Water Stress Corrosion Cracking (PWSCC) of Thick Wall Alloy 600 Material (MRP-55), Revision 1," Electric Power Research Institute (EPRI), Palo Alto, CA: 2002. 1006695.

locations), in both high and low hillside locations. Ten (10) of these penetrations will have complete inspections (ultrasonic and bare metal visual) in accordance with the Order. At PTN-4, there are a total of 7 penetrations with this heat (including the 2 RVLMS locations), in mostly high hillside locations. Five (5) of these penetrations will have complete inspections (ultrasonic and bare metal visual), in accordance with the Order. These ultrasonic examinations will give a good representation of the performance of material heat #NX5940 in the specific unit. The performance of these ultrasonic inspections, when combined with the bare metal visual inspection, and J-groove weld inspections of penetrations #59 and #60, will provide an acceptable level of quality and safety, without making hardware changes to the plant.

This request for relaxation will be withdrawn for PTN-3 if any of the following conditions exist or are discovered during the March 2003 refueling outage:

- If the bare metal visual inspection around penetration #59 or #60 has an indication of a leak coming from the penetration.
- If any of the 10 other RPV head penetrations of material heat # NX5940 have indications that initiate in the nozzle material and require repair to operate one additional 18 month refueling cycle. Repair requirements will be based on the NRC guidance of November 21,2001 and plant specific flaw evaluation.
- If any circumferential cracking at or above the J-groove weld is observed in any of the remaining 64 RPV penetrations that are being inspected with the ultrasonic inspection method.
- If examination of the J-groove weld and adjacent nozzle surface of penetrations #59 and #60 have observable indications that can not be cleared by grinding.

This request for relaxation will be withdrawn for PTN-4 if any of the following conditions exist or are discovered during the October 2003 refueling outage:

- If the bare metal visual inspection around penetration #59 or #60 has an indication of a leak coming from the penetration.
- If any of the 10 other RPV head penetrations at PTN-3, or 5 other RPV head penetrations at PTN-4, of material heat #NX5940 have indications that initiated in the nozzle material and require repair to operate one additional 18 month refueling cycle. Repair requirements will be based on the NRC guidance of November 21,2001 and plant specific flaw evaluation.
- If any circumferential cracking at or above the J-groove weld is observed in any of the remaining 64 RPV penetrations at PTN-4 that are being inspected with the ultrasonic inspection method.
- If examination of the J-groove weld and adjacent nozzle surface of penetrations #59 and #60 at PTN-4 have observable indications that can not be cleared by grinding.

If a defect is identified during the inspection, the issue will be addressed within the plant corrective action program. The disposition will address the impact on the other unit and will be discussed as part of the required 60 day post outage response mandated by the Order EA-03-009

Risk Evaluation:

A risk evaluation and R.G. 1.174 analysis were performed by Westinghouse[6] to document the change in risk associated with this relief request. The approach and results are described below:

Risk Evaluation Approach: The approach is to first establish the maximum number of axial and circumferential flaws that may be left in the base metal of the inspected population (64 penetrations per unit), with 95% confidence that no one flaw will exceed the pertinent critical flaw size during the desired time interval. This calculation uses a probabilistic model derived from extreme value theory, with values for inputs (critical sizes and crack growth rates) taken from a recently completed structural integrity study for Turkey Point Units 3 and 4 [4]. The maximum allowable number is then compared with the upper 95% confidence value on flaws projected to currently exist in the un-inspected RVLMS penetrations. This is based on a simple statistical evaluation of the assumed sample inspection results of no flaws found in the inspected penetrations. If the maximum allowable flaw number exceeds the upper confidence limit number, then it can be claimed, with at least 95% confidence, that the units can operate for the proposed 1.5 effective full power years (EFPY) without one or more of the un-inspected penetrations containing a crack that could progress to a critical size. This analysis is augmented with a Regulatory Guide 1.174 analysis to evaluate whether the incremental core damage risk associated with the delayed inspections is within regulatory guidelines.

Risk Evaluation Results: The analysis concludes that if no cracks or leaks are found in the inspected population, then it may be stated with at least 95% confidence that the un-inspected penetrations will not produce an axial or circumferential flaw that will exceed the assumed critical sizes over the proposed 1.5 additional EFPY (The actual calculated time to reach the critical size flaw is 7.5 EFPY). Further, the incremental core damage risk of waiting until the next refueling outage to examine the RVLMS penetrations is well within regulatory guidelines. These conclusions are based on conservative assumptions with respect to the average crack size, the level of stresses influencing crack growth, the circumferential crack growth rate, and the statistical implications of the inspected population results.

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[6] Westinghouse Letter Report STD-DA-03-05 to FPL, "Probabilistic Analysis of the Safety Risk Associated with Turkey Point Units 3 & 4's Unexamined CRDM Penetrations – with Addendum for Inspection of 1 Unit Only (Proprietary Version)" dated February 21,2003

Regulatory Guide 1.174 Analysis: Regulatory Guide 1.174 suggests that a contribution to plant risk is "small" if the contribution to plant core damage frequency (CDF) is no more than 1E-6. By implication, the incremental plant risk (equivalently, incremental probability of core damage) of extending the inspection interval for the RVLMS penetrations by 1.5 EFPY should not exceed 1.5 x 1E-6.

The probability of 1 or more leaks in the 2 penetrations is estimated to be 17.1%. The unconditional probability of a critical flaw (PCF) over the contemplated 1.5 EFPY for the two (2) subject penetrations is 9.85E-4 (PCF = 0.171* probability of circumferential flaw > critical length; for 1.5 EFPY is 0.171 * 5.76E-3 = 9.85E-4).

Assuming that a critical circumferential flaw is associated with an immediate small LOCA, the contribution to core damage probability (CCDP) for theTurkey Point units is 9.57E-4. The resulting increase in plant risk for postponing the inspection of the RVLMS penetrations is thus estimated to be 9.4E-7 (Incremental Risk = PCF * CCDP = 9.85E-4 * 9.57E-4 = 9.4E-7). The conservatively estimated increase in risk of 9.4E-7 is substantially smaller than the guideline value of 1.5 E-6.

Additional Risk Mitigating Factors: The following factors, although not considered in the above calculations, serve to further mitigate the consequences of postponing the RVLMS penetration inspections for one cycle:

- A typical CRDM nozzle ejection would result in a flow path of 2.75" diameter (I.D. of nozzle), or 5.939 square inches. For a RVLMS penetration, the lower portion of the CRDM nozzle and the welded support plate would be assumed to remain in place, due to its substantial design and a postulated nozzle ejection resulting from a circumferential flaw above the J-groove weld. This configuration would result in a sleeve hole of 1.487" diameter, or 1.737 square inches, plus four 5/16" diameter weep holes, 0.306 square inches, for a total open area of 2.040 square inches. The resulting flow area from a RLVMS nozzle ejection is substantially less than the small break LOCA assumed for the typical 2.75" inside diameter of a CRDM. The 2.040 square inch area is equivalent to a 1.61 inch diameter LOCA, which falls into the small-small break LOCA category, and has a CCDP less than that used in the risk analysis (9.16E-4 for small-small LOCA).

- Turkey Point Units 3 and 4 have a reactor vessel head leak detection system capable of detecting leakage on top of the RPV head inside the CRDM cooling shroud. This standby system was installed as an enhancement to the normal on line monitoring of RCS leak rate and containment radiation monitoring. When this system is cycled to the head detection mode, it can provide the capability of determining if the leak is

located in the area of the RPV head. The system is used as a diagnostic tool if leakage of an indeterminate source is noted.

The system collects the samples to be monitored from the reactor head area (CRDM cooler discharge) for comparison with the background containment atmosphere sample. A Beta scintillation detector (Particulate), which provides a signal to a rate meter in a remote display rack, analyzes the samples. The detector response to leaks is proportional to the RCS activity level. The system is checked for functionality periodically, by procedure, to determine system operability. It has a rate meter alarm that illuminates, should the radiation level increase above 1×10^7 counts per minute, and a fail alarm that is checked during the periodic operability check. This system provides additional assurance that leakage would be detected on the RPV head between periods of inspection, before significant degradation could occur.

Based on the information presented above, it is concluded that the proposed alternative inspection provides an adequate level of quality and safety.

5. DURATION OF PROPOSED ALTERNATIVE:

This relaxation is scheduled to be implemented, if approved, during the planned March 2003 refueling outage for PTN-3 and the planned October 2003 refueling outage for PTN-4. After one operating cycle from the 2003 identified refueling outages, penetrations #59 and #60 at PTN-3 and 4 will be inspected as per the Order, or the heads will be replaced.

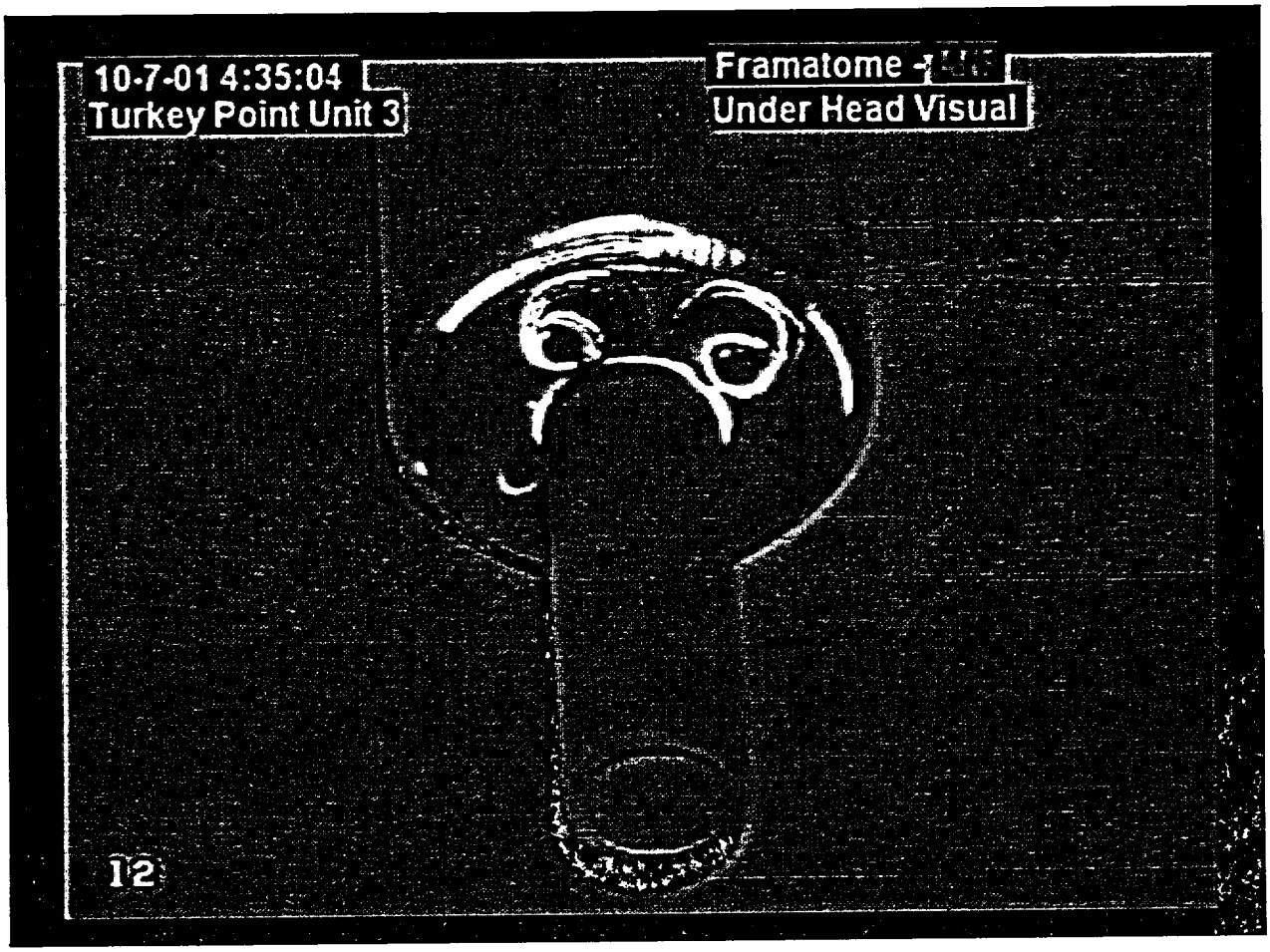

Figure 1
PTN-3 RVLMS Guide Sleeve and Support
(Typical for PTN-4)

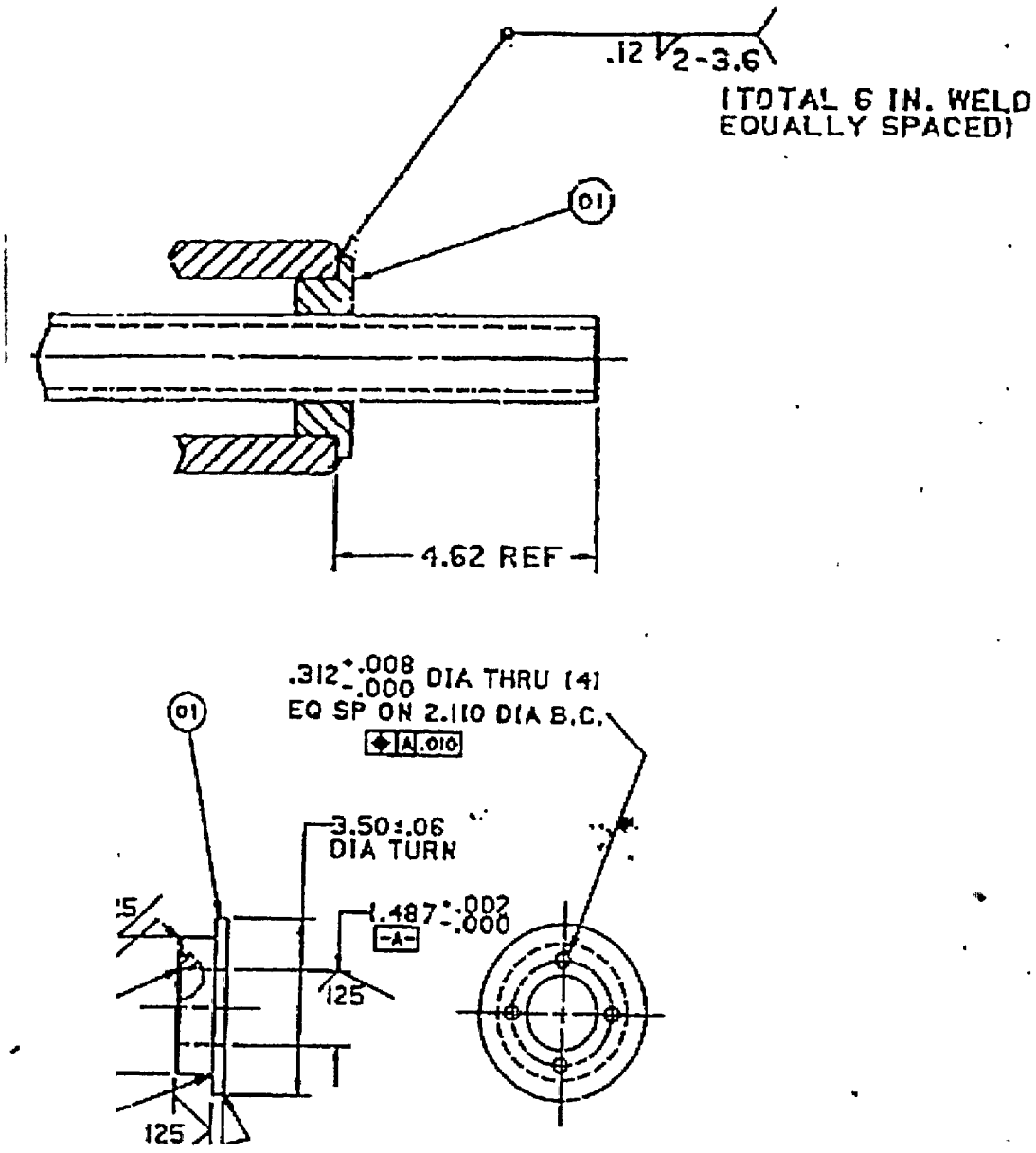

Figure 2: **Sketch of PTN-3 and 4 RVLMS Guide Sleeve Support Plate for Penetrations # 59 and # 60**