Florida Power & Light Company, 6501 S. Ocean Drive, Jensen Beach, FL 34957

FPL

March 23, 2004

L-2004-071
EA-03-09(IV)(F)(2)

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

Re: St. Lucie Unit 1
Docket No. 50-335
Order (EA-03-009) Relaxation Requests 1 and 2
Examination Coverage of Reactor Pressure
Vessel Head Penetration Nozzles – Supplement 1

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. By letter L-2003-283 dated November 21, 2003 and pursuant to the procedure specified in Section IV, paragraph F of the Order, Florida Power & Light Company (FPL) requested relaxation from certain requirements specified in Section IV, paragraph C (1) for St. Lucie Unit 1. On February 20, 2004, the NRC issued first revised order EA-03-009. On March 4, 2004 during a conference call between FPL and the NRC, FPL was asked to clarifiy the need for the staff to continue the review of St. Lucie Unit 1 Relaxation Requests 1 and 2. On March 11, 2004, the NRC Project Manager asked FPL to docket the basis for the continued need for the relaxation requests.

A summary of the March 4 conference call and the basis for the continued review are provided in Attachment 1 of this letter. Attachment 2 provides the requested stress plots vs. distance below the weld toe developed by Westinghouse for St. Lucie Unit 1.

FPL requests that the NRC complete their review and approval of the subject relaxation requests as soon a reasonably achievable as the St. Lucie Unit 1 refueling outage (SL1-19) started on March 22, 2004.

Please contact George Madden at (772) 467-7155 if there are any questions about the relaxation.

Very truly yours,

William Jefferson, Jr.
Vice President
St. Lucie Plant

Attachments (2)

A101

Record of Conference Call between FPL and the NRC

On March 4, 2004, a conference call was held between FPL and the NRC. The call was held to clarify the need to continue review of the Relaxation Requests 1 and 2, submitted by FPL letter L-2003-283[1], for inspection of the St. Lucie Unit 1 reactor pressure vessel (RPV) head and penetrations in accordance with NRC Order EA-03-009. Specifically, the NRC wanted to determine if FPL still needed relaxation under the requirements of the first revised NRC Order EA-03-009 dated February 20, 2004.

In regards to the visual relaxation (#1), the first revised Order section IV.C.(5)(a), requires inspection of 100% of the surface and 360° around each penetration for all elevations upslope of the outer most RPV penetrations. The revised 95% coverage requirement is only applicable down slope of the outer most penetrations. For St. Lucie Unit 1, an obstruction at nozzle #2 precludes examination of approximately 1/8 of its circumference where it penetrates the RPV head. There are also some small surface areas between penetrations that are obstructed by the insulation. Since the potential obstructions identified in the FPL relaxation request are at elevations above the outermost RPV penetrations, relaxation from the 100% criteria and 360° for nozzle #2 is still requested.

In regards to the ultrasonic testing (UT) relaxation (#2), the first revised Order section IV.C.(5)(b)(i), provides an option to perform UT from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 1.0-inch below the lowest point at the toe of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) and including all RPV head penetration nozzle surfaces below the J-groove weld that have an operating stress level of 20 ksi tension and greater. Relaxation Request #2 was submitted to the original order because difficulty was observed collecting UT data both 0.75 inches above and below the J-groove weld root and weld toe of the 69 control element drive mechanism (CEDM) penetrations. In support of this relaxation request, FPL utilized the generic work on operational stresses both above and below the weld extremes in MRP-95. Plant specific stress analysis, documented in WCAP-15945[2], shows that if an axial flaw were to exist below the proposed 0.75-inch limit below the weld toe, it would take greater than five years to grow to a point of contacting the weld for all locations. Additional analysis has been performed by Westinghouse to identify the distance below the weld at which the operational hoop stress levels drop below 20 ksi tensile. This analysis shows that:

1. The operational stress levels on the outside diameter (OD) of the penetration drop below 20 ksi at approximately 0.5 inches below the weld toe for all penetrations modeled (0° through 42.5°). Therefore, 0.75 inches below the weld bounds all OD locations.

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[1] FPL letter L-2003-283, St. Lucie Unit 1, Docket No. 50-335, Order (EA-03-009) Relaxation Requests 1 and 2, Examination Coverage of Reactor Pressure Vessel Head Penetration Nozzles, William Jefferson Jr. to NRC, November 21, 2003.

[2] WCAP 15945-P, Rev. 1, Structural Integrity Evaluation of Reactor Vessel Upper Head Penetrations to Support Continued Operations: St. Lucie Unit 1, Westinghouse LLC, November 2002. Submitted to the NRC by FPL Letter L-2002-233 on November 21, 2002.

2. The operational stress levels on the tube inside diameter (ID) fall below 20ksi at 1.2 inches for the 0° location and trends down to approximately 0.4 inches below the weld toe for the outer most 42.5° nozzle angle as shown in the attached plot. The distance of coverage on the ID surface is approximately 0.39 inches greater (toward the bottom of the nozzle) than that at the OD due to the vertical spacing of the sending and receiving UT transducers (discussed in L-2003-283). Therefore, the 0.75-inch distance below the weld measured on the OD surface corresponds to 1.14 inches of coverage below the weld toe on the ID surface. The 1.14 inches of UT coverage on the ID surface (0.75 inches of scan distance measured on the OD surface) bounds all nozzles ≥ 11°, based on the trend of the attached 20 ksi drop off plot.

3. There is only one 0° nozzle. All other nozzles have a nozzle angle ≥ 11°. The OD of the 0° nozzle is bounded by the actual coverage achieved in the 2002 examination where a distance of one inch was reached. This is equivalent to 1.39 inches on the ID. The ID has a hoop stress of less than 20 ksi at 1.39 inches. Therefore, the 0° nozzle inspection will satisfy the revised Order requirements, assuming what was achieved previously is achieved on this inspection.

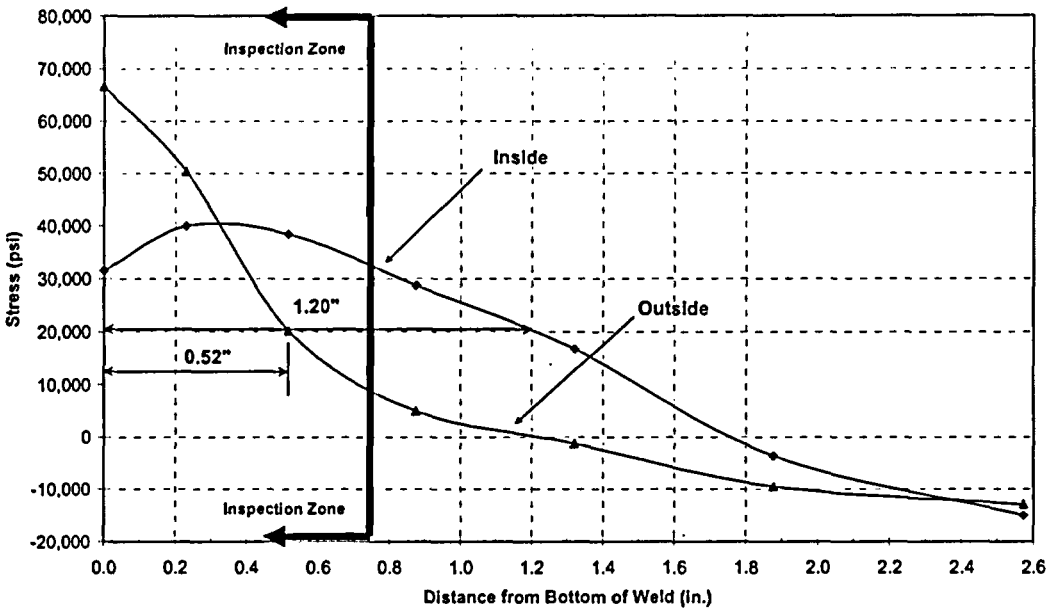
The actual stress plots and distance below the weld toe are attached. Accordingly, relaxation is not necessary from the requirement to inspect all areas where greater than 20 ksi tensile stresses exist. However, relaxation is requested from the one inch below the toe of the weld minimum inspection requirement.

Relaxation to 0.75 inches above the highest point of the weld root instead of 2 inches above the weld root is also still requested due to limitations observed in the prior inspection outage above the weld. Part of the interference is due to reduced clearance associated with the two counter bores in the nozzle. MRP 95 shows that both axial and hoop stress levels in this region drop off quickly to at least below 70% of the penetration yield stress, or below 20 ksi for most all CEDM/CRDM locations modeled, with the exception of the 0°. FPL expects that UT examination of the 0° nozzle will include approximately one inch above the weld. The WCAP-15945 plant specific analysis also indicates that the stresses are low, such that a flaw outside of the proposed inspection area would not grow to an unacceptable size for several operating cycles. Finally, a review of prior plant inspection data from a large cross-section of US pressurized water reactors, documented in MRP-95, revealed that of the 237 flaw indications reported, all flaws would have been detected had the inspections been limited to the 0.75 inches proposed examination zones.

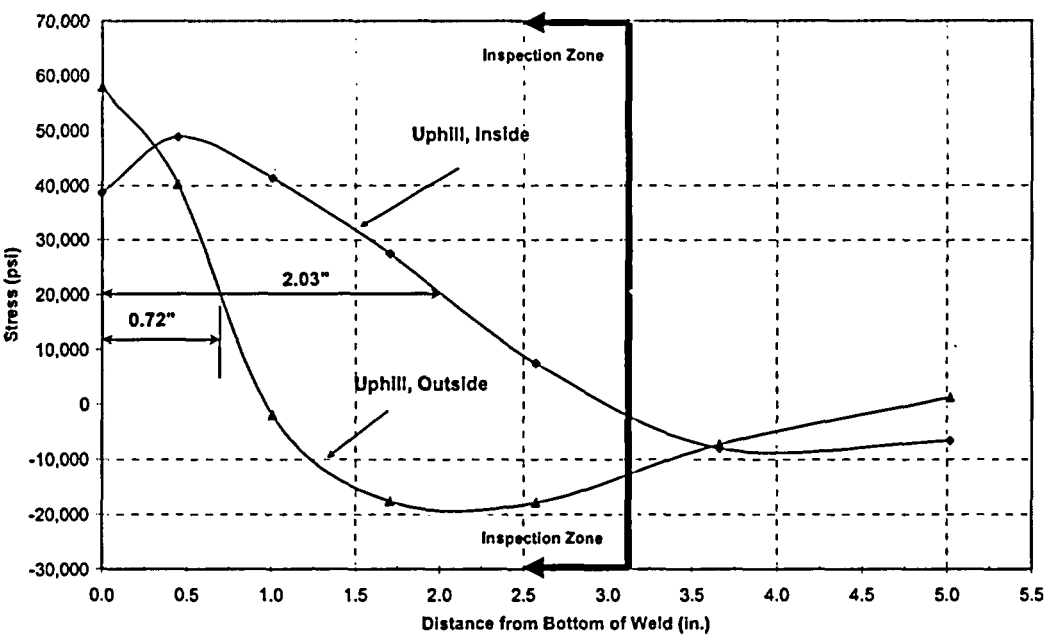
It is common practice to use 70% of yield stress as a threshold for primary water stress corrosion cracking (PWSCC). The 20 ksi was selected as a PWSCC threshold in MRP–95 because it is a low bound for the industry. The 20 ksi corresponds to approximately 70% of the 30 ksi minimum yield strength for SB-167 alloy 600 products. St. Lucie Unit 1 has material with yield strength from 39.5 ksi to 54 ksi, which suggests that the lower bound for PWSCC could be closer to 27 ksi for the 39 ksi material. These higher stress values provide additional margin for the identified inspection area.

In all cases the actual examination will be attempted to the maximum extent practical both above the weld root (> 0.75 inches) and below the weld toe to the bottom of the penetration.

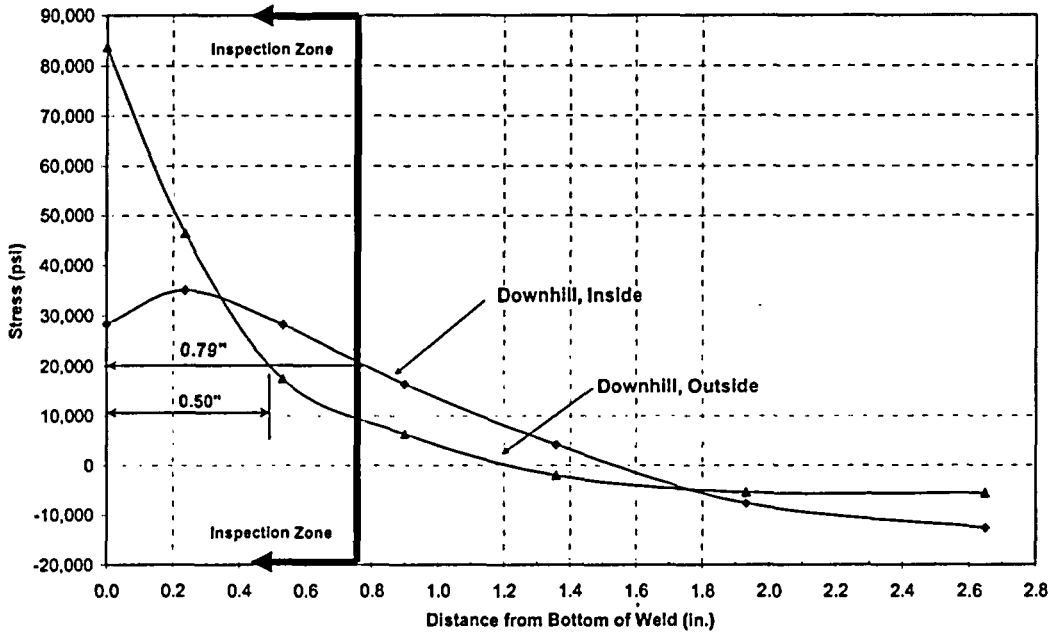
Hoop Stress in 0° CEDM Nozzle vs. Distance from Bottom of Weld, Uphill and Downhill



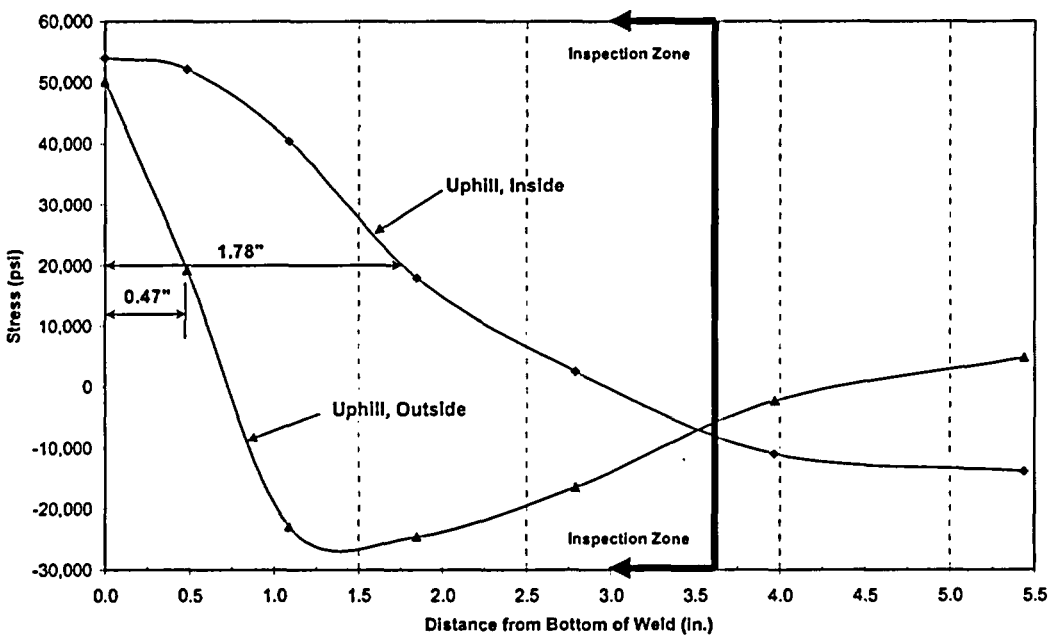
Hoop Stress in 29.1° CEDM Nozzle vs. Distance from Bottom of Weld, Uphill



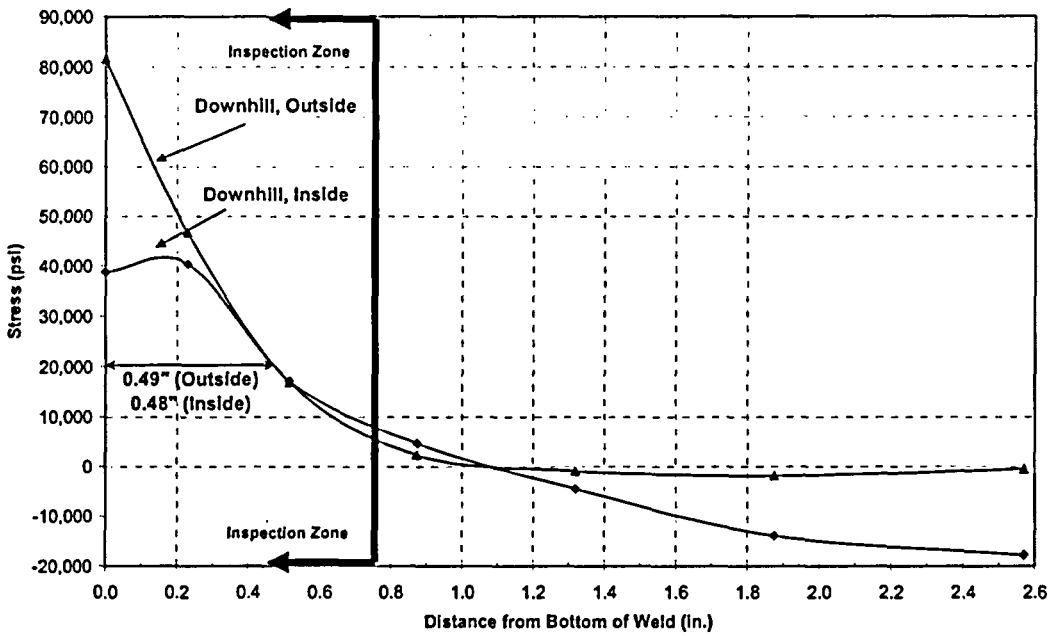
Hoop Stress In 29.1° CEDM Nozzle vs. Distance from Bottom of Weld, Downhill



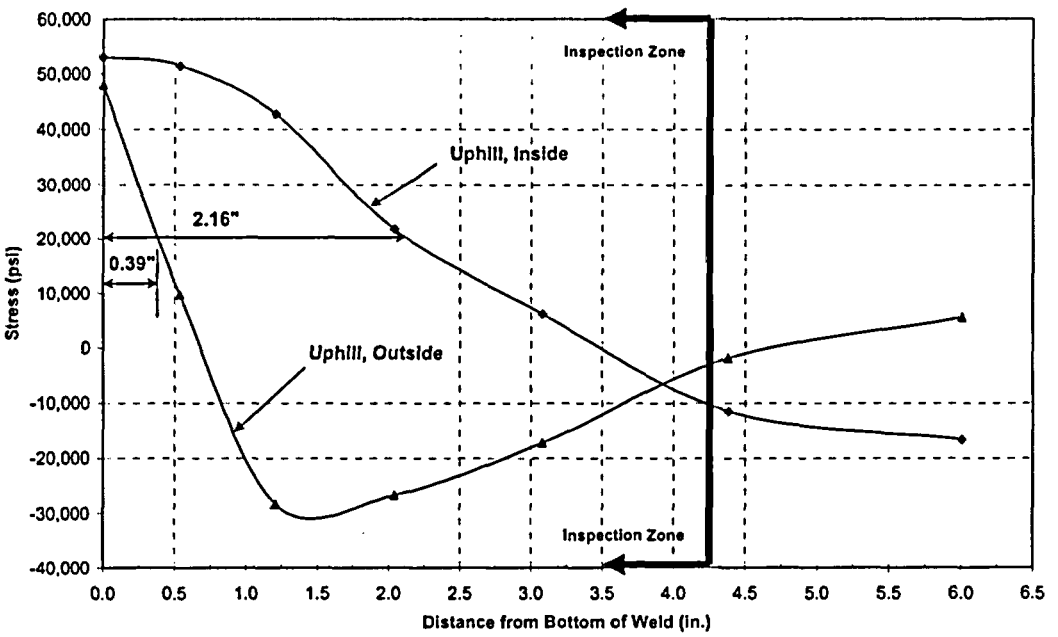
Hoop Stress In 37.1° CEDM Nozzle vs. Distance from Bottom of Weld, Uphill

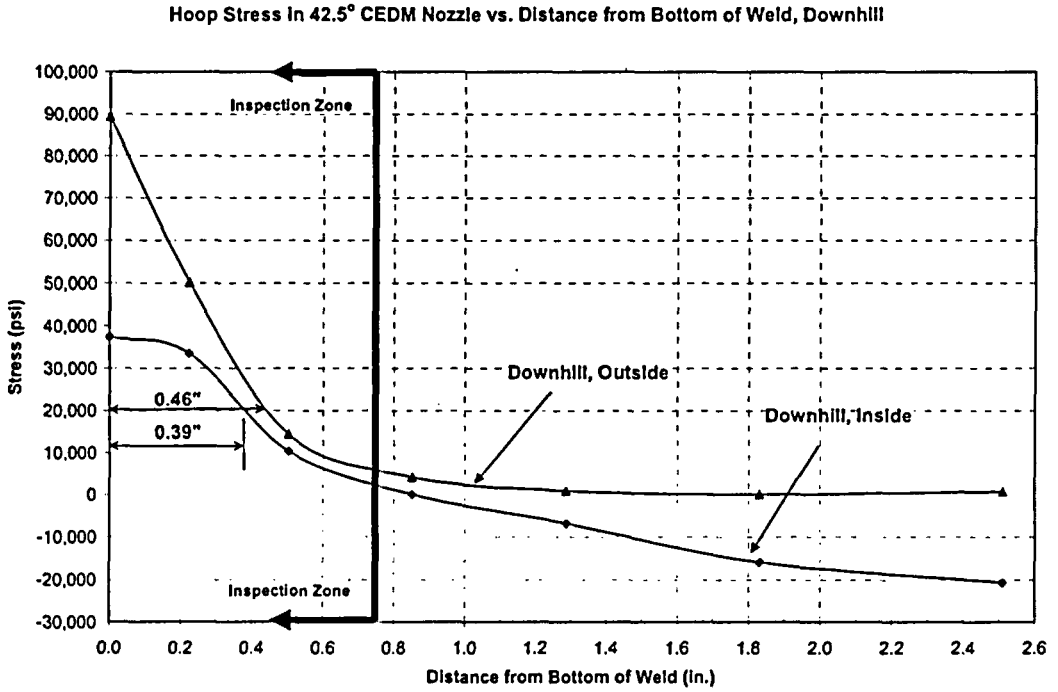


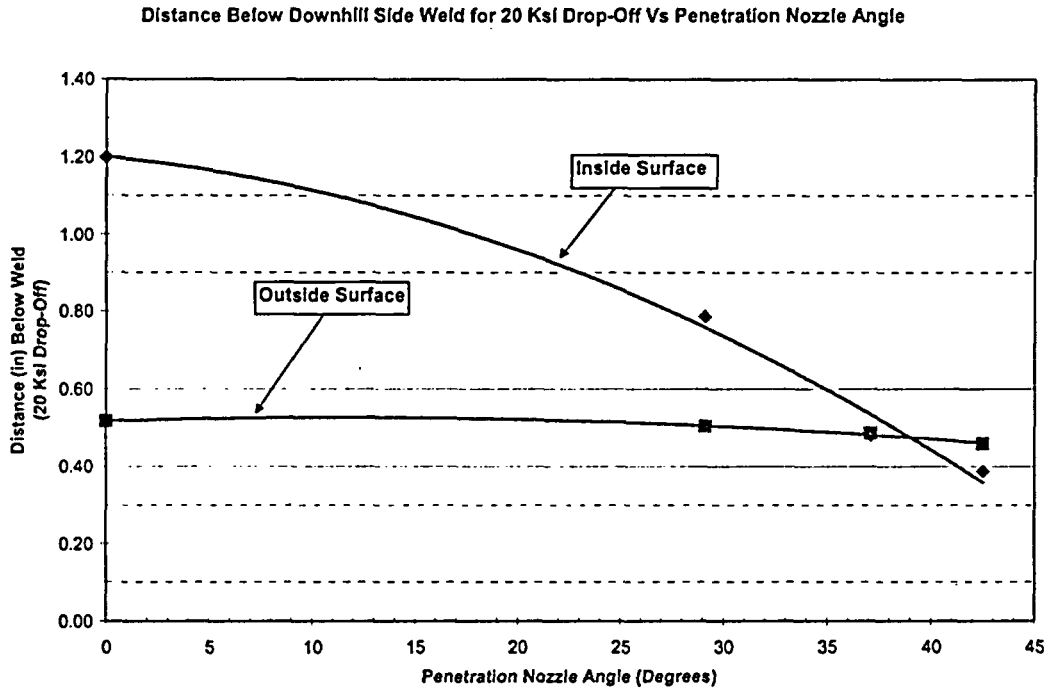
Hoop Stress in 37.1° CEDM Nozzle vs. Distance from Bottom of Weld, Downhill



Hoop Stress in 42.5° CEDM Nozzle vs. Distance from Bottom of Weld, Uphill




Hoop Stress in 42.5° CEDM Nozzle vs. Distance from Bottom of Weld, Downhill
Stress (psi)
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
-10,000
-20,000
-30,000
Inspection Zone
Inspection Zone
0.46"
0.39"
Downhill, Outside
Downhill, Inside
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
Distance from Bottom of Weld (in.)


Distance Below Downhill Side Weld for 20 Ksi Drop-Off Vs Penetration Nozzle Angle
Distance (in) Below Weld (20 Ksi Drop-Off)
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Inside Surface
Outside Surface
0
5
10
15
20
25
30
35
40
45
Penetration Nozzle Angle (Degrees)