Research Update on CASS Piping NDE

CASS Research Focus Area

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NDE Reliability

NRC Public Meeting
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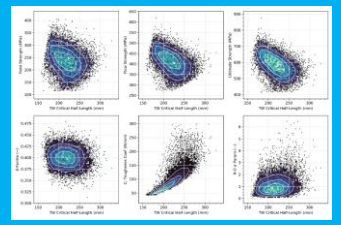
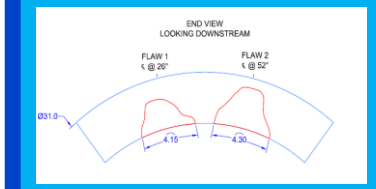
Rockville, MD

EPRI's Major Focus Areas for CASS



Probabilistic Fracture Mechanics Evaluation of CASS PWR Piping Components



Flaw Fabrication for CASS Examinations

Technique Enhancements for CASS Examination

- Improvements were noted on 12” and 28” series specimens
  - **100% detection of circumferential flaws with weld crown in place**
  - Flaw sizing remains challenging
- No major improvements for 36” series specimens
  - **Undetected flaws remain**
  - Detection of unintended defects versus intended flaws
  - **Sizing unreliable in most cases**
  - Flaw implanting technology needed
- Weld crown removal resulted in increased characterization capabilities

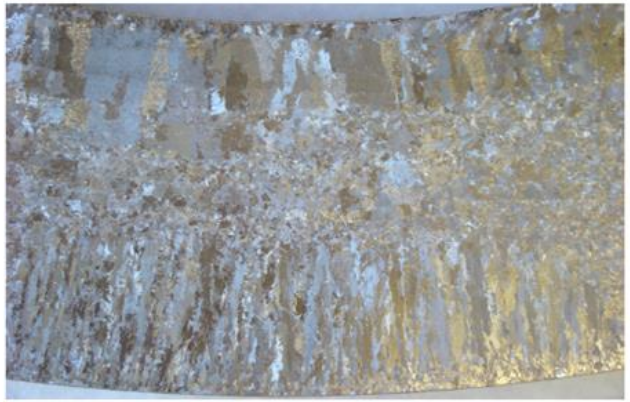


Figure 2-6
Microstructure from Downstream Side of 28-in. Specimen Material (vintage material from pipe manufacturer)

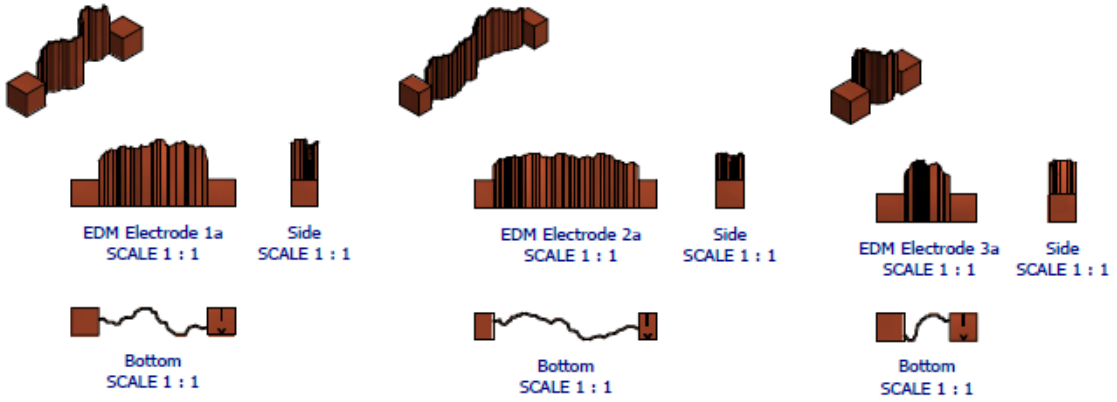
Figure 2-7
Microstructure from 36-in. Specimen Material (vintage material from canceled plant)

Current Activities

- Working closely with MRP project team that is using probabilistic fracture mechanics (PFM) analytical evaluations to help limit the technical challenges that NDE has experienced and allow for development of a Supplement 9 to Appendix VIII
  - This work is key to the overall success of the project
    - Axial Flaw Detection
    - Circumferential Flaw Sizing Limitations
- Technique development is focused on
  - Detection, length sizing of circumferential flaws
- Flaw manufacturing development and testing
- Evaluating Examination Frequency of Cast Piping
  - Survey of US fleet

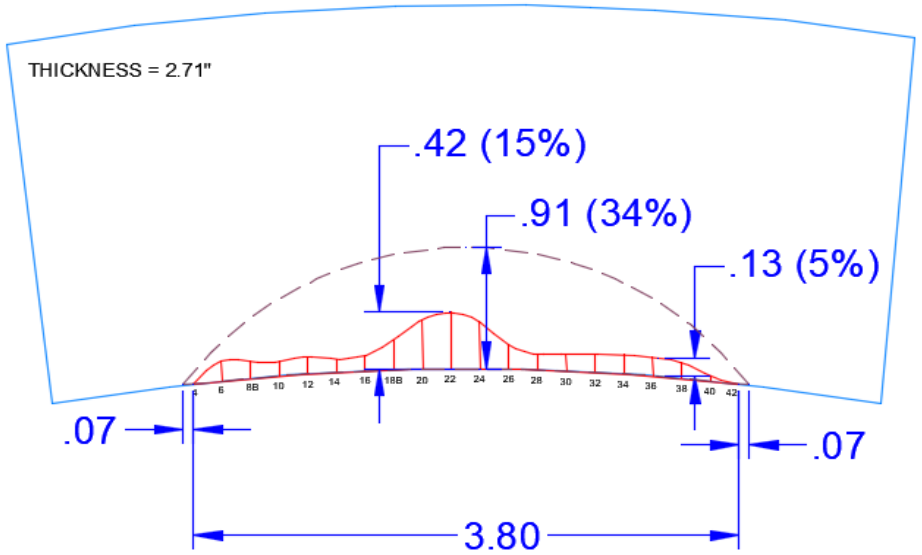
Flaw Implantation Development

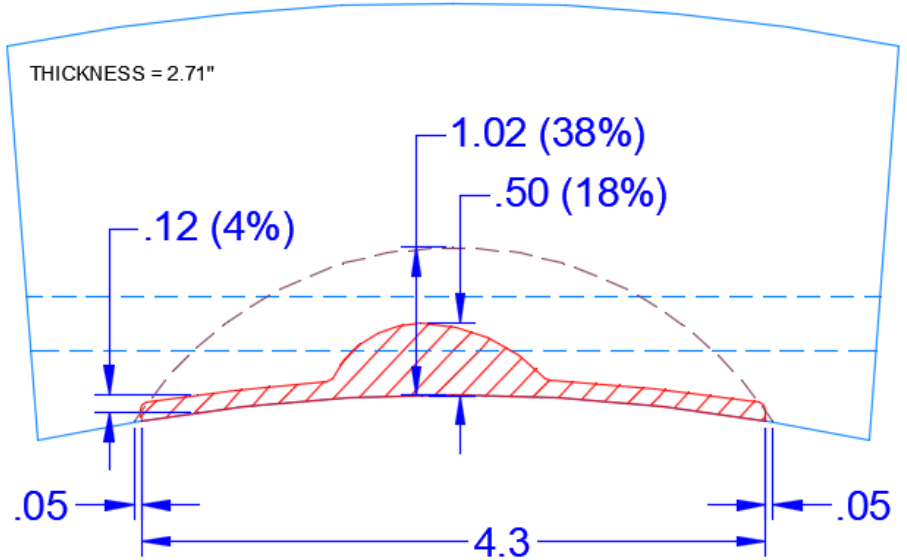
- Work underway is focused on developing reliable methods to implant flaws to known depths greater than 25% of the wall thickness that do not leave unfavorable ultrasonic signatures



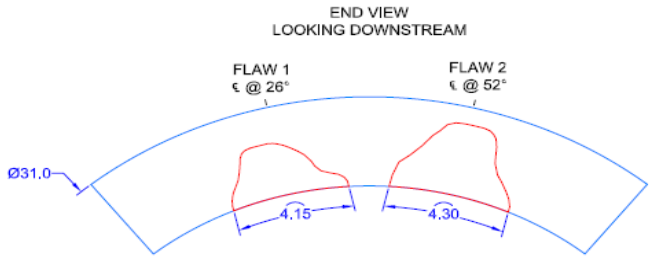
Flaw Implantation Development (Continued)

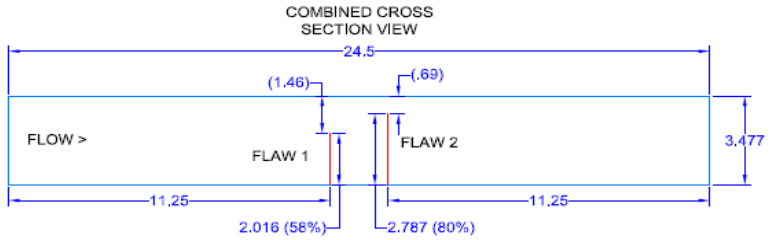
- Issues
  - Flaw A
    - Intended depth: 0.91” (23 mm)
    - Actual depth: 0.42” (11 mm)
  - Flaw B :
    - Intended depth: 1.02” (26 mm)
    - Actual depth: 0.5” (13 mm)

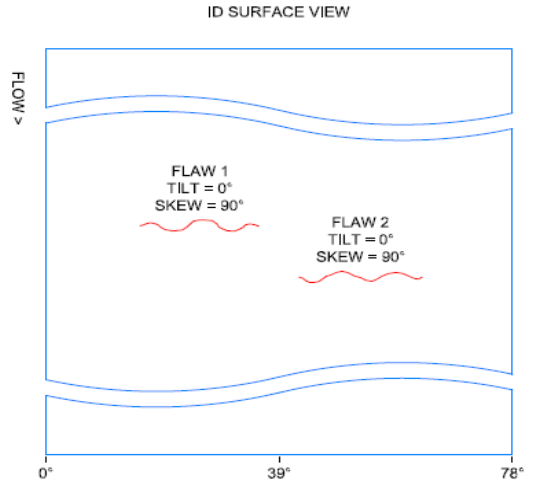




Flaw Implantation Development (Continued)







NOTES:

1. ALL FABRICATION PERFORMED IN ACCORDANCE WITH EPRI FABRICATION PROGRAM DOCUMENT GW FABSPEC 01 REV.00.

REVISION BAR	PREPARED BY	DATE	REVIEWED BY	DATE	APPROVED BY	DATE
DESCRIPTION						REV

EPRI

TITLE:
EPRI CASS SPECIMENS
WAVY EDM NOTCH SPECIMEN
WBS; 1-108751-02-01

DESCRIPTION:
DETAILED FLAW VIEWS
NON-SECURE AS-BUILT DRAWING
SPECIMEN ID; 347-31-01P

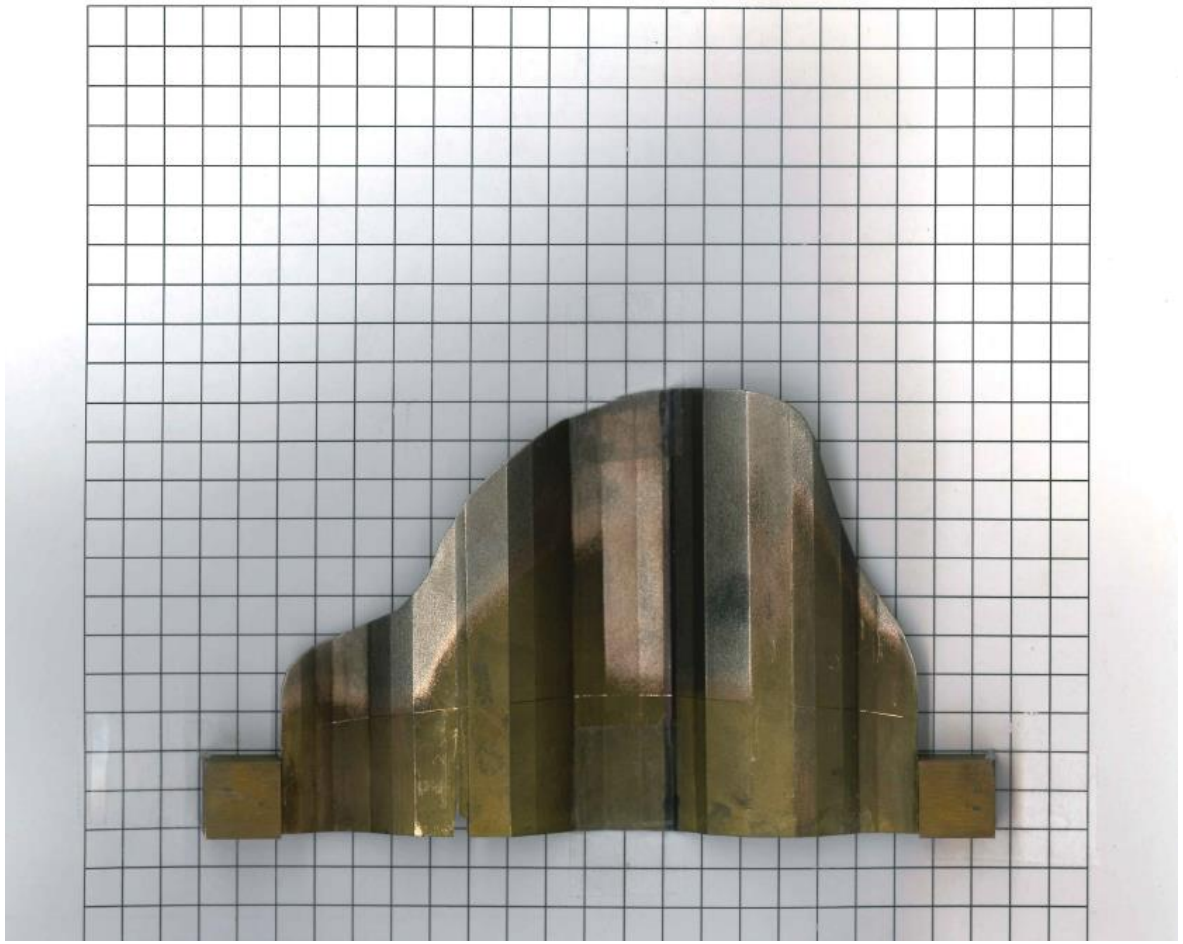
PREPARED BY:	DATE:	DWG. NO.	REV.
M. MCCALLUM	18 JUNE 2024	347-31-E01P	00

SIZE	SCALE: 1:4	SHEET 1 OF 1
B		

Flaw Implantation Development (Continued)

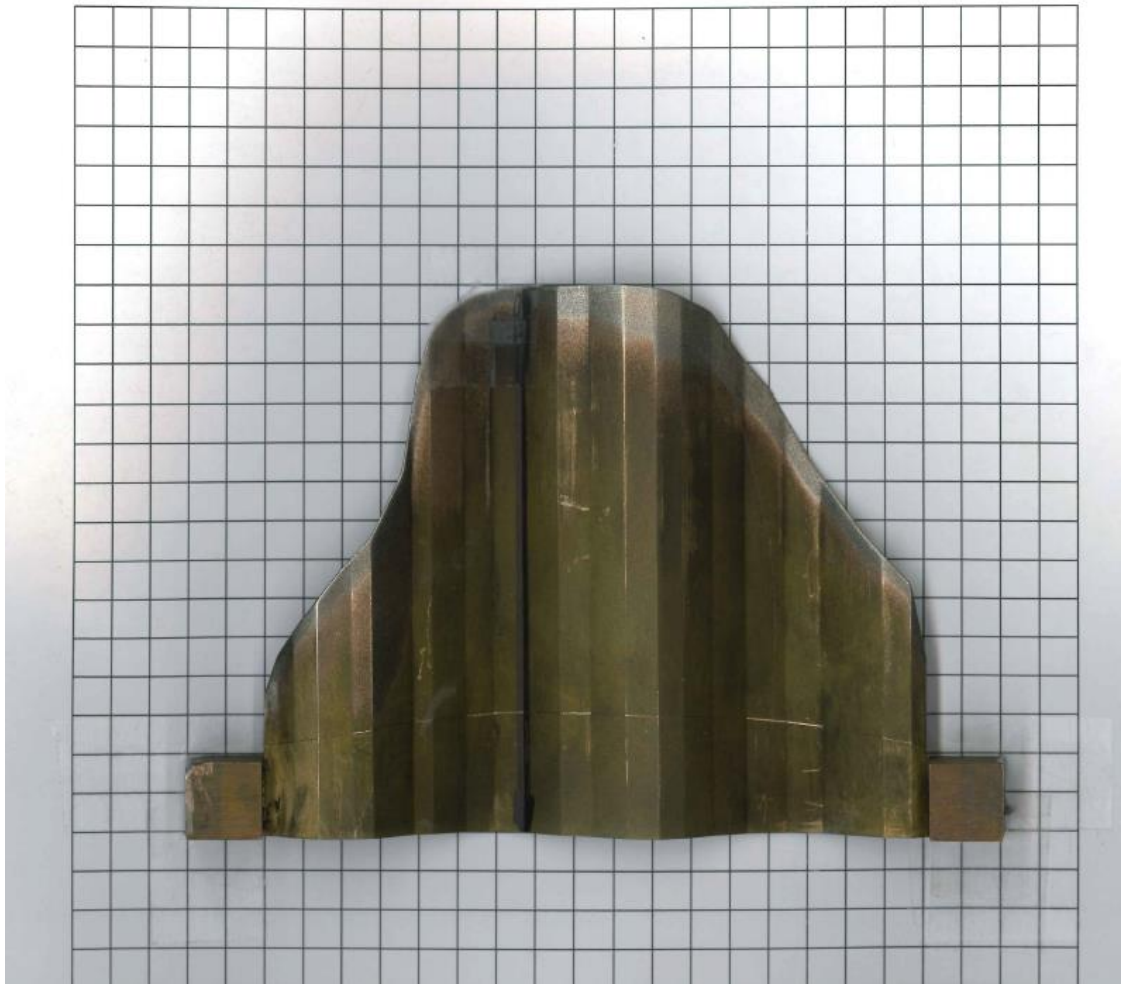
Flaw #: 1

Grid Size: 0.25”

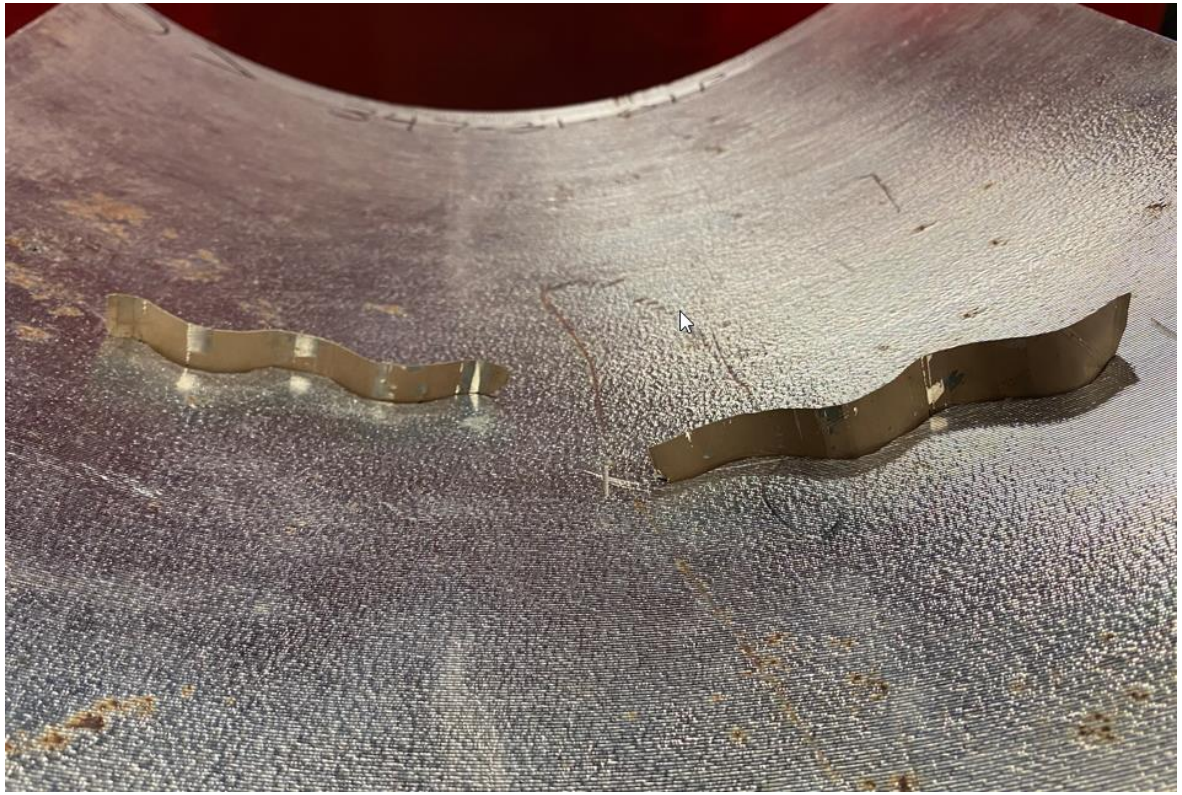


Flaw #: 2

Grid Size: 0.25”



Flaw Implantation Development (Continued)



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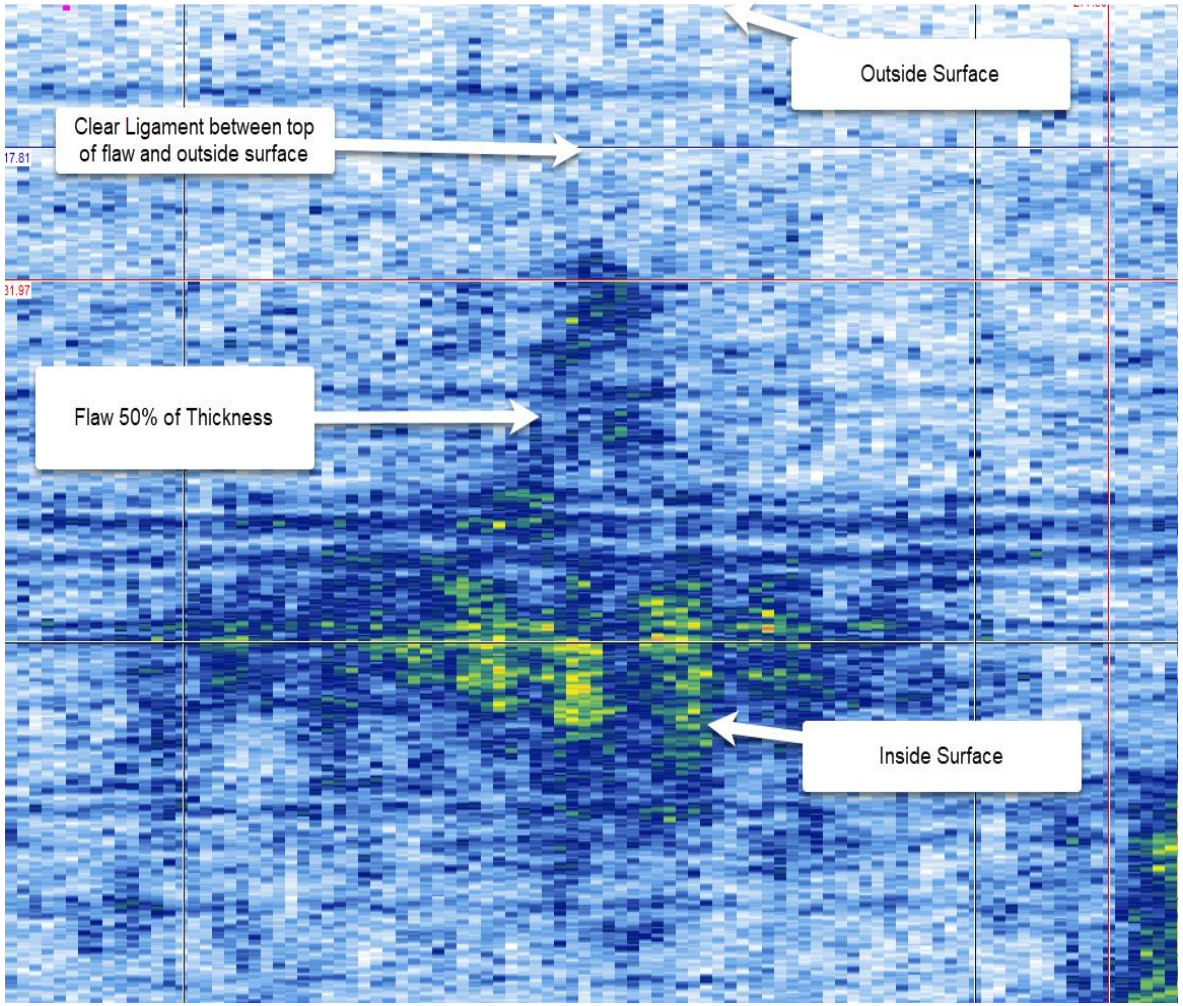
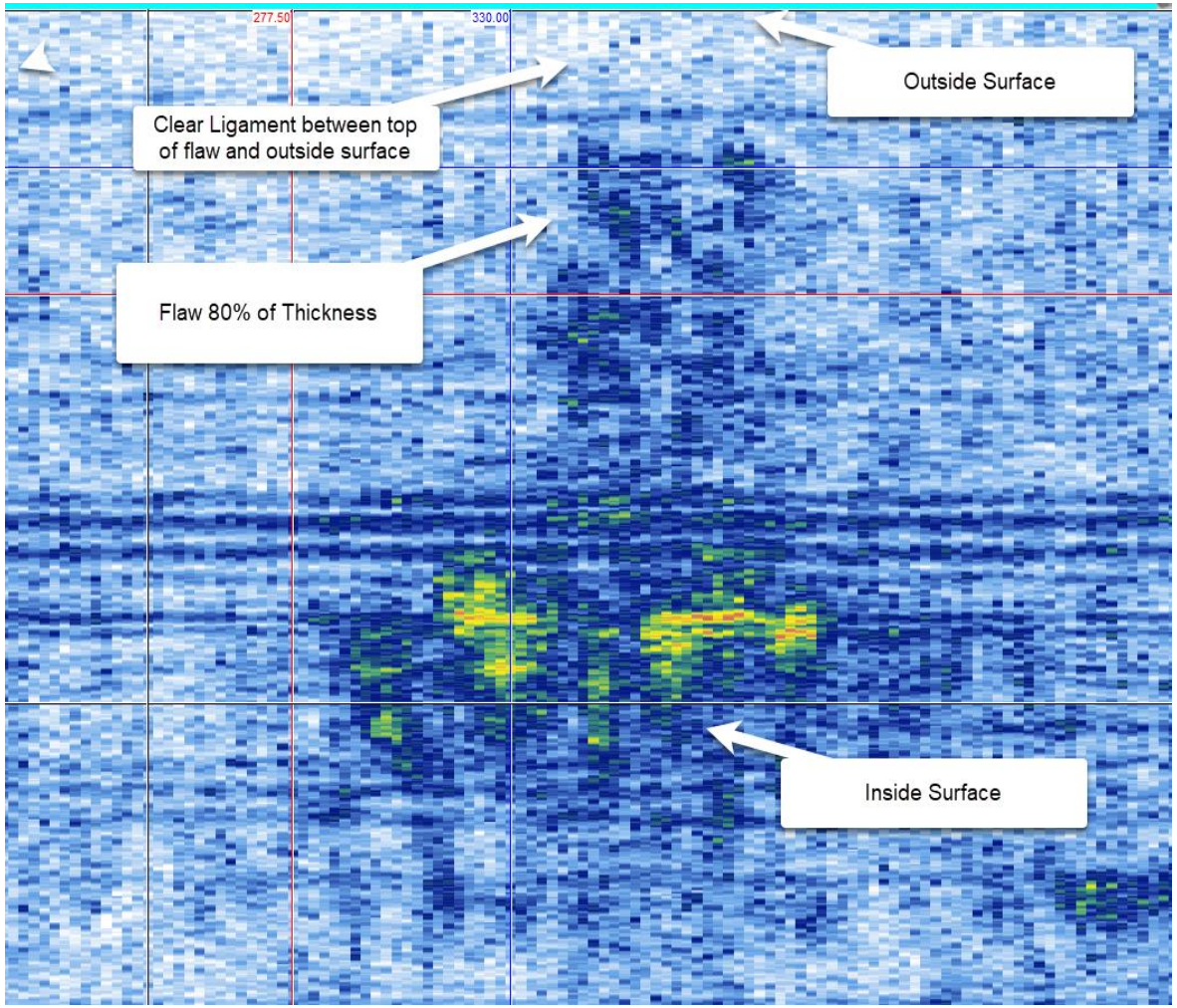
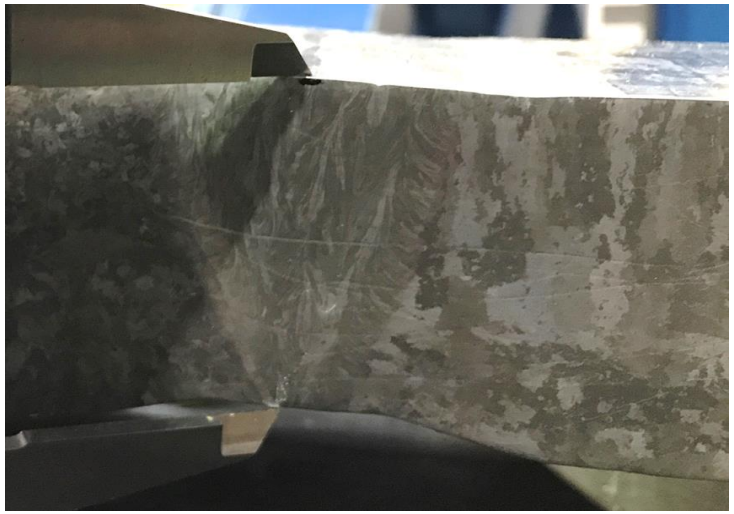




Additional CASS NDE Projects Underway

Projects

- Multi-Frequency Phased Array UT for CASS Piping Welds
- Advanced Ultrasonic Techniques for CASS Materials (Users Group)
- CASS Performance Demonstration Program Development



CASS Survey

- Preliminary discussions with industry indicate that in the United States RI-ISI programs have significantly reduced the number of examinations required
- EPRI has been requested to organize a survey to determine;
  - How many CASS piping examinations are included in utility inspection programs
  - What types of components are required to be examined
    - Safety injection saddle welds
    - RCS butt welds
    - Branch connections

Summary

- The acceptance of the PFM work and resultant Code changes is an important factor in successfully developing an effective qualification program and examination strategy for CASS
- Improved flaw making techniques show promise
- Alternative evaluation techniques are being explored to help with the characterization of potential flaws
- Industry is conducting survey to determine the scope of examinations being performed on CASS piping

Questions/Comments/Feedback

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