



PDI Dissimilar Metal Weld Program Limitations

PDI/NRC Information Meeting

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New Orleans, Louisiana

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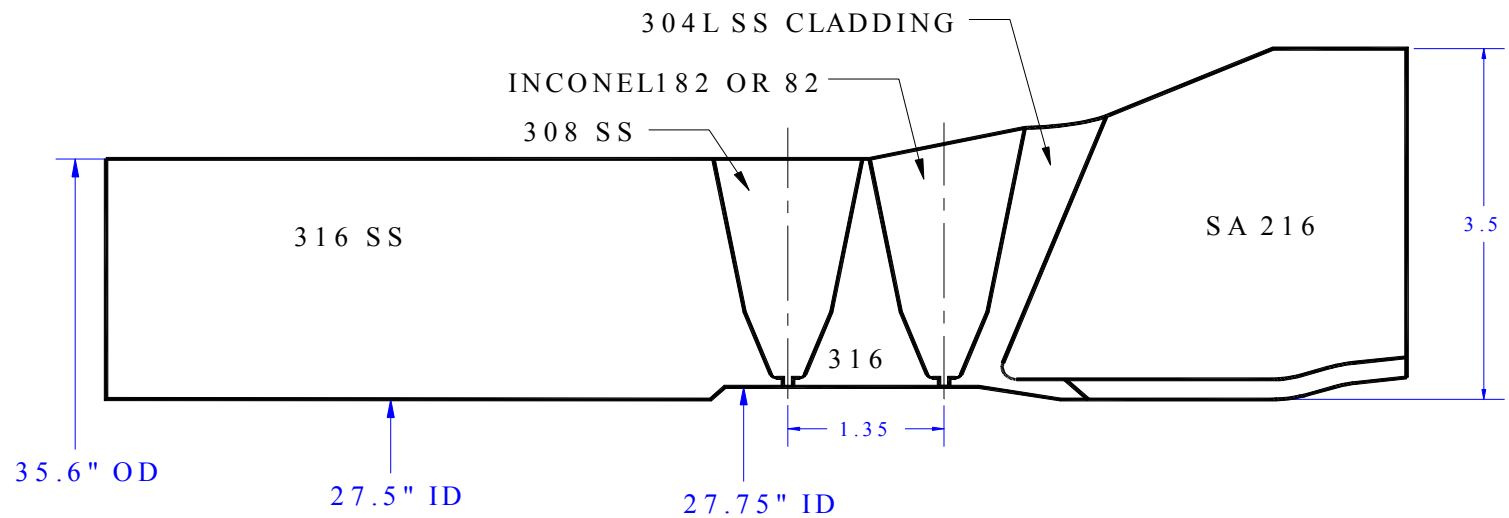
Outside Surface Examinations

▲ Manual

- Limitations to procedure and personnel qualifications
 - This procedure/candidate is not qualified for examinations performed from the cast stainless steel side of a component (Supplement 9)
 - This procedure/candidate is not qualified for through wall sizing.
 - This procedure/candidate is only qualified to length size circumferentially oriented flaws (Excluded from Supplement 10)
 - This procedure/candidate is not qualified for examinations where the ultrasonic sound beam is required to propagate through an adjacent austenitic weld prior to impinging on the dissimilar metal weld. The PDI 711 series sample is an example of this configuration

Outside Surface Examinations

36" PWR STEAM GENERATOR NOZZLE CONFIGURATION (711/X)





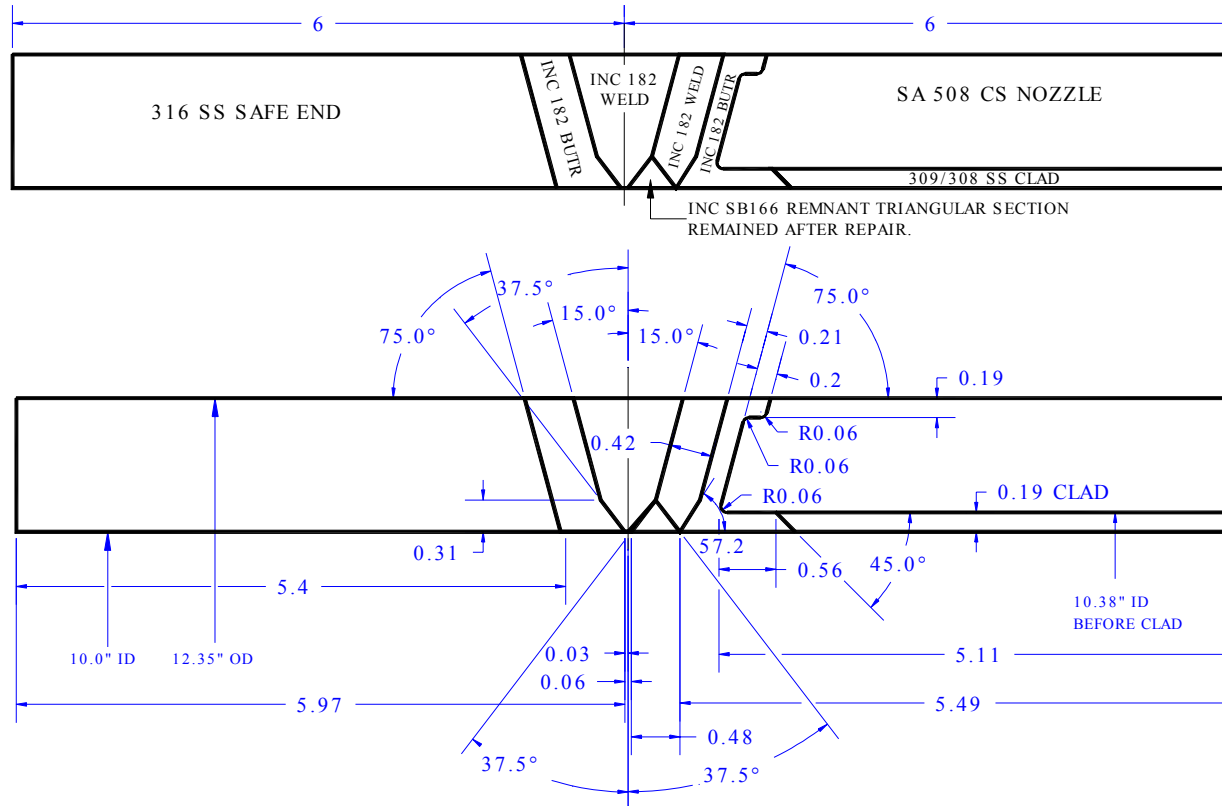
Outside Surface Examinations

▲ Manual (Cont.)

- Examination of safe-end replacement configurations, identified as 706 and 707 series configurations in the PDI Program are qualified.
- This procedure/candidate is qualified for examination from both single and dual sided access as applicable
- Weld crown must be ground flush and configuration must allow **unobstructed access** across the entire weld crown and butter
 - *This includes lack of contact caused by tapers or other discontinuities*

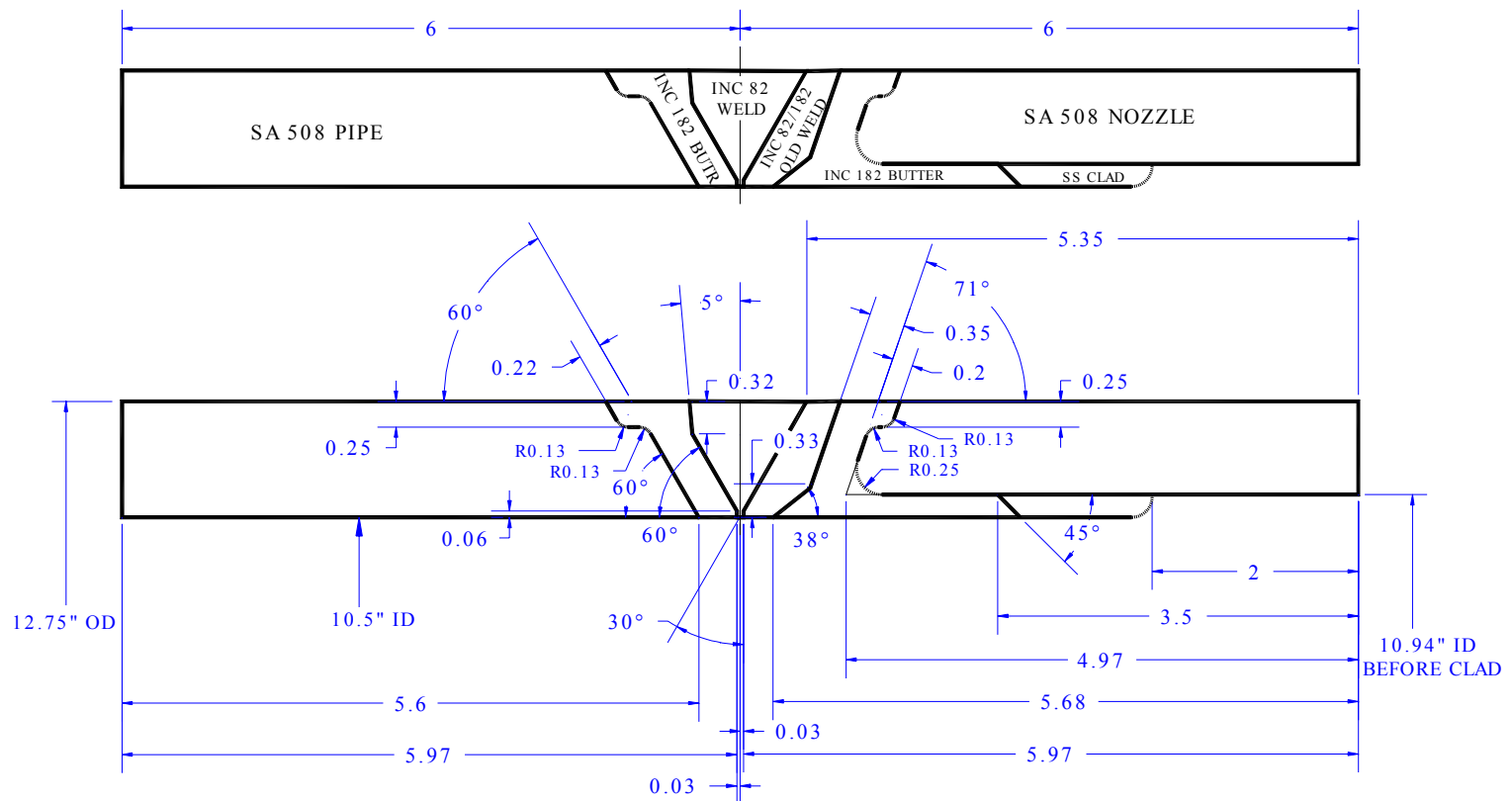
Outside Surface Examinations

BWR N2 NOZZLE REPLACEMENT CONFIGURATION (706/X)



Outside Surface Examinations

BWR 12" N4, N5, & N6 NOZZLE CONFIGURATIONS (707/X)





Outside Surface Examinations

▲ Automated (Primarily BWR Ranges No Tapers)

– Procedure/Personnel Limitations

- This procedure/candidate is only qualified to length size flaws orientated in the circumferential direction (Not included in Supplement 10)
- This procedure/candidate is not qualified for examinations performed from the cast stainless steel side of a component (Supplement 9)



Outside Surface Examinations

▲ Automated (Cont.) (BWR Ranges Only)

- This procedure/candidate is qualified for examinations performed from either single or dual sided access as applicable
- This procedure/candidate is not qualified for examinations conducted from tapered surfaces
- Weld crown must be ground flush and configuration must allow **unobstructed access** across the entire weld crown and butter
 - *This includes lack of contact caused by tapers or other discontinuities*



Outside Surface Examinations

▲ Automated

- 3 vendors have qualified procedures for detection and length sizing
 - General Electric
 - Primarily for BWR configurations and have the same limitations listed for manual procedures (No Tapers)
 - Diameter ranges 4.0" to 28"
 - Thickness ranges 0.50" to 2.0"
 - Framatome ANP
 - Same as GE
 - WESDYNE
 - Primarily BWR configurations but is qualified to cover thicker DM welds. Same limitations listed for manual procedures (No Tapers)
 - Diameter ranges 4.0" to 50"
 - Thickness ranges 0.50" to 5.2"



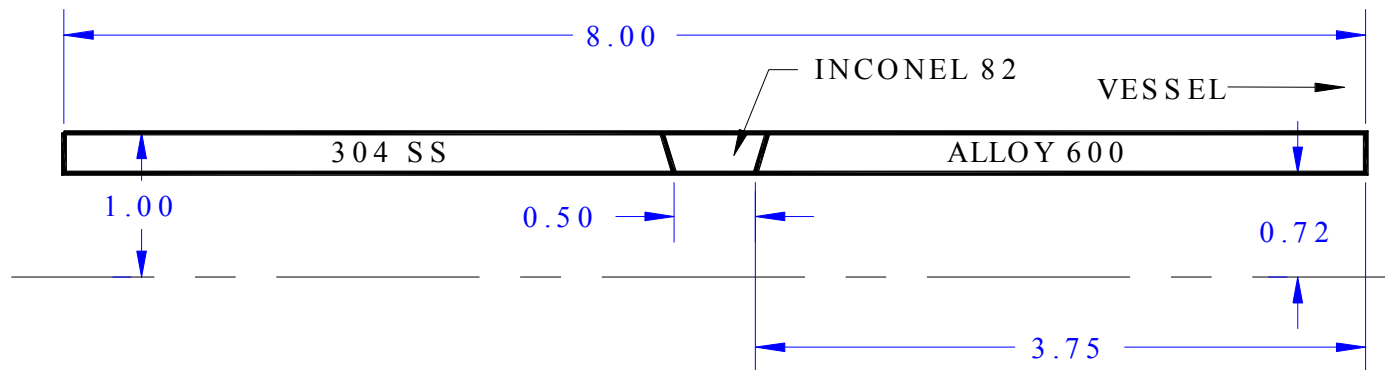
Outside Surface Examinations

- Depth Sizing
 - GE, Framatome and WESDYNE procedures qualified (= 0.125" RMS) for Depth Sizing
 - *Diameter ranges 4.0" to 28"*
 - *Thickness ranges 0.50" to 2.0"*
 - *No Tapered Surfaces*

Outside Surface Examinations

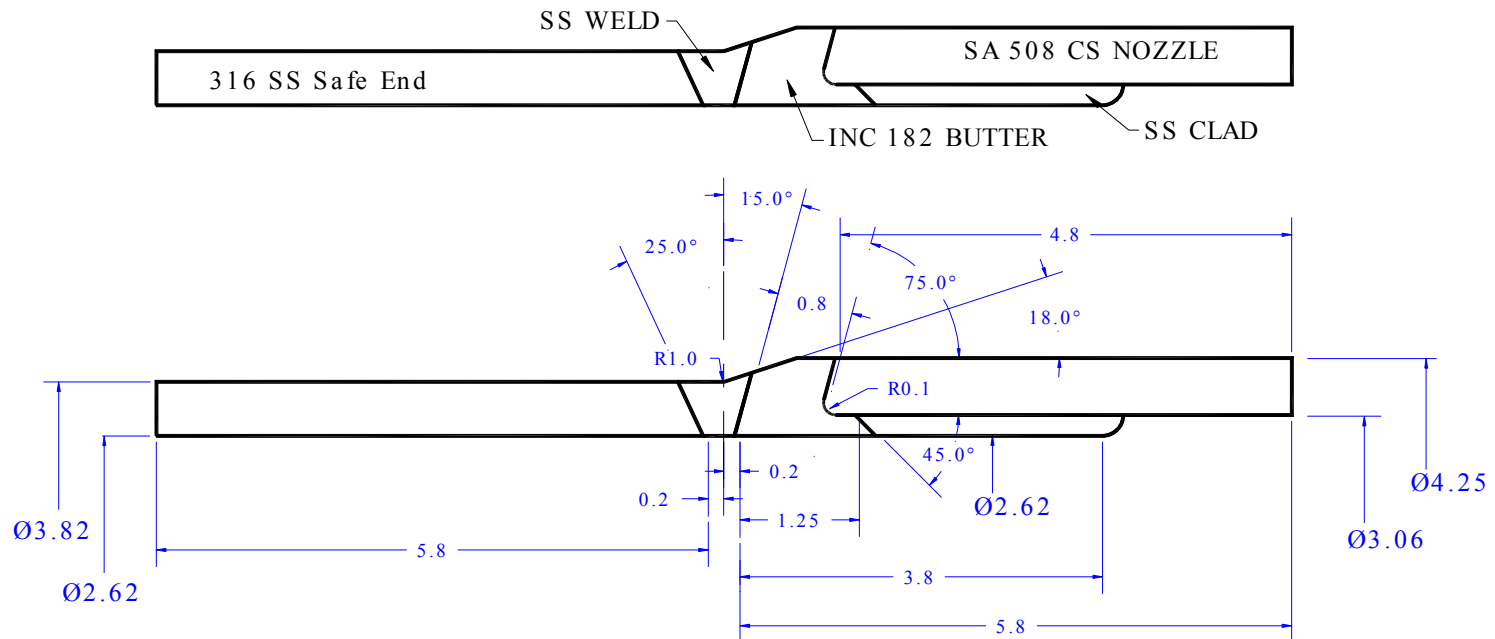
- ▲ **Configurations not covered in present automated qualifications**

BWR STANDBY LIQUID CONTROL CONFIGURATION (701/X)



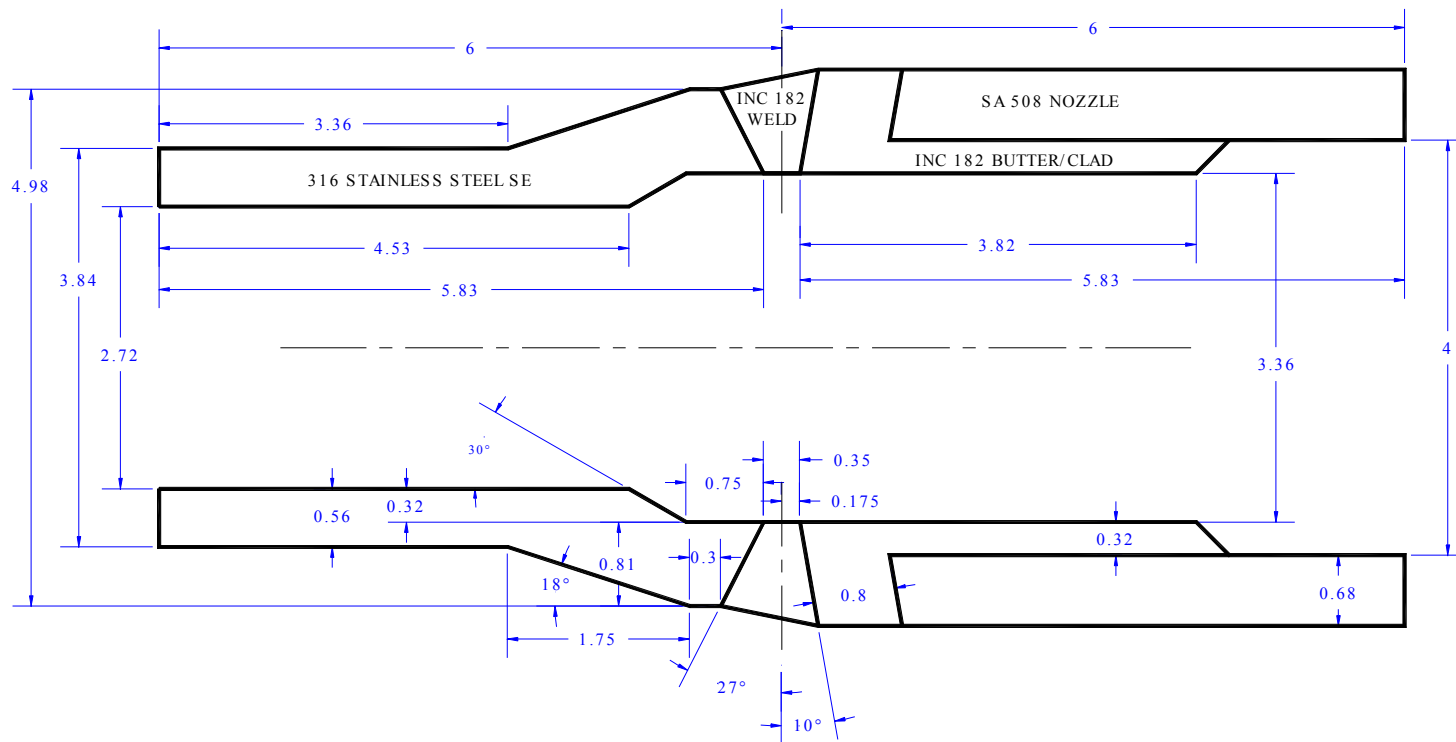
Outside Surface Examinations

PWR PRESSURIZER SPRAY CONFIGURATION (702/X)



Outside Surface Examinations

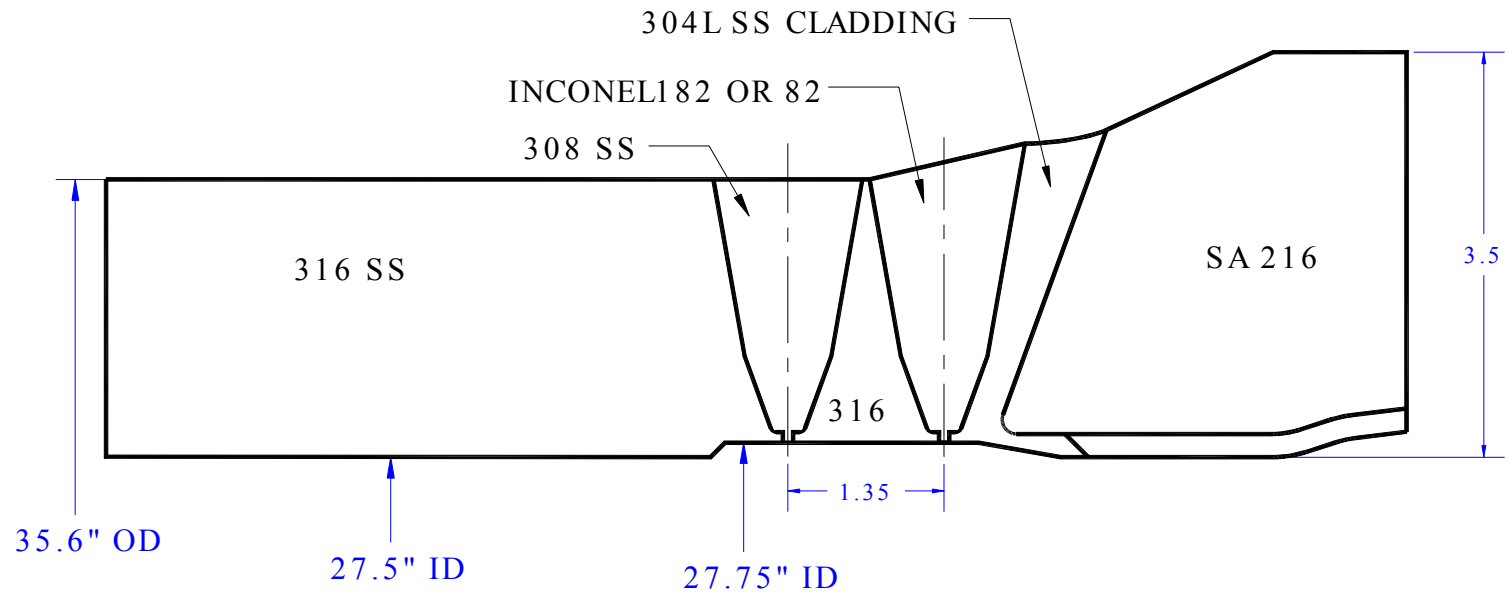
PWR PRESSURIZER SPRAY NOZZLE CONFIGURATION (704/X)





Outside Surface Examinations

36" PWR STEAM GENERATOR NOZZLE CONFIGURATION (711/X)





Inside Surface Examinations

▲ Automated (Inside Surface Examinations)

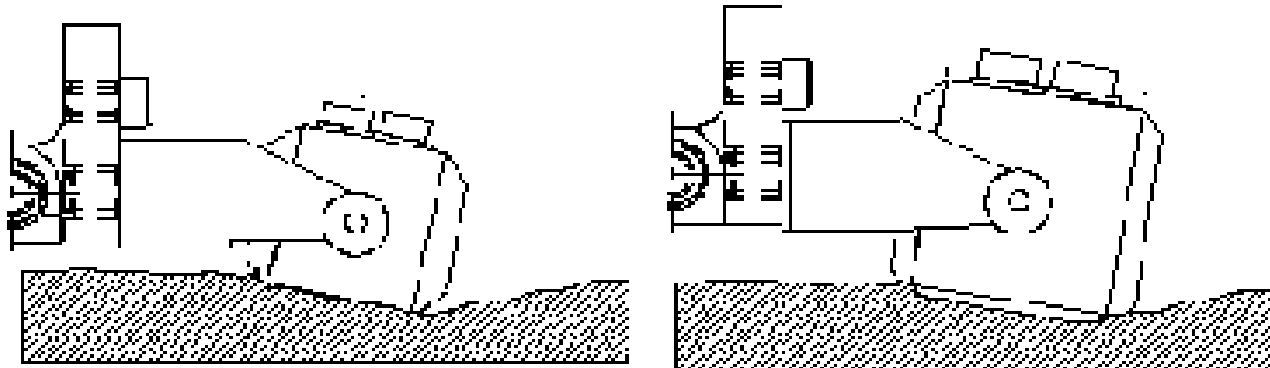
– Procedure/Personnel Limitations

- This procedure/candidate is not qualified to length or depth size axial flaws in Supplements 2 and 3 piping welds
- This procedure/candidate is not qualified for depth sizing of flaws in Supplement 10 welds
- This procedure/candidate is not qualified for examinations performed from the cast stainless steel side of a component.
- This procedure/candidate is not qualified to detect axial flaws in either Supplement 2 or 10 closure weld (field weld) configurations.
- Detection, length and depth sizing of embedded flaws has not been demonstrated during this qualification.

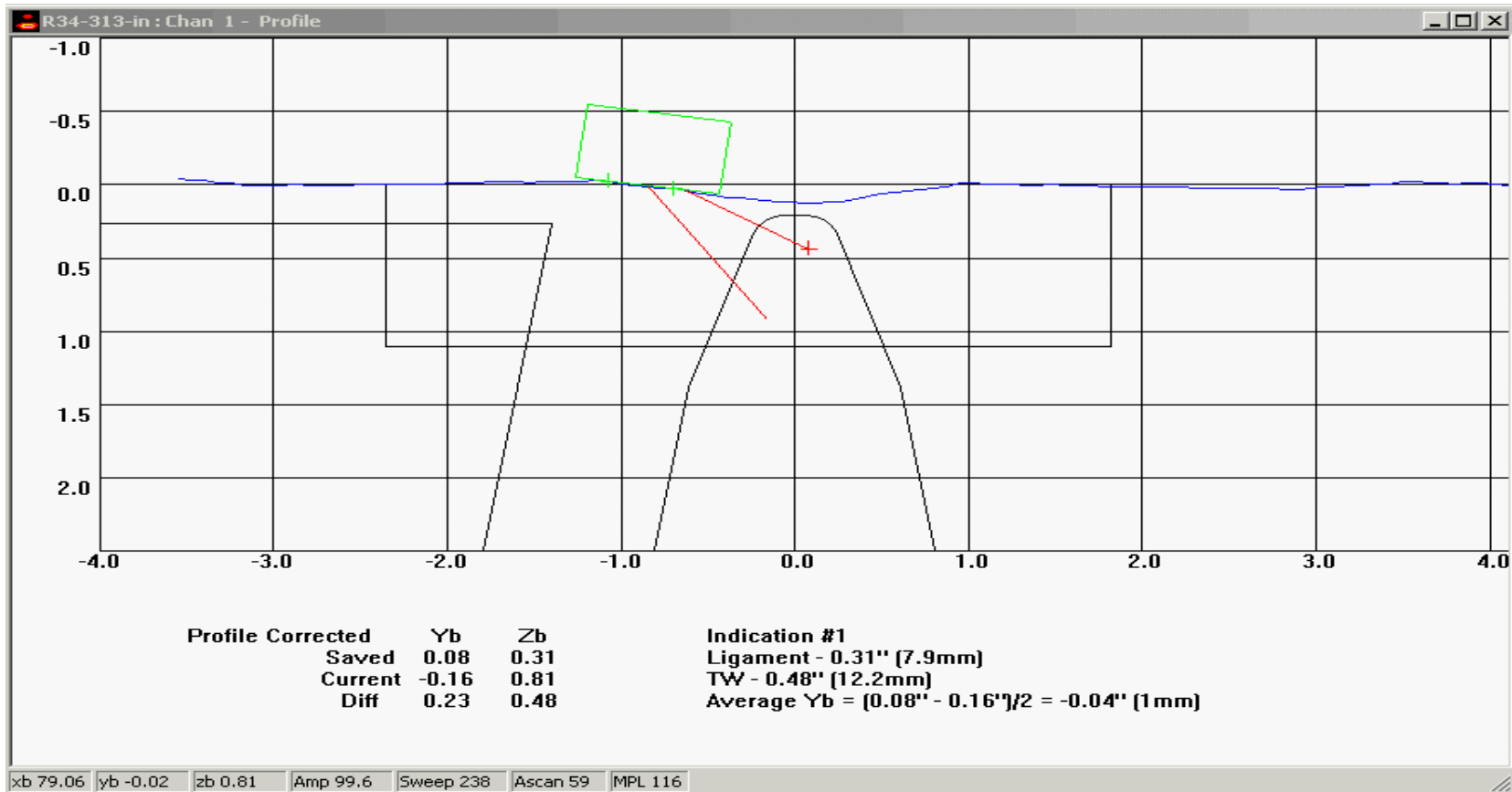
▲ Detection

- Detection limitations may not be overcome
 - Inside Surface Examinations
 - *Inside surface conditions too severe to overcome*
 - *Root/counterbore*
 - *This is not a ultrasonic technique problem, but a surface condition problem*
 - *If successful detection is achieved with ultrasonic techniques examination times will likely increase substantially*
 - *Very small search units moving over geometry at a very slow rate*
 - Outside Surface Examinations
 - *Complex Geometries prohibit scanning with automated techniques*
 - *Location of adjacent welds prohibit meaningful examination*

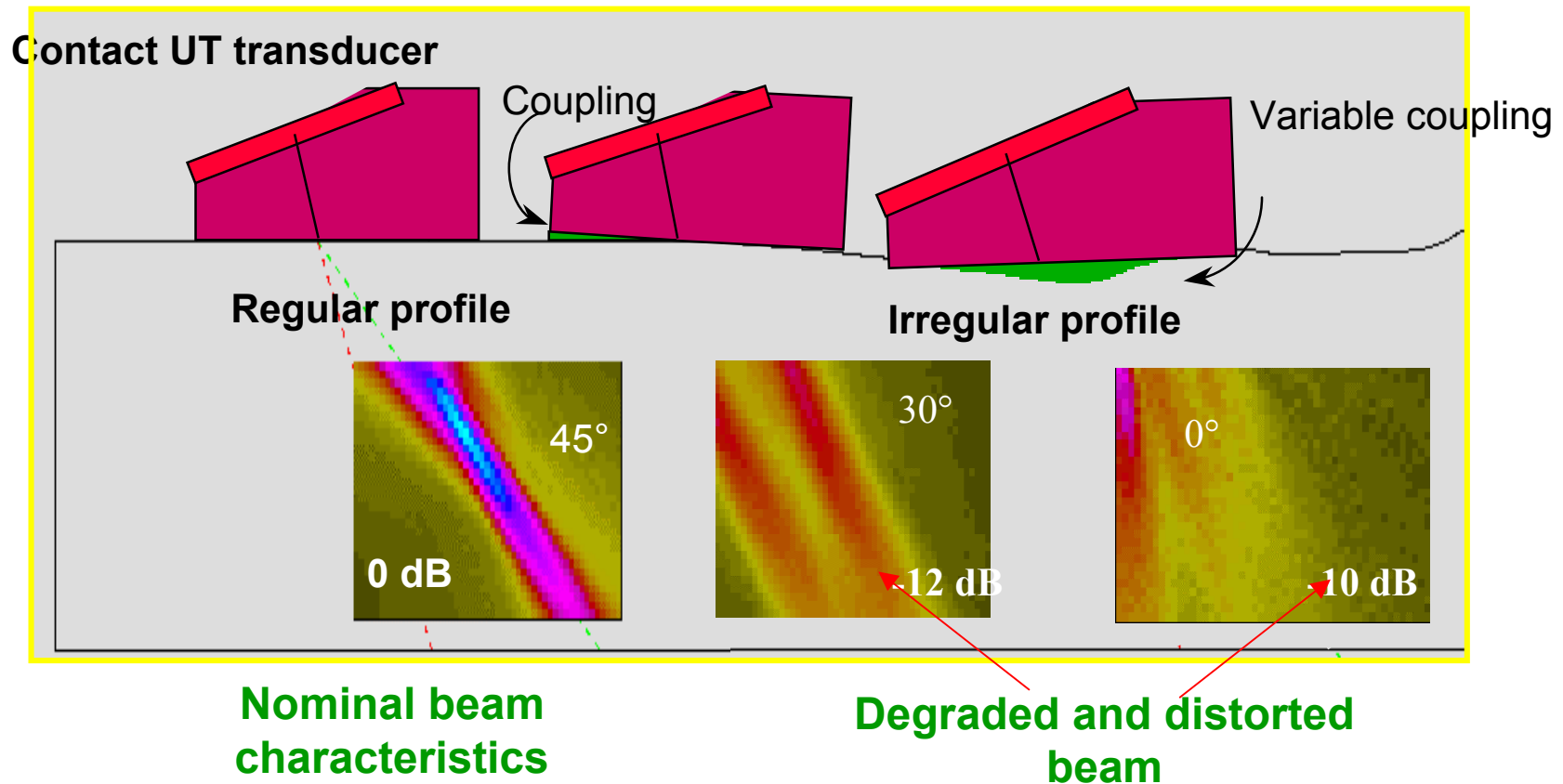
- ▲ **Small Search Units Utilized to Improve Detection on Inside Surface Examinations**



Profilometry



Contact





Problems

▲ Depth Sizing

- Depth sizing utilizing automated techniques may be possible from outside surface
- Successful depth sizing qualification very unlikely for inside surface examinations
 - Too many variables to overcome
 - Depth sizing error may be too large to be useful
 - *Error added to sized flaw height may force immediate repair due to high growth rates*



Summary

- ▲ **PDA staff will be working with vendors full time**
 - Helping with technique development (if needed)
 - Facilitating demonstrations
 - Documenting results
 - Work with vendors to improve sizing techniques
 - Profilometry
 - Phased array
- ▲ **Vendors**
 - Applying massive resources and technology to the problem