Regulatory Perspective Regarding Alloy 690 And Associated Weld Materials

RES Alloy 690 PWSCC Research Meeting
Rockville, MD
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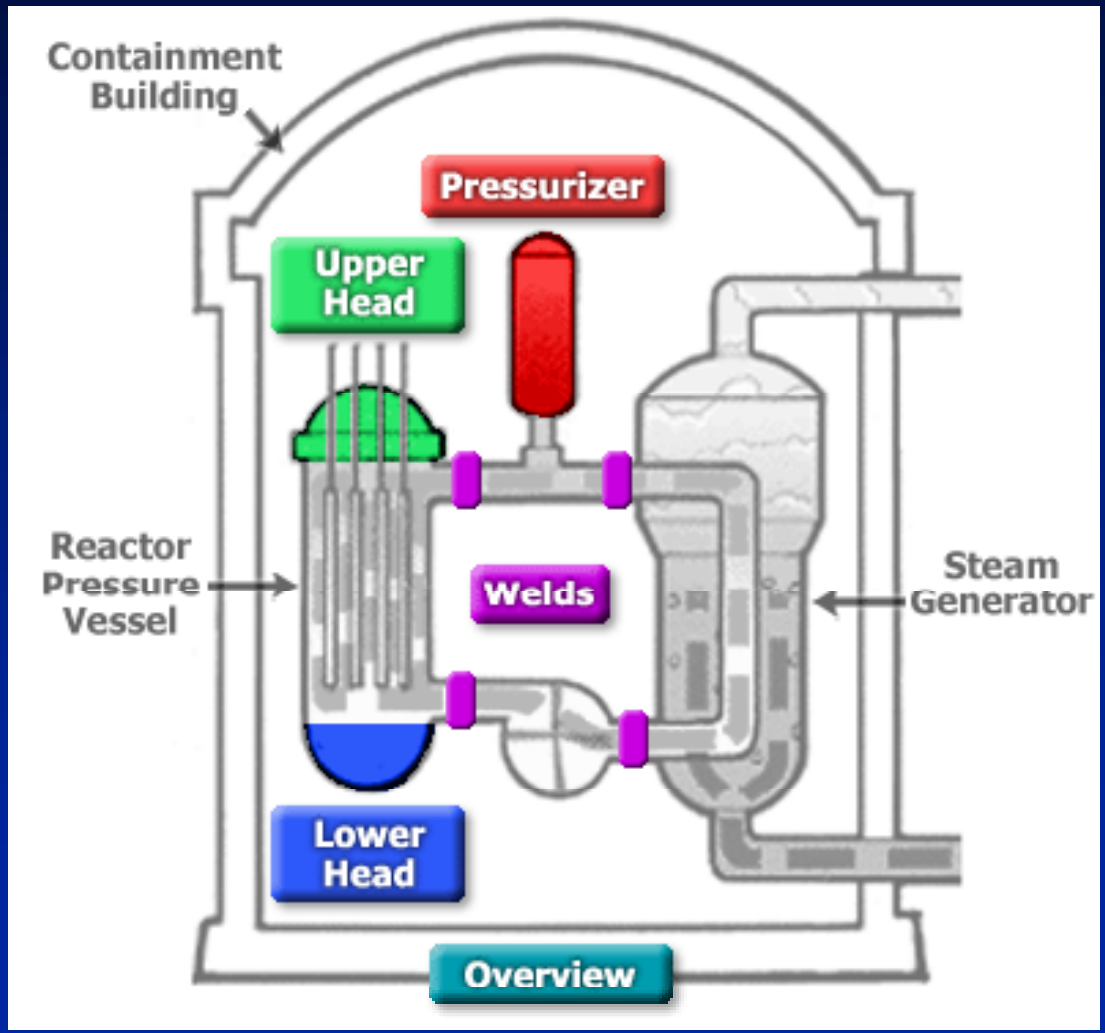
PWR Ni-base Alloy Regulatory Actions



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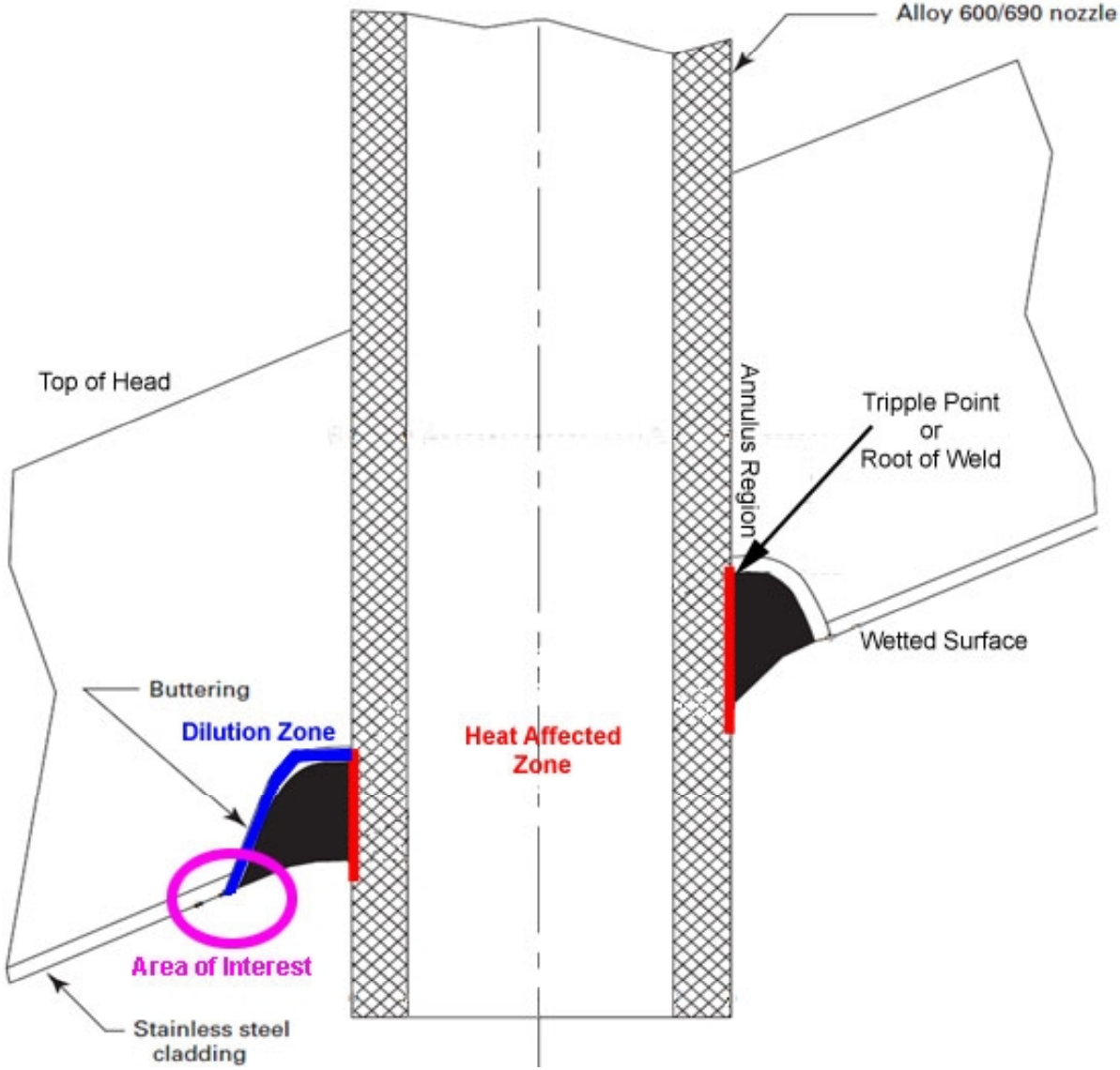
Transitioning Requirements

Area	Current	Transitioning To
Upper Head	ASME CC N-729-1	
Pressurizer	MRP-139 ASME CC N-722	ASME CC N-722-1 & N-770-1
Lower Head	ASME CC N-722	ASME CC N-722-1
DM Welds	MRP-139 (TI 2525/172)	ASME CC N-770-1

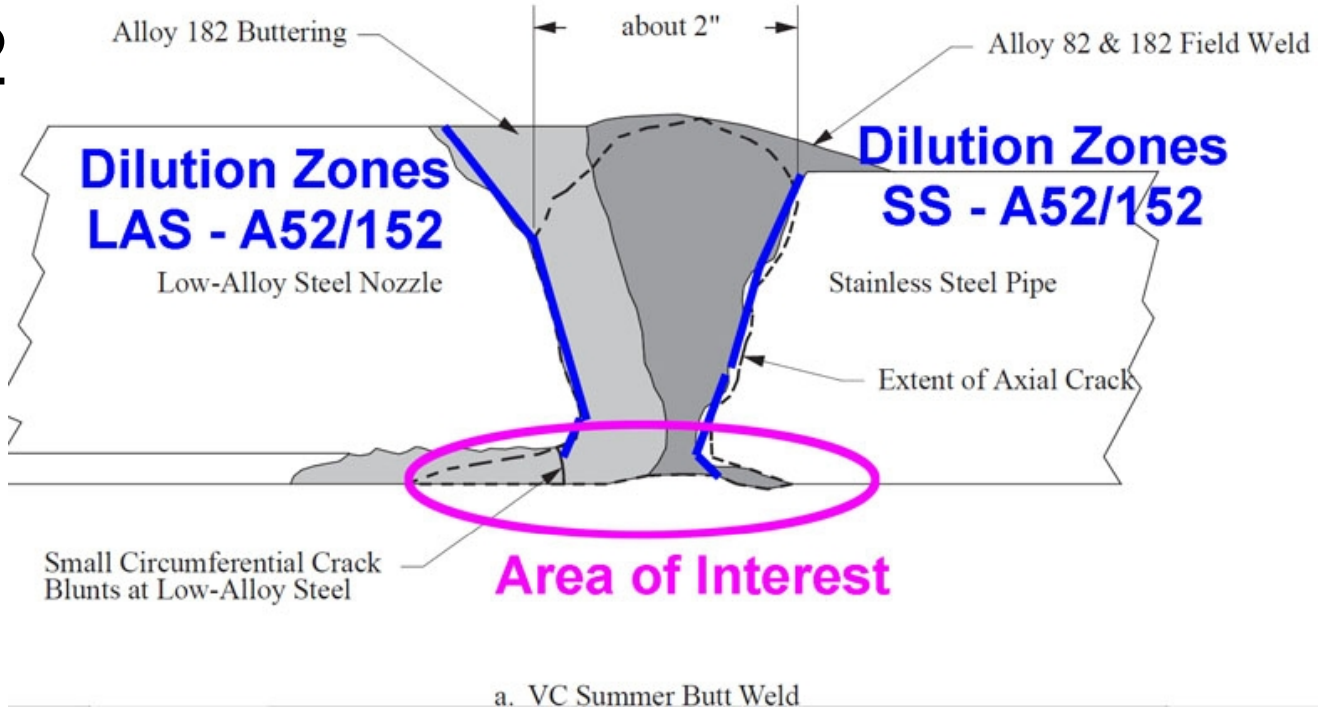
Challenges - Upper RPV Head

- **Heat Affected Zone**
  - Testing applicable?
- **Dilution Zone**
  - LAS to A52/152
  - SS to A52/152
  - What is dilution type at the **Area of Interest**?



Challenges - New Dissimilar Metal Welds

- **Dilution Zones**
  - LAS to A52/152
  - SS to A52/152
  - Dilution zone in the **Area of Interest** for all welds?
- Inlays/Onlays
  - Weld defects
  - Thin layer dilution



a. VC Summer Butt Weld

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Testing Goals

- Sufficient Heats Tested for crack growth rate curves or improvement factors
  - Range of Vendor heats and welds
  - 26 heats tested for MRP-55
  - 17 welds tested for MRP-115
  - Consider binning results due to
    - HAZ
    - Dilution Effects
- 1-D Cold Work Issue

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Testing Goals (con't)

- Alloy 152/52
  - Dilution layer testing
    - Mitigation interfaces (Alloy 82/182, SS)
    - Low alloy steel (buttering and narrow groove effects)
  - Consider effects of hot cracking and ductility dip cracking
    - Thin mitigation layers
  - Testing on 52M, 52MSS, 152i/52i, and new combinations

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Scheduled Testing

March – Sept 2011	Oct – March 2012	April – Sept 2012	Oct – March 2013	April – Sept 2013
ANL Alloy 152 V2 & SM Alloy 52MSS	CIEMAT 152/690 HAZ & 52/690 HAZ	KAPL 52/690 HAZ & SM 52MSS/690 HAZ	52M/182 Overlay #1 & #2	52M/182 Inlay #1 & #2
MHI Alloy 152 & 20%CF Alloy 152	30%Tensile & 30%CF CRDM 690	As-Rec 690TT Sumi + EPRI Plate	As-Welded Sumi 52M & 10%CF 152	Weld Modifications #1 & #2
17%CR CRDM 690 & 31%CR 690 + 700C/1h Recovery	30%%CR CRDM & 20%CR SA - B25K Plate	30%%CR CRDM Carbide2 & SA+TT B25K Plate	Alloy 52M Weld Defects, Duct. Dip & Solidification	Alloy 52M Weld Defects, Duct. Dip & Solidification
ENSA 22%CR & 32%CF 690 Plate	152/52/LAS Dilution Zone #1 & #2	MHI 152/304SS & KAPL 52M/316SS	One-Pass Narrow Gap #1 & #2	Open - Service Material Issues
Overlay 52M/182	Alloy 690 HAZ CRDM	10 & 20% Tensile CRDM 690	Mod. 690 CRDM & B25K Plate	Open - Service Material Issues
ANL 152 V2	Overlay 52M/182	As-Received Alloy 690TT		
ANL 152/690 HAZ	Overlay 52M/182 Dilution Zone	Weld Parameters #1		
	As-Rec. ANL Plate	As-Welded MHI Alloy 152		
	Alloy 152/LAS Dilution	Weld Parameters #2		

Draft schedule of future tests to show NRC plans to address goals and challenges

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Discussion Items for This Meeting

- Intermittently, can this body reach consensus and publish summary results for initiation and crack growth rates?
  - Flaw Evaluations
    - Surface breaking fabrication defects
    - Inspection requirements
  - Probabilistic Codes (e.g., XLPR development)
- EPRI materials collection
  - Discuss plans to reserve materials for testing
  - Status on identifying preferred materials