INL/MIS-21-65150-Revision-0

Alloy 709 Code Qualification Status

November 2021

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Changing the World's Energy Future

Idaho National Laboratory

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November 5, 2021

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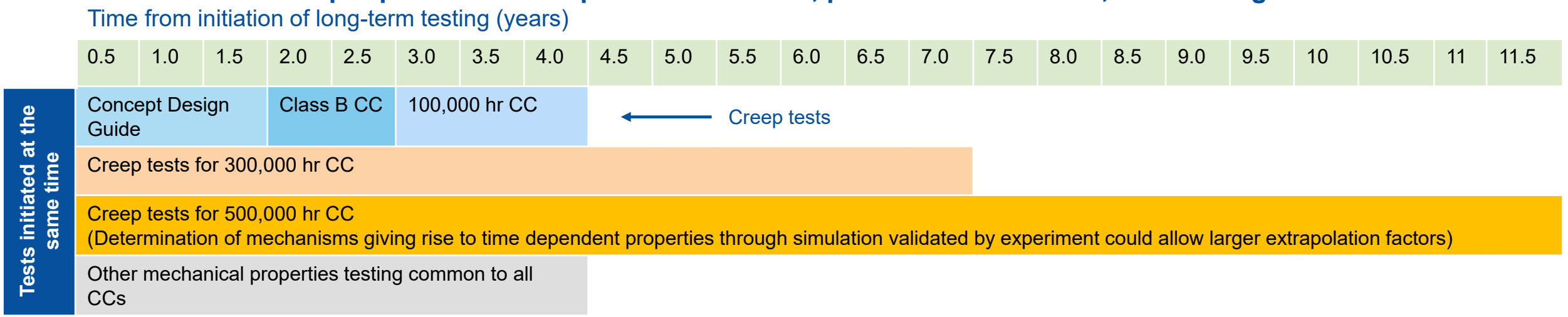
A "Staged" Qualification Approach for Alloy 709 Code Cases Is Being Executed by the Fast Reactors Campaign

Creep rupture time extrapolation factor = 5, per current Section III, Division 5 guidance



A four-year testing program, not accounting for resource constraints, would generate data package to support:

- Conceptual design
  - Conceptual Design Guide for 500,000-hour lifetime
- Preliminary design
  - 100,000-hour Class A code case
  - Class B material code case

Additional creep data at 7-year mark from start:

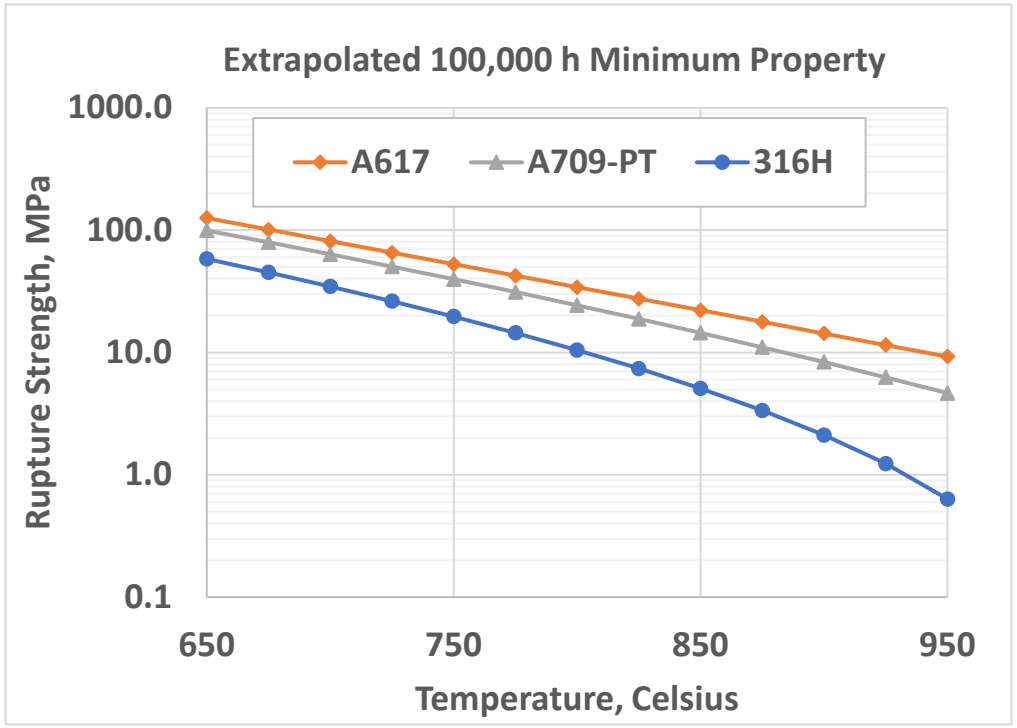
- Final design
  - 300,000-hour Class A code case

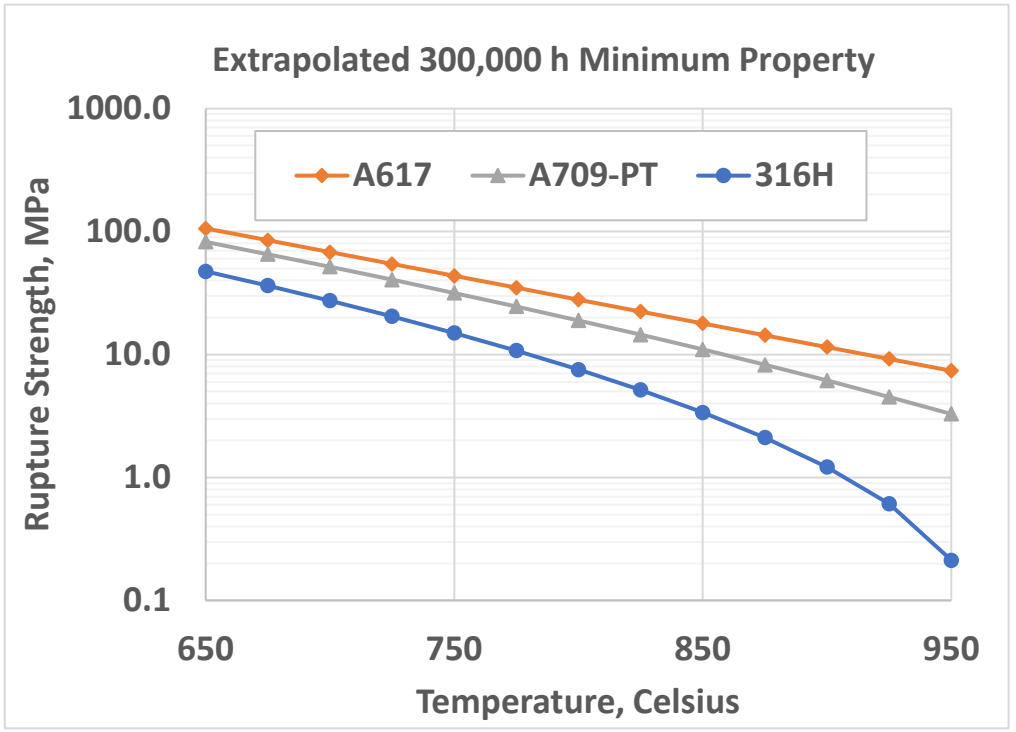
Additional creep data at 12-year mark from start:

- Nth-of-a-kind material insertion
  - 500,000-hour Class A code case

Alloy 709-PT Has Very Good Creep Rupture Properties

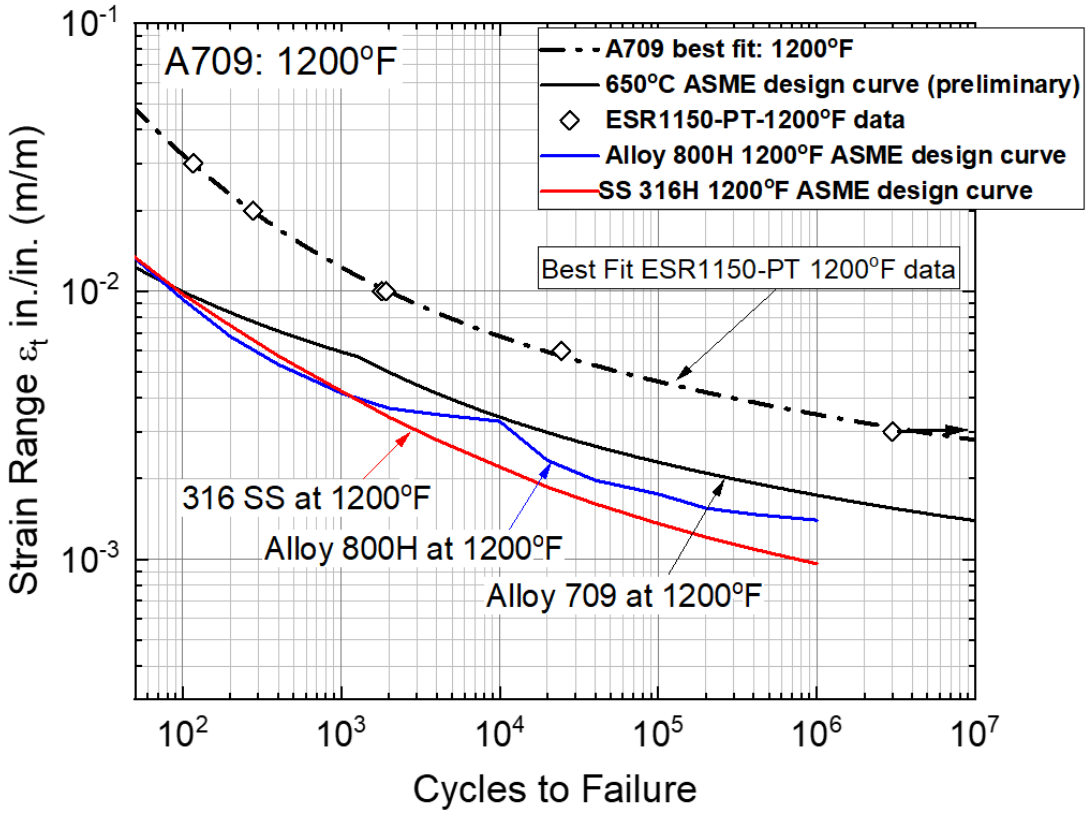
- Alloy 709-PT, solution anneal plus precipitation treatment at 775C for 10 hours



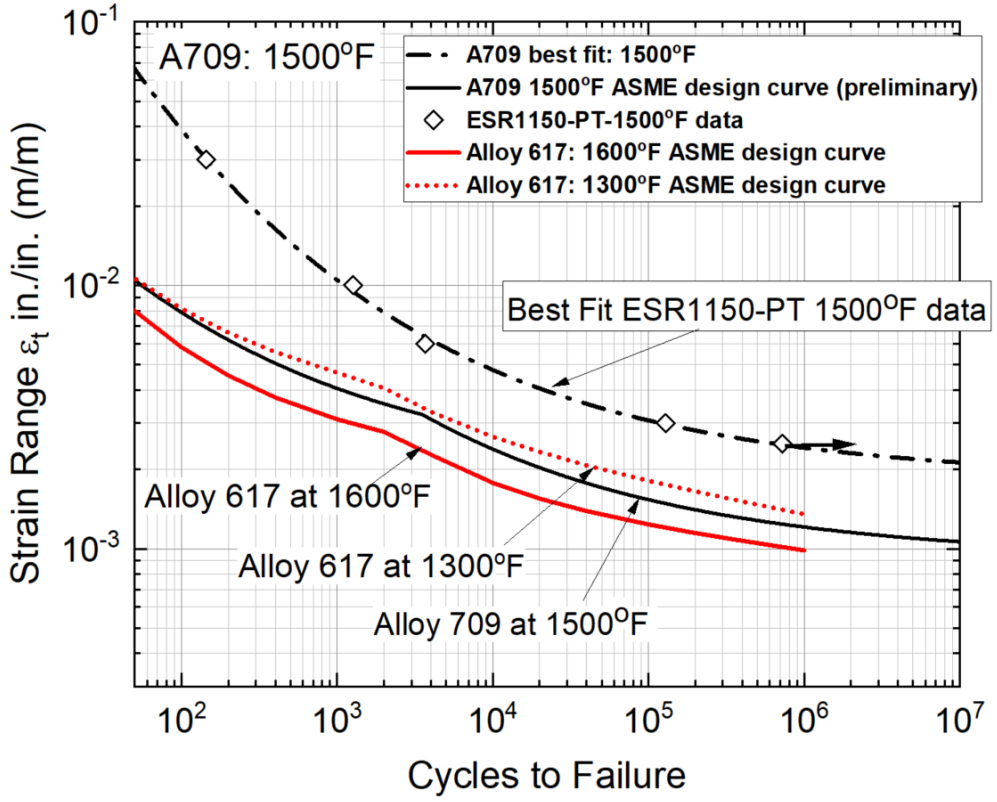


Alloy 709-PT Has Enhanced Fatigue Properties

Alloy 709-PT better than Alloy 800H and 316H at 1200F (650C)

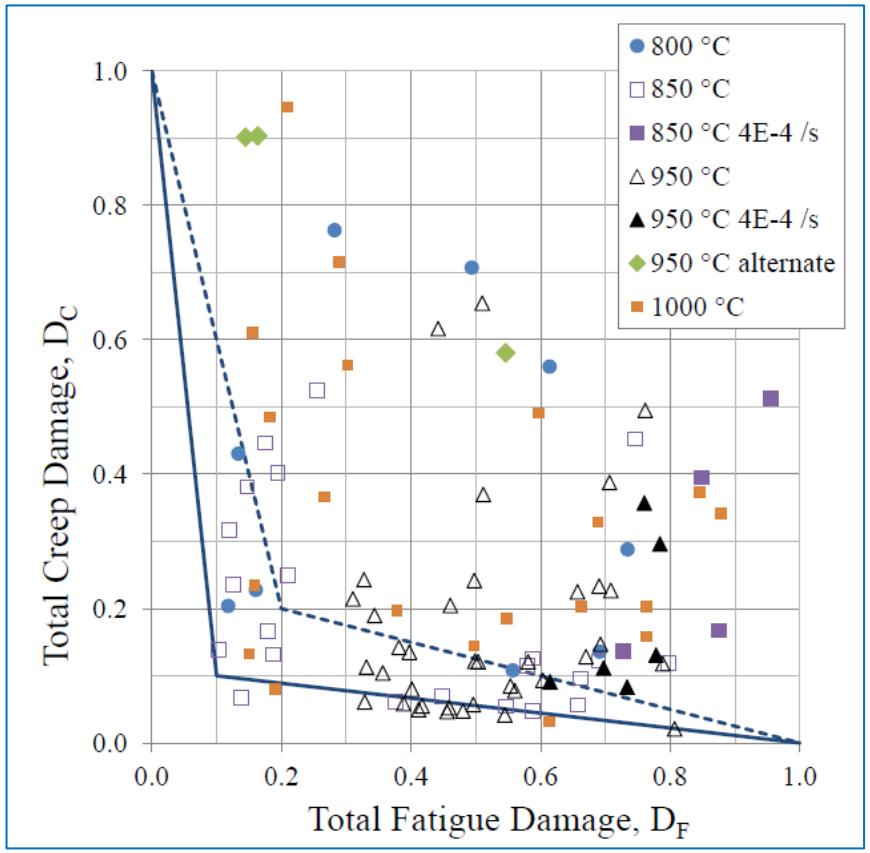


Alloy 709-PT comparable to Alloy 617 at 1500F (816C)

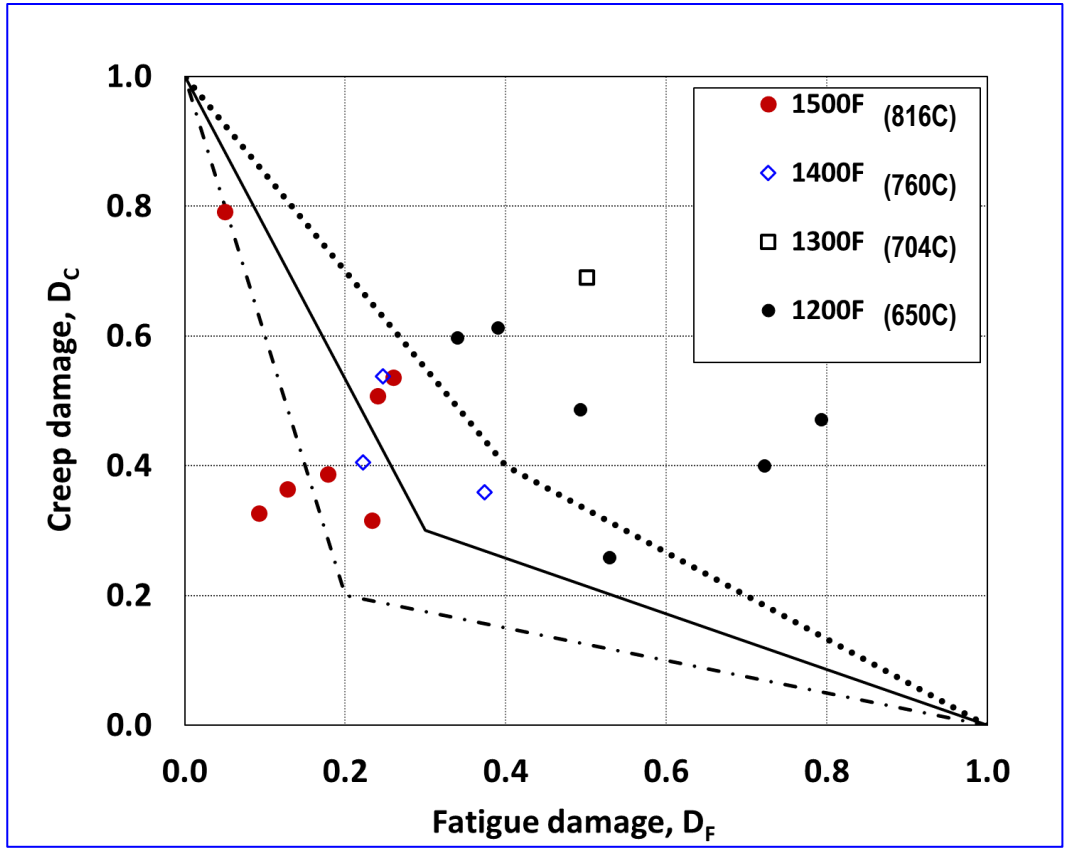


Alloy 709-PT Has Very Good Creep-Fatigue Resistance

Alloy 617 Creep-Fatigue Interaction



Alloy 709-PT Creep-Fatigue Interaction



- **Alloy 709-PT Continues to Demonstrate Balanced Creep, Fatigue and Creep-Fatigue Performance**