



# Temperature Qualification Device Conceptual Design

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*Changing the World's Energy Future*

Austin D Fleming, Devin D Imholte



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# **Temperature Qualification Device Conceptual Design**

**Austin D Fleming, Devin D Imholte**

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**Idaho National Laboratory  
Idaho Falls, Idaho 83415**

**<http://www.inl.gov>**

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# Temperature Qualification Device Conceptual Design

Battelle Energy Alliance manages INL for the  
U.S. Department of Energy's Office of Nuclear Energy



Idaho National Laboratory



# Outline

- Instrumentation System Qualification and Development
- Temperature Qualification Device Design
- Concept of Operations

# INL Sensor Development

- Different temperature and flux variations:
  - Low:  $<550^{\circ}\text{C}$
  - Medium:  $550\text{-}800^{\circ}\text{C}$
  - High:  $>800^{\circ}\text{C}$

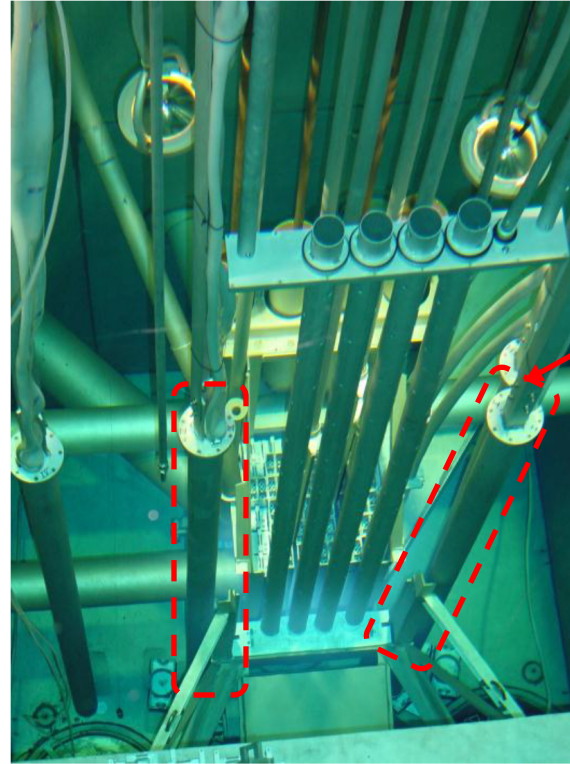
## Quality Assurance Requirements for Nuclear Facility Applications

AN AMERICAN NATIONAL STANDARD



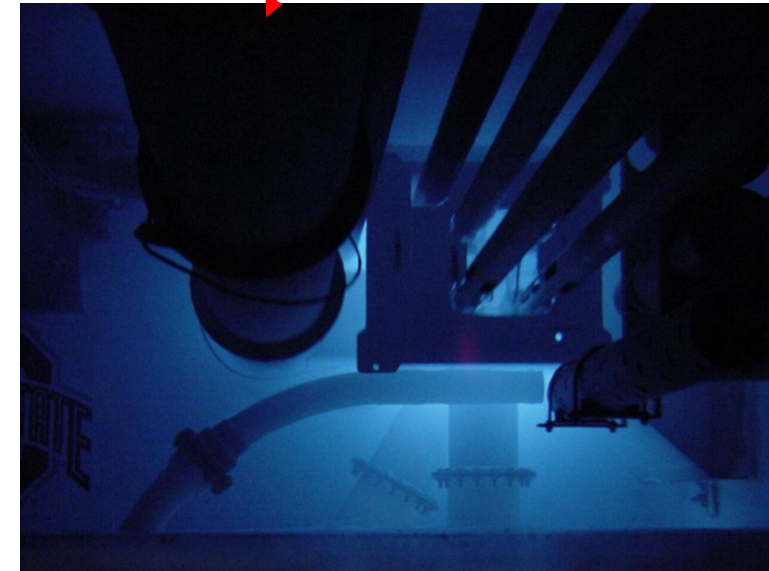
# Temperature Qualification Device Requirements

- Nominal Environment: Research reactor dry well/standpipe
- Temperature Range: Up to 550°C
- Heating Method: Electrical Heating
- Materials: Aluminum, or other low activation & low neutron worth
- Thermocouple (TC) Variation
  - 4 classes of TCs
    - Qualification
    - Check
    - Reference (NIST-traceable)
    - Heater Controller



Nuclear Reactor Program NC State University, User Guide, Rev. 5/11/2015

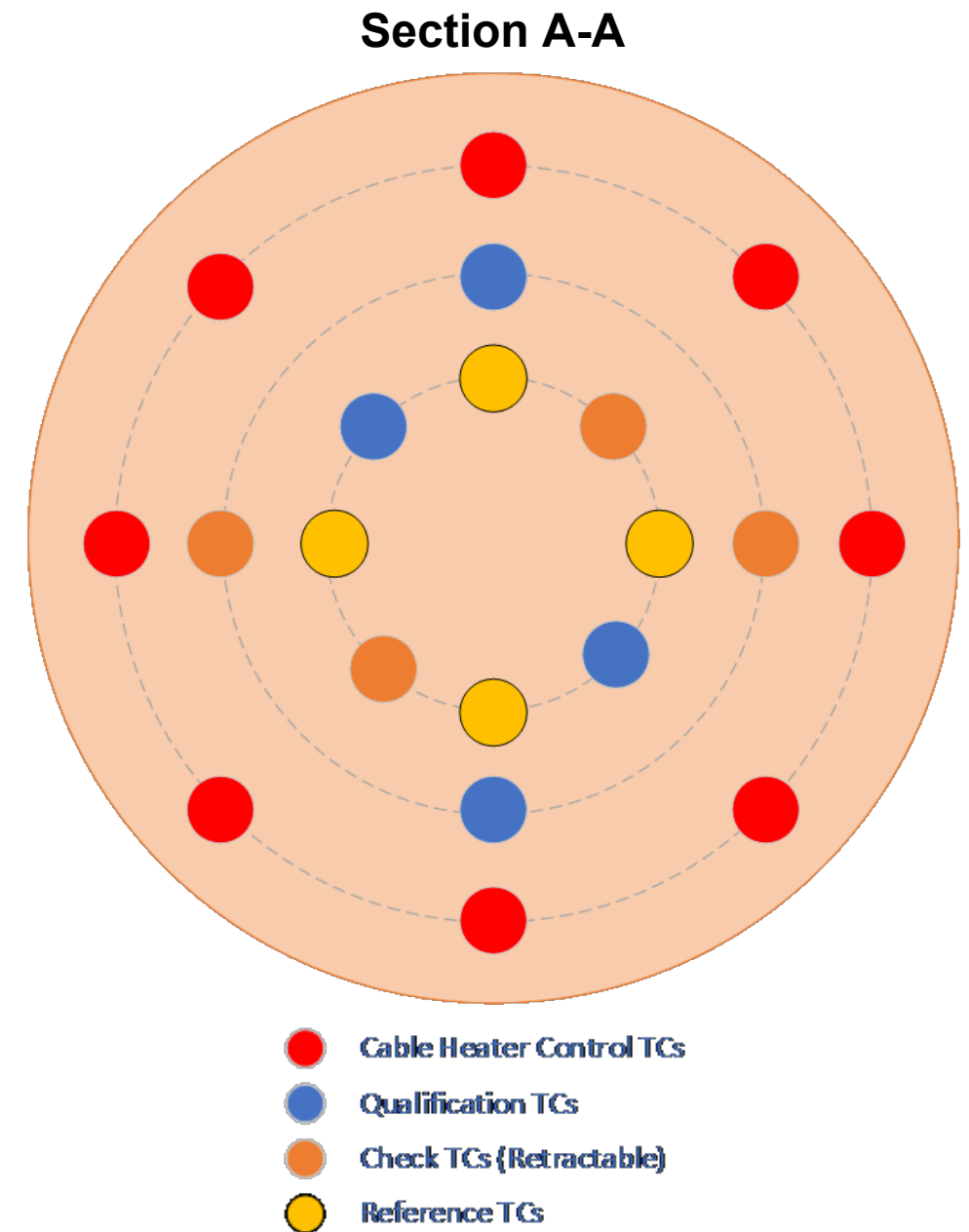
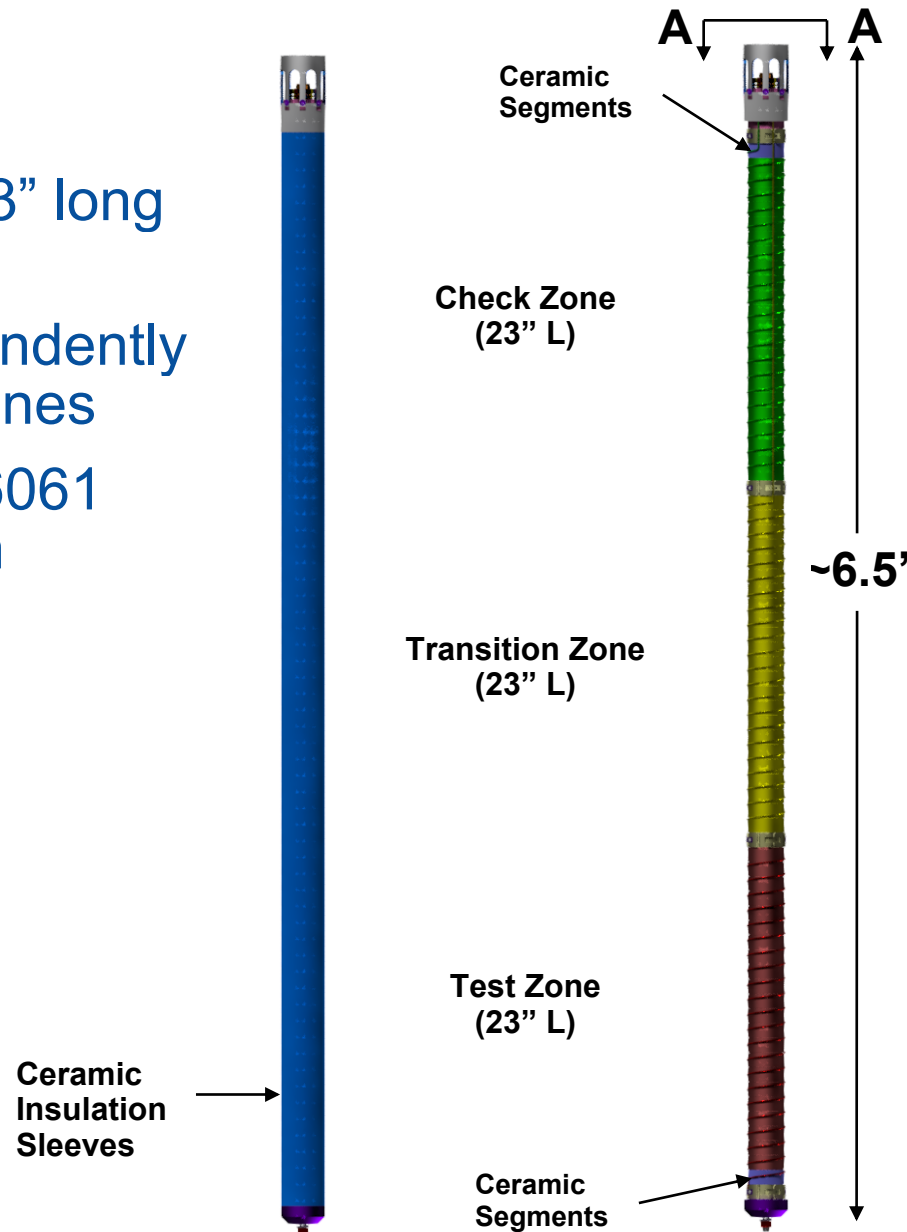
**Dry Well/Standpipe**



Nuclear Reactor Laboratory User Guide, OSU

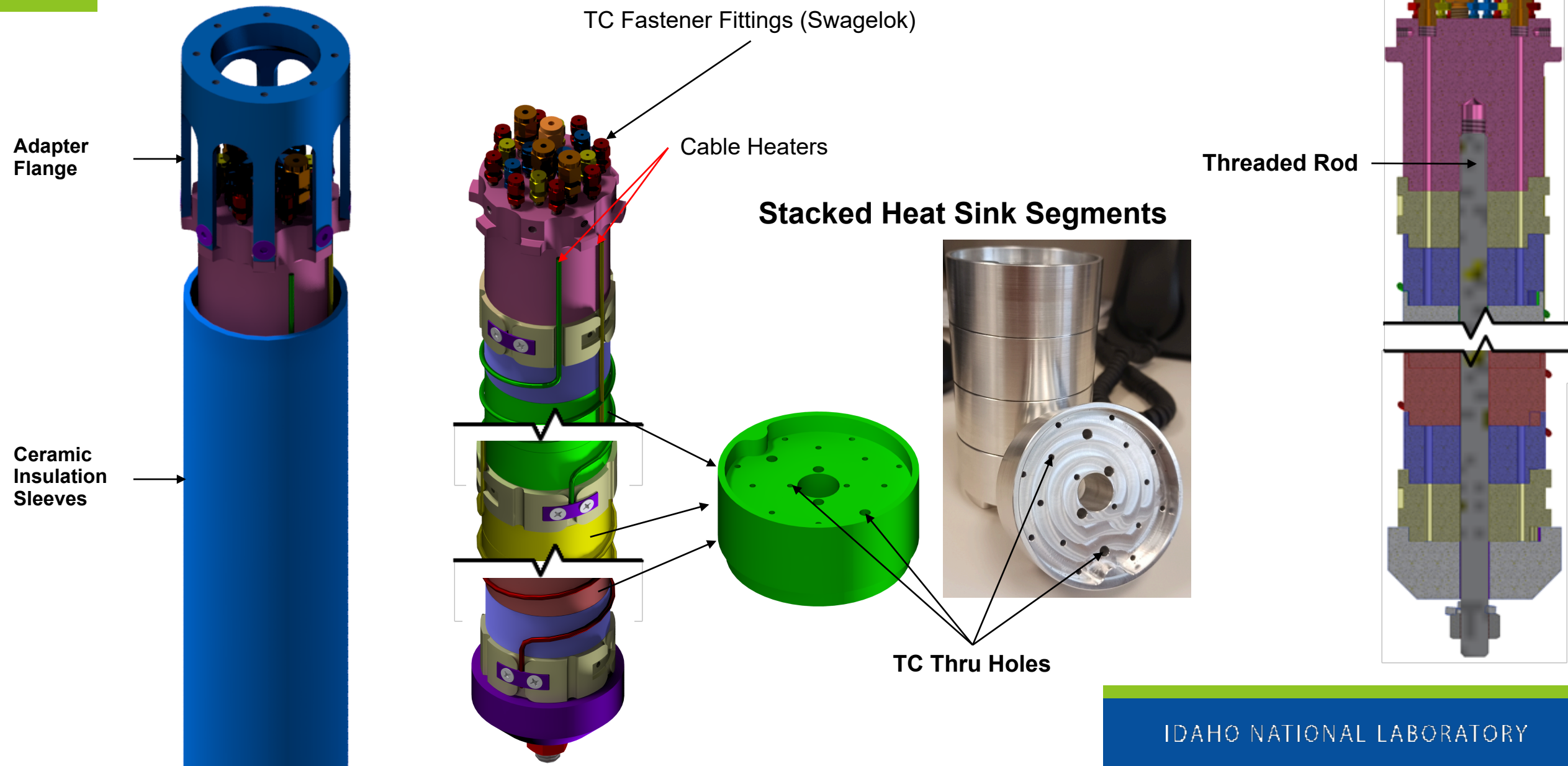
# Temperature Qualification Device

- ~6.5' × Ø3" long assembly
- 3x independently heated zones
- Made of 6061 Aluminum



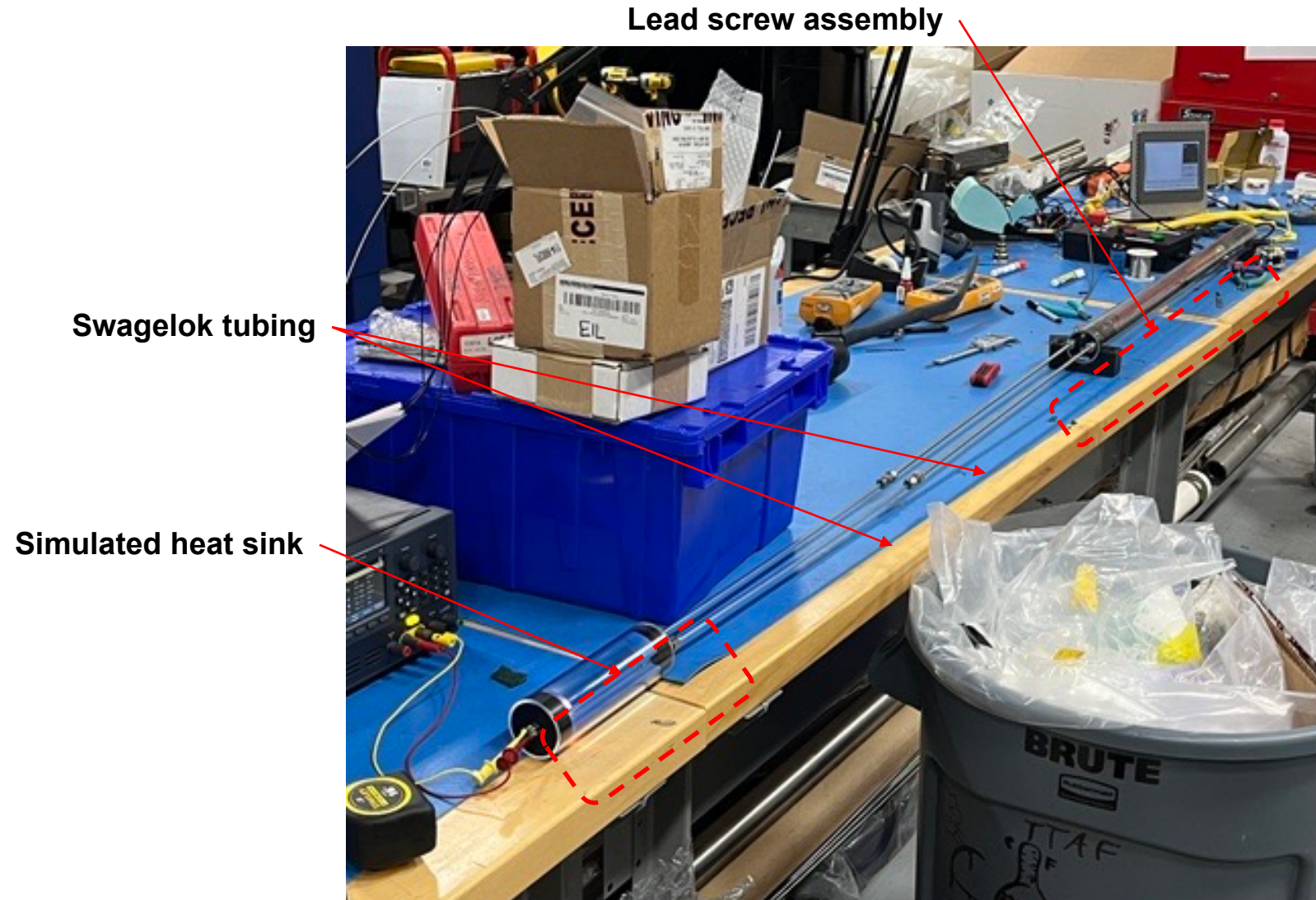


# Temperature Qualification Device Construction



# Temperature Qualification Device – TC Retraction Assembly

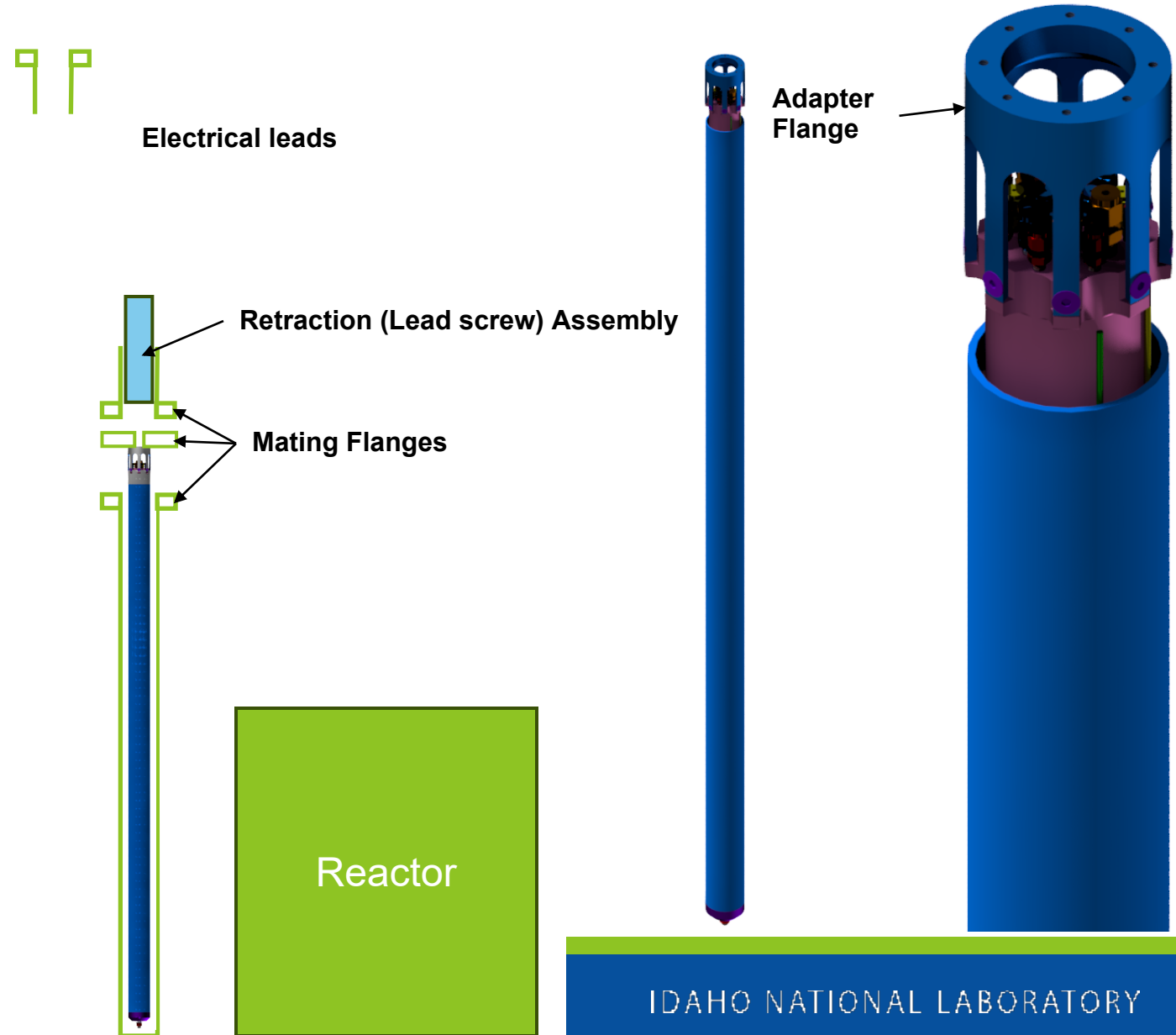
- Lead screw moves TC(s) in and out of TQD
- Concentric tubing is required to address TC buckling during insertion



# Temperature Qualification Device – Installation Concept

- Dry well/standpipe assembly is totally assembled dry and by hand
- Inserted into pool adjacent to reactor

Dry well/  
standpipe  
Assembly



# Temperature Qualification Device – Prototype







## Future Work

- Instrumented prototype testing
- High temperature configuration conceptual design development