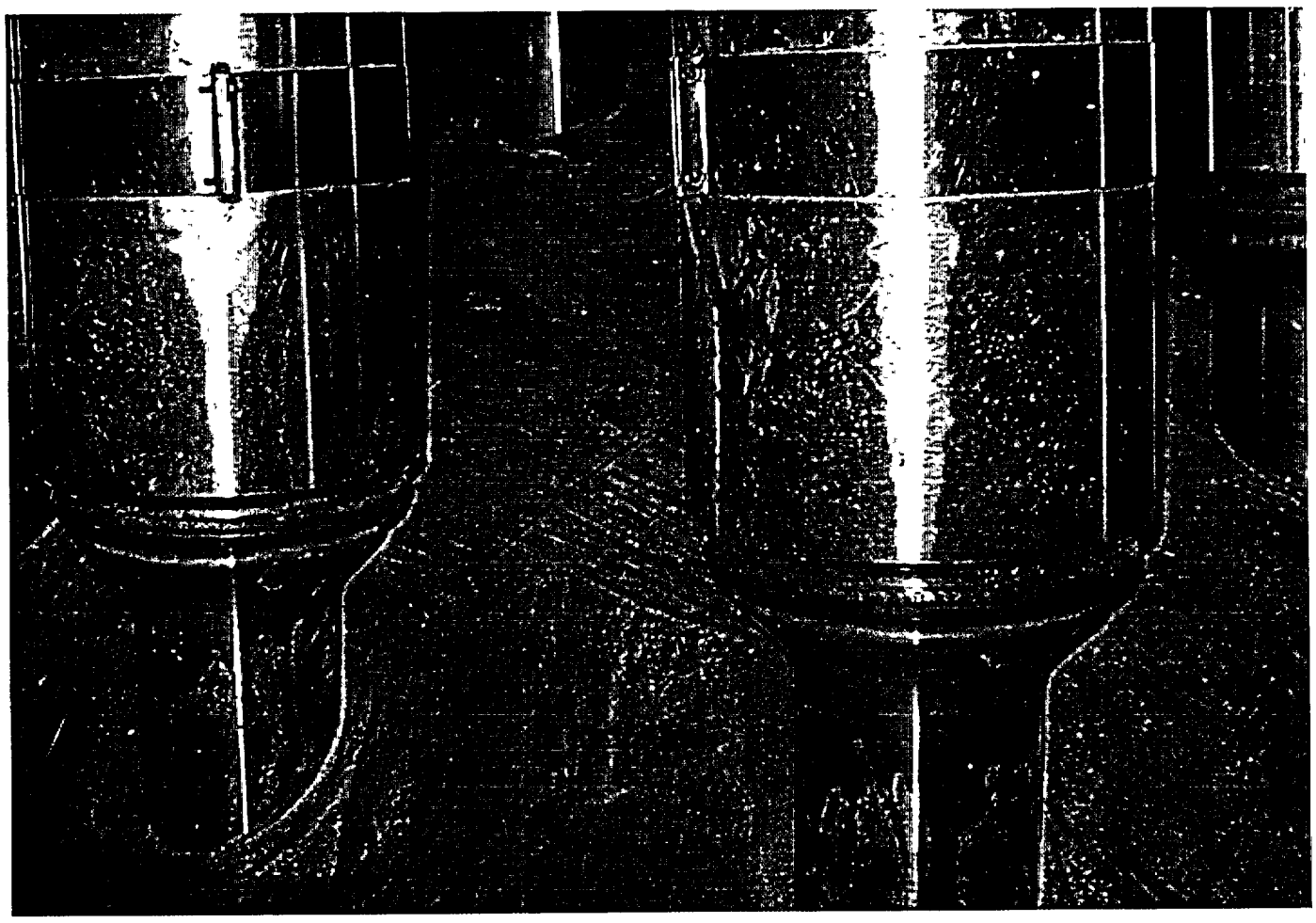
Reactor Vessel Head Inspection
Current Status and Future Plans

Calvert Cliffs
Nuclear
Power Plant
Unit 2

March 18,
2003



Enclosure 2

Agenda

• Meeting Objective	John Hosmer
• Background-Why we're here	John Hosmer
• Inspection Issues/Plans	Mike Milbradt
• Safety Case	Bob Hardies
• Summary	John Hosmer

Objective

- Provide the status of our Reactor Pressure Vessel Head inspection
- Provide our plans and the safety basis for completion of our head inspections

Background

- Important safety issue
- Early engagement with industry and utility inspections
- Best available technology and vendor selected
- Known physical constraints
- Planned in accordance with our October response to Bulletin 02-02

Why We Are Here

- Order issued three days before outage
- Discovered nozzle distortion
- Coverage to date was less than anticipated
- Clarity of the ground rules is necessary to complete our inspections

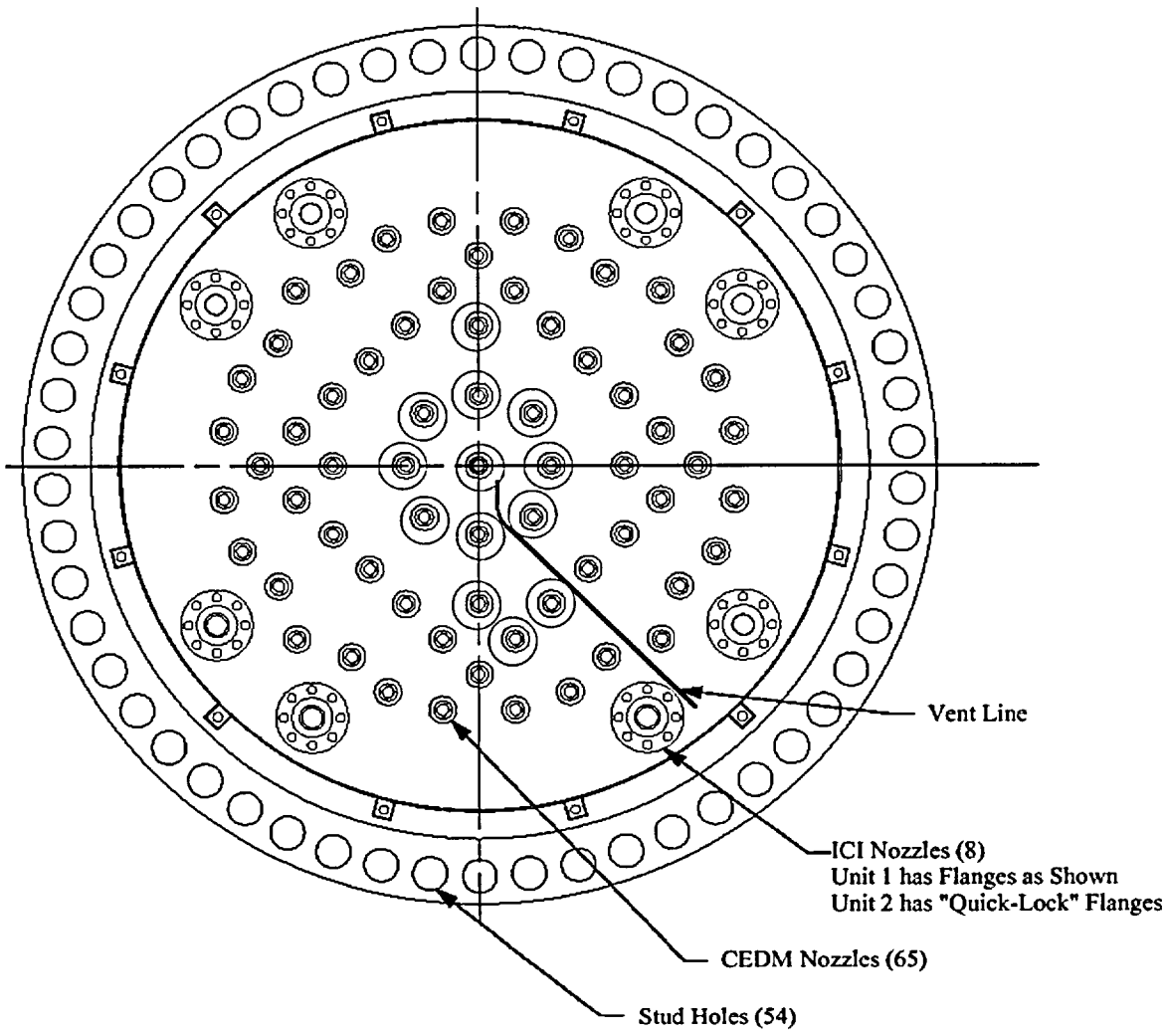
Safety Basis Summary

- Clean bare metal "qualified visual" inspection results for Units 1 and 2
- Low susceptibility material
- Successful leak path assessments
- No UT indications of PWSCC seen in the inspections to date
- Resume inspection using improved methods and tools
- Will seek endorsement for our current direction

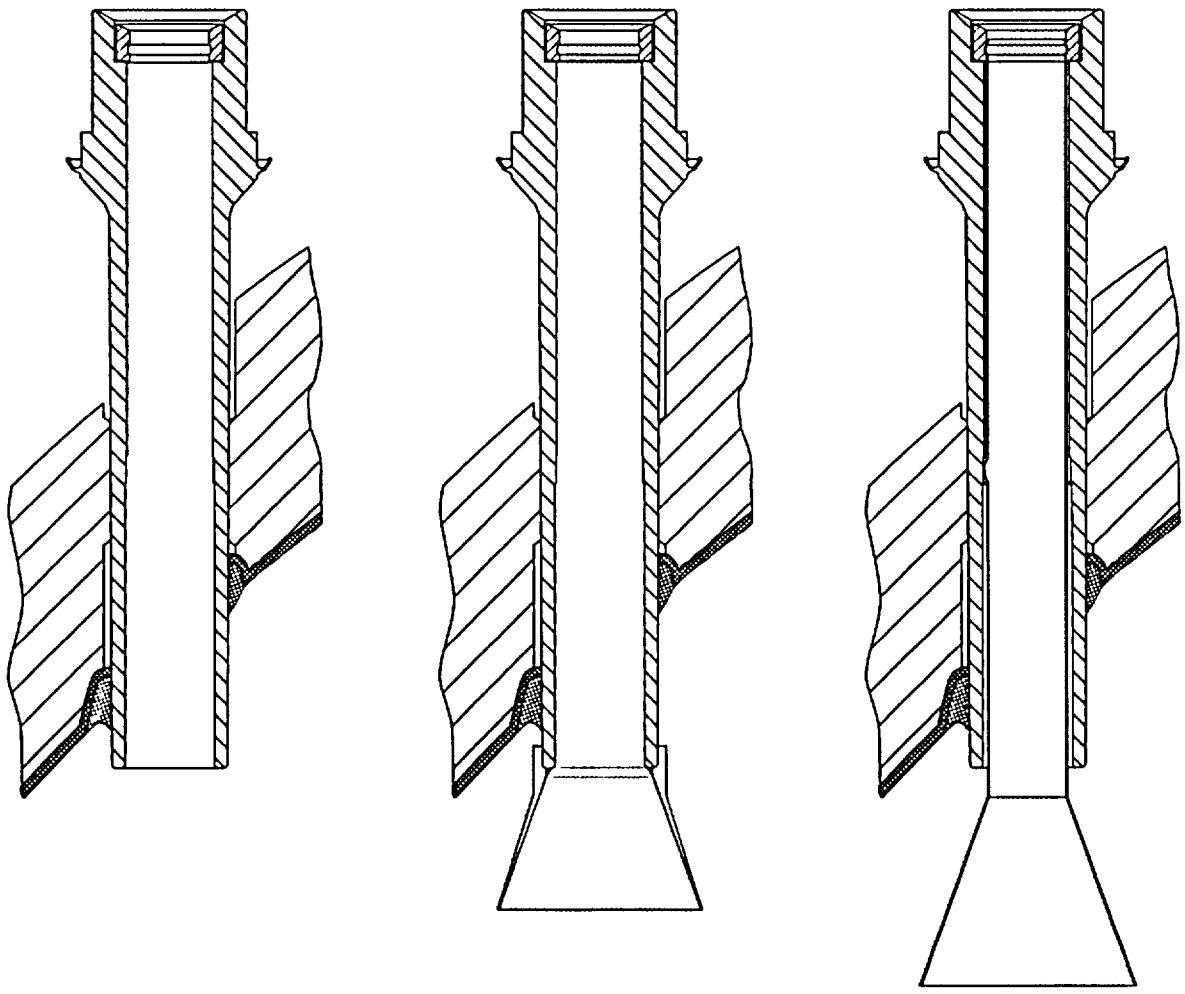
Inspection Issues/Plans

- Inspection Project Goals
  - To ensure safe operation of Unit 2
  - Maximize data collection
  - Utilize best resources
  - Utilize best available technology
- Inspection elements
  - Bare metal qualified visual
  - Volumetric examination
  - Assessment of leakage

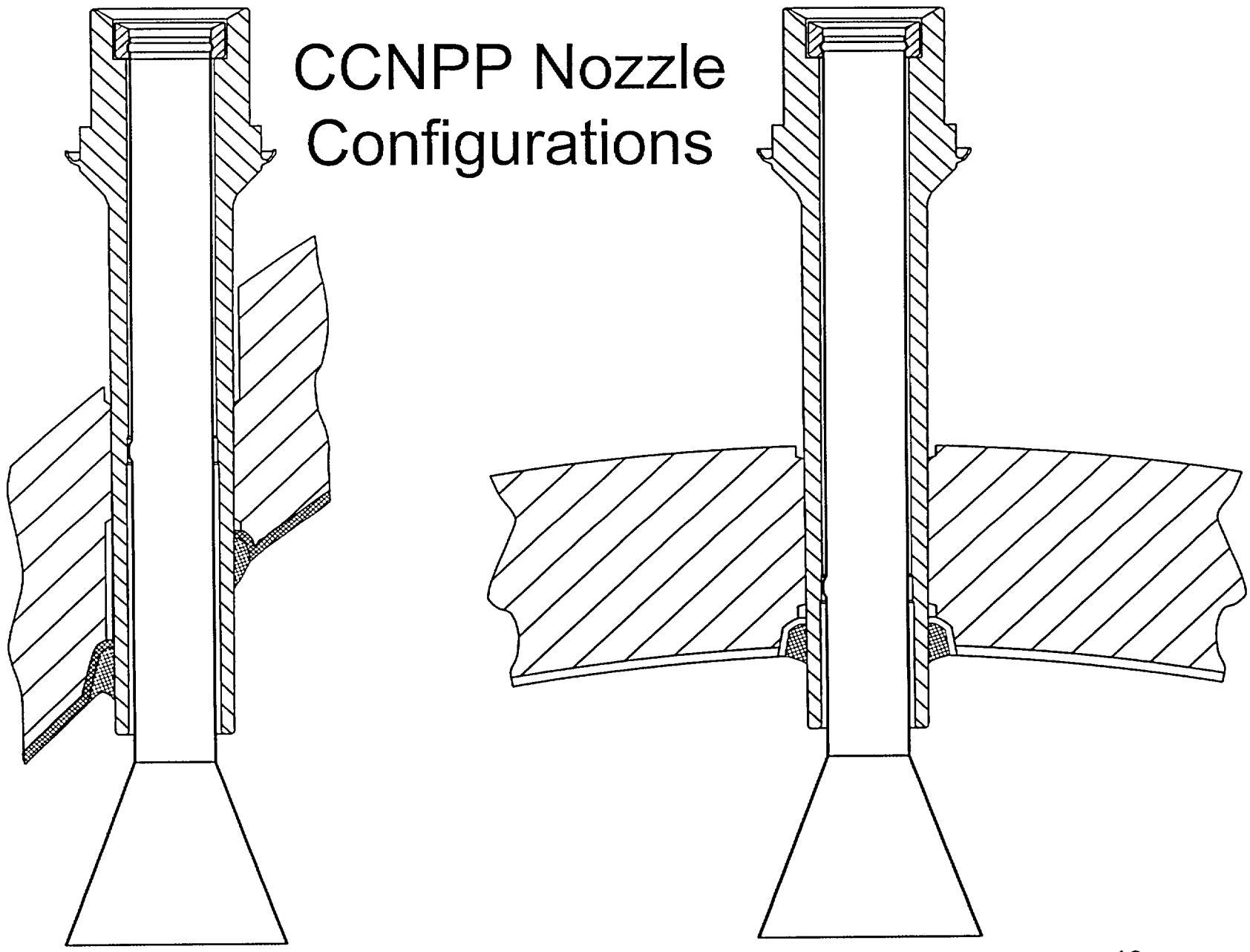
CCNPP Head Configuration



Industry Nozzle Configurations



CCNPP Nozzle Configurations



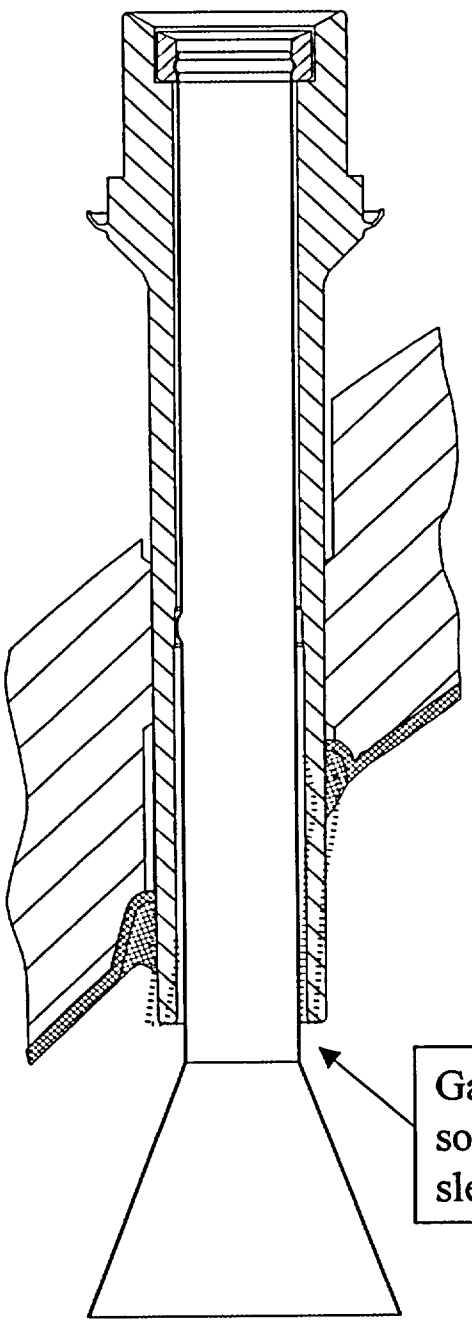
Inspection Results to Date

- 100% "qualified visual" bare metal examination of reactor vessel head
  - No evidence of nozzle leakage
- Volumetric examinations (22 penetrations)
  - No evidence of PWSCC

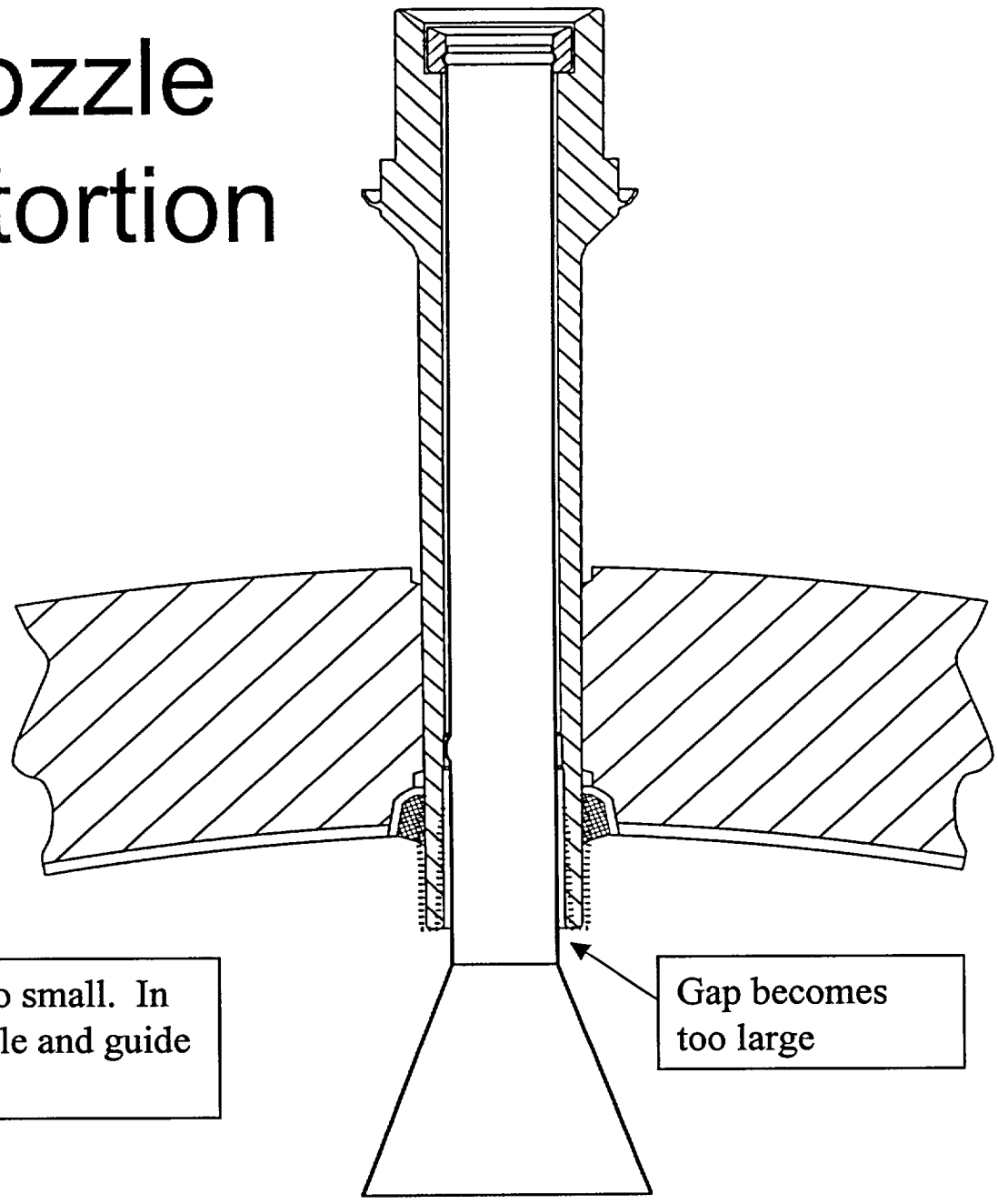
First Window Inspection Issues

- Nozzle distortion
  - Probe coupling
  - Probe access

Nozzle Distortion



Gap becomes too small. In some cases nozzle and guide sleeve touch.



Gap becomes too large

Current Project Activities

- Working with vendor to improve probe design, mockup/testing
- Assessed removal of guide sleeves
  - Acceptable level of quality and safety without removal
  - Dose and new residual stress considerations

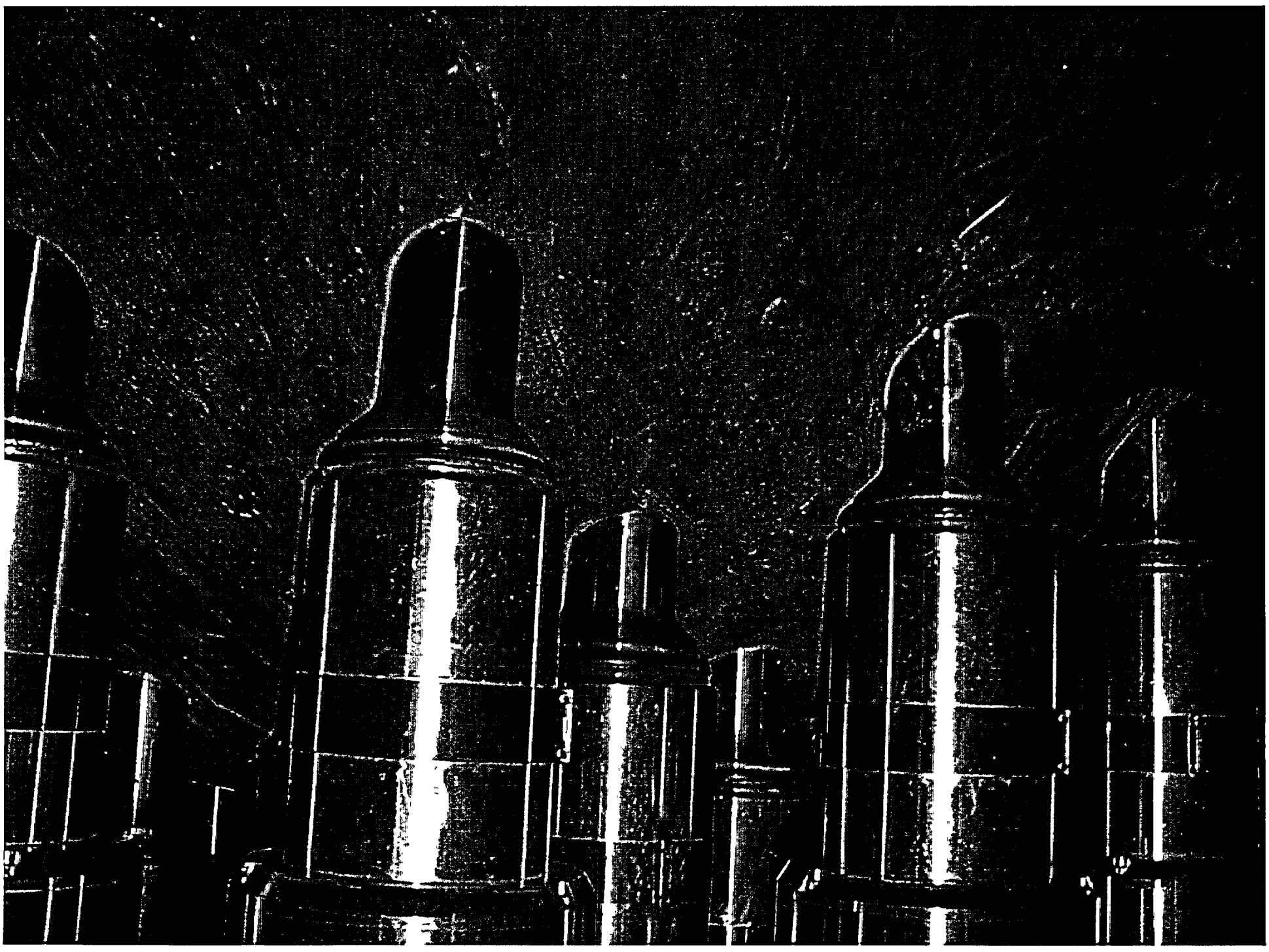
Future Plans

- Plans for 2nd inspection window:
  - Use modified probe to increase coverage
  - Examination of all nozzles
  - Coverage consistent with physical constraints

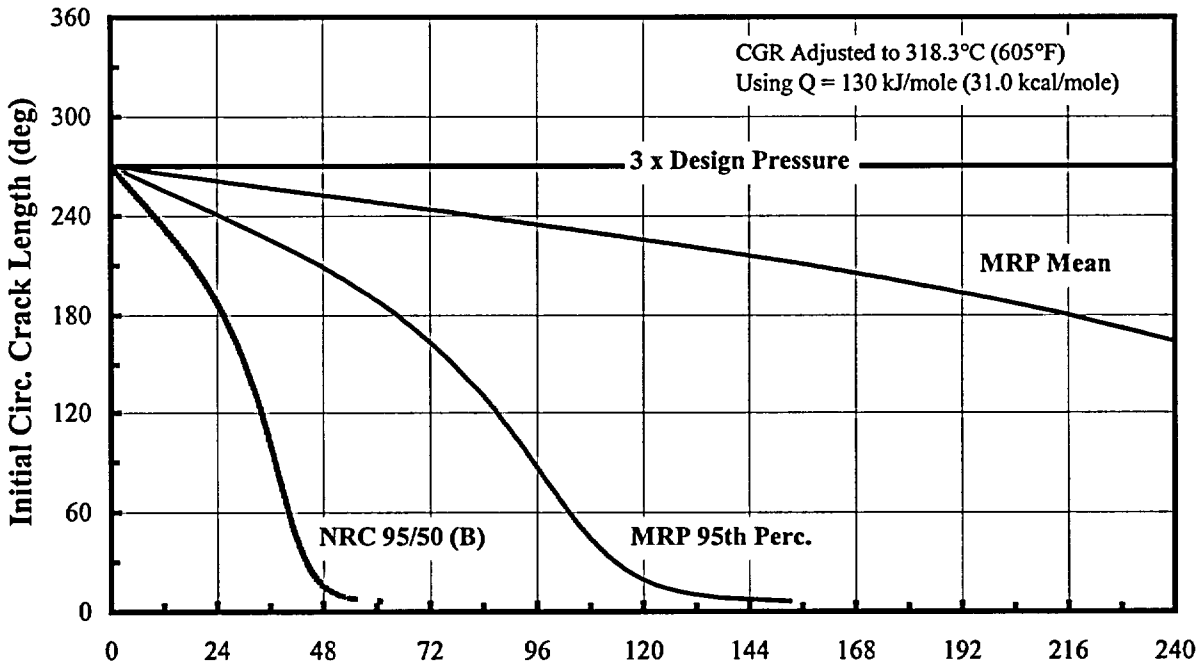
- Future refueling outages:
  - Refine inspection equipment to maximize inspection coverage and minimize dose to personnel

RV Head Materials

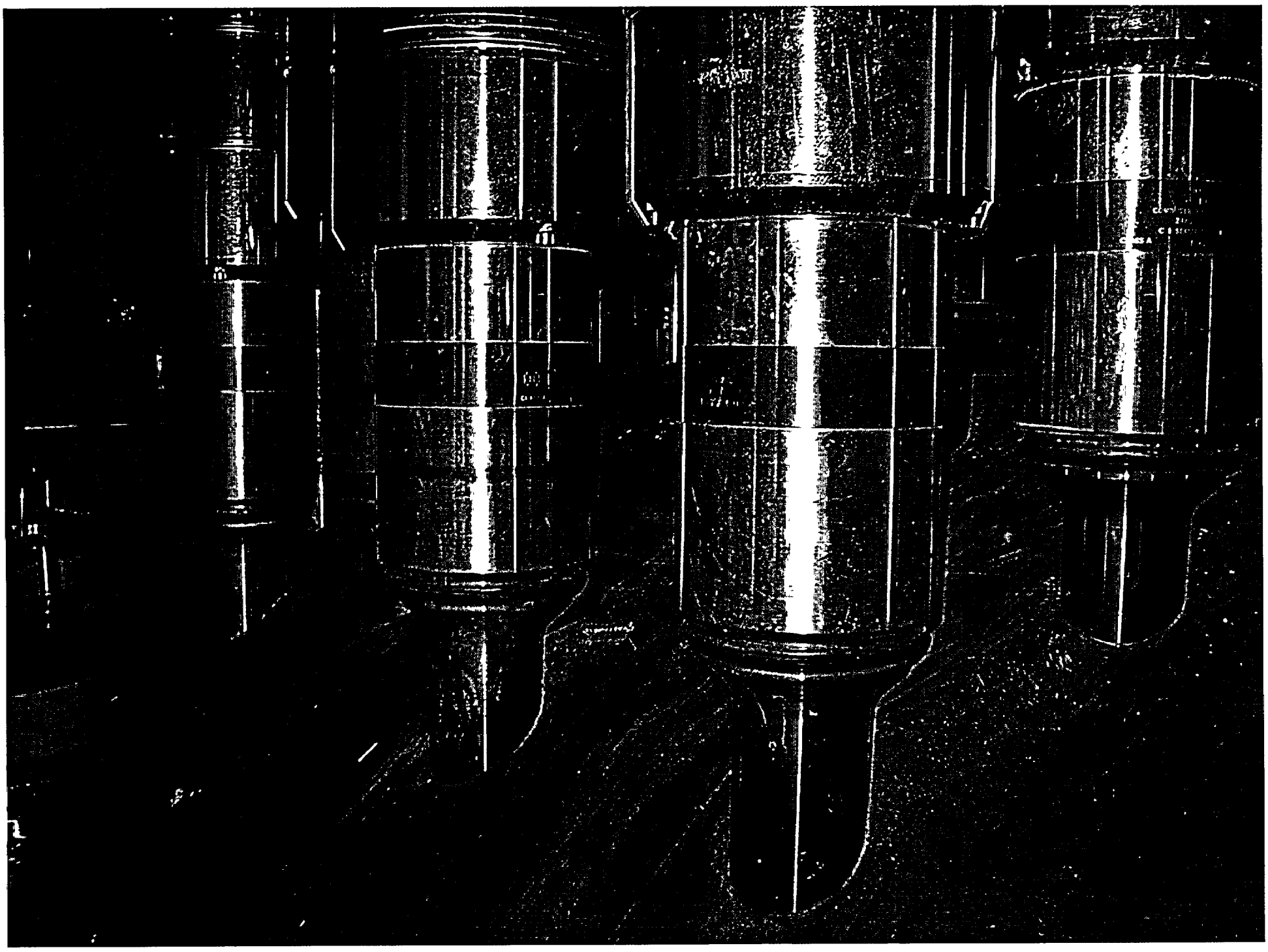
- PWSCC driven by stress
  - Lower yield strength results in lower driving force for cracking
  - PWSCC also driven by time at temperature
- All CEDM nozzles consist of only 2 heats



Postulated Crack Growth



Calculated Remaining Operating Time for a Circumferential Crack to Grow to the 3× Limit Load Condition at the Maximum U.S. Head Temp of 605°F



Bare Metal Visual Examination

- Basis for conclusion of structural integrity and safety for ensuing cycle
  - No evidence of leakage, therefore, no through wall cracks that will threaten structural integrity
  - Empirical basis

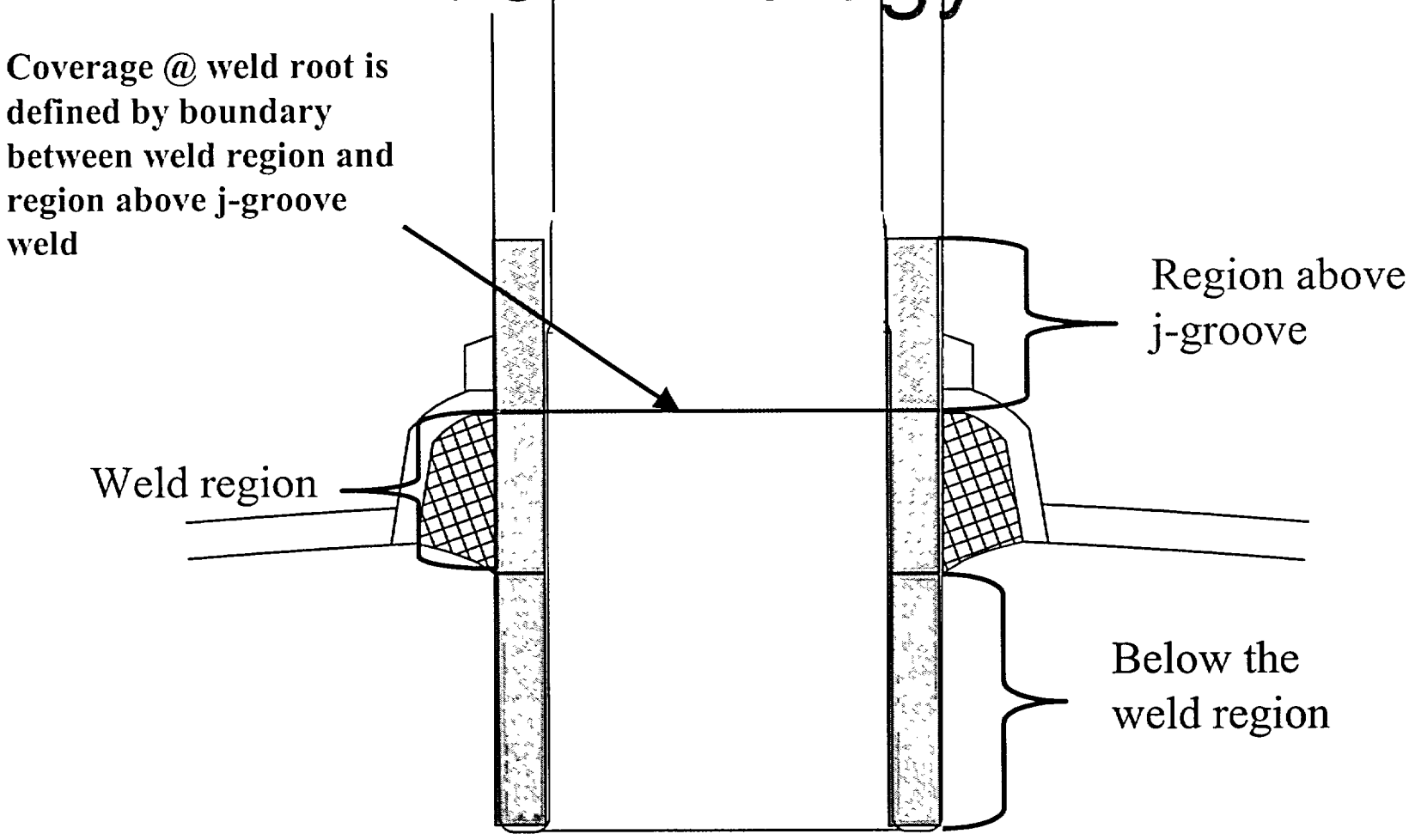
Volumetric Examination

- Volumetric examination of nozzle material provides defense in depth
  - Volumetric examination identifies part through wall cracks
  - No part through wall cracks ensure no precursors to structural integrity exist

Volumetric Examination

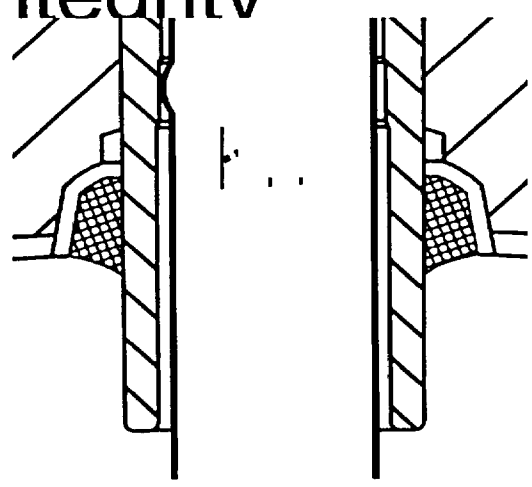
- Achieve greatest coverage possible within physical and other limitations
- ICI and RV head vent line
  - Rotating probe
    - 100% coverage complete
    - Clean
- CEDM nozzles have guide sleeves that prevent access with a rotating probe

Nozzle Exam Coverage Terminology



Coverage Above Weld Region

- Have achieved examination of approximately 214 of 227 in^2
- Unavailable azimuths assessed deterministically for structural integrity
  - 11 nozzles have 360° coverage
  - One has 355° coverage
  - One has 117° coverage

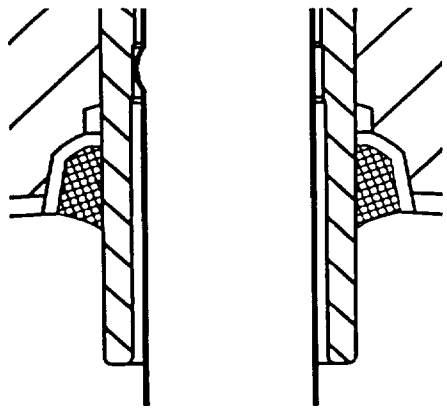


Coverage at Weld Root

- Have examined approximately 6 of 10 total in^2
- Unavailable azimuths can be assessed deterministically for structural integrity
- Several nozzles 0° coverage

Material Adjacent to Weld Region

- Have examined approximately 37 of 117 total in^2
- Fewer structural integrity concerns for unavailable azimuths in welds



Material Below Weld Region

- Have examined approximately 92 of 229 total in^2
- No structural integrity concerns for unavailable azimuths below weld

Assessment of Leakage

- Accomplished for 20 of 22 nozzles with no degradation identified
- We will complete assessment on every nozzle

Current Data

- Unit 2 head does not have leaks
- UT has yielded no evidence of PWSCC
- Unit 2 is safe for an additional cycle of operation

Summary

- Inspection results
- Plan for remaining inspection
- Safety basis

Safety Basis Summary

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Conclusion

- Approach provides reasonable assurance of adequate protection of public health and safety