

**NRC AUGMENTED  
INSPECTION TEAM  
EXIT MEETING**

**DAVIS-BESSE REACTOR  
VESSEL HEAD CORROSION**

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APRIL 5, 2002

# NRC Augmented Inspection Team Exit Meeting

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## Agenda

P Welcome

P Meeting Agenda and Structure for Public Involvement

P Introduction of NRC and DB Personnel

P Purpose of an Augmented Inspection Team

P Background on Boric Acid Corrosion and Reactor Head Penetration Cracking

# NRC Augmented Inspection Team Exit Meeting

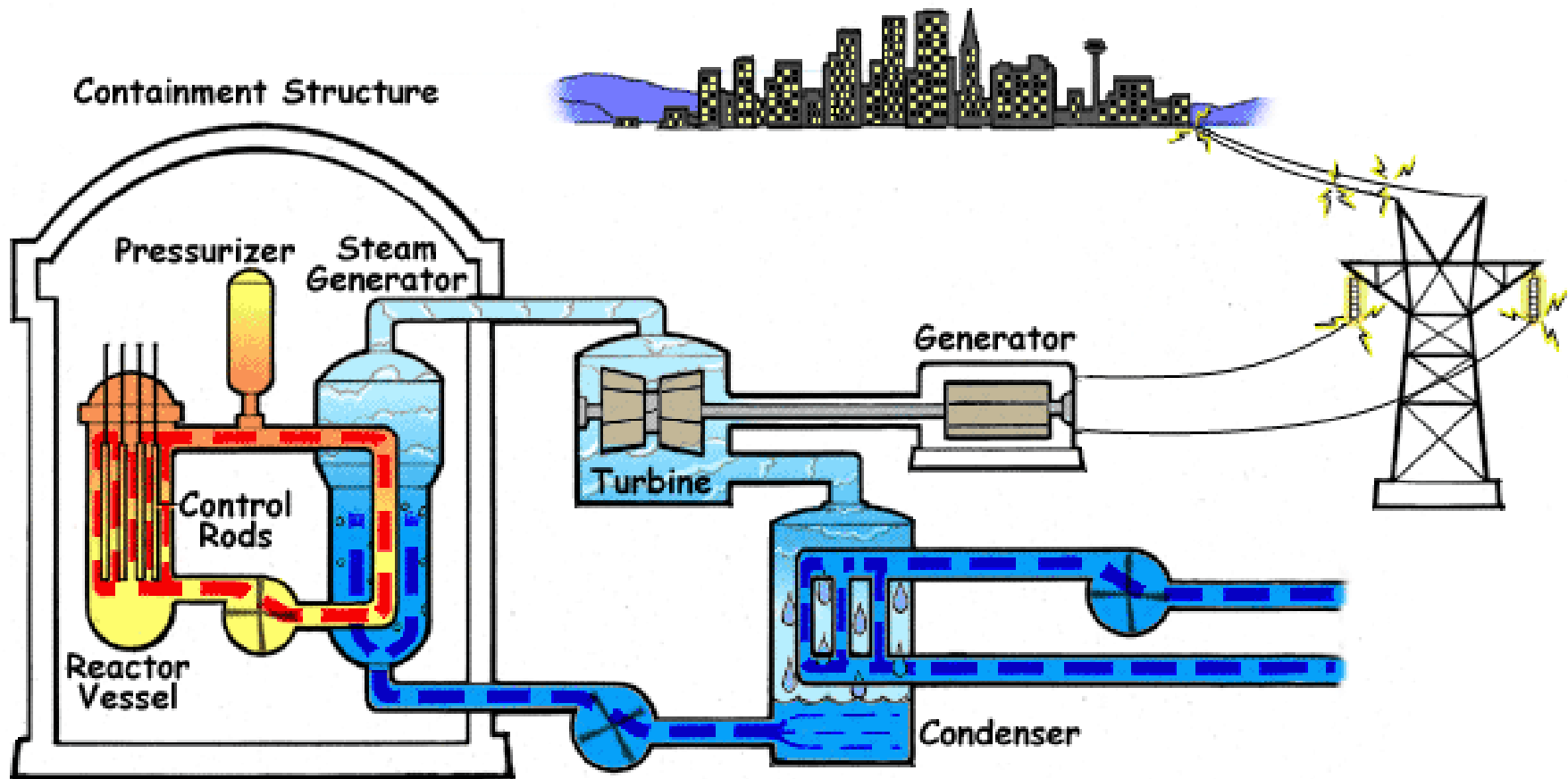
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## Agenda

- P Characterization of Reactor Head Inspection Results
- P Methods and Results for Identifying Reactor Head Corrosion
- P Preliminary Causes for Reactor Head Corrosion
- P NRC Further Actions
- P Concluding Remarks
- P Response to Public Questions

# Typical Pressurized Water Reactor

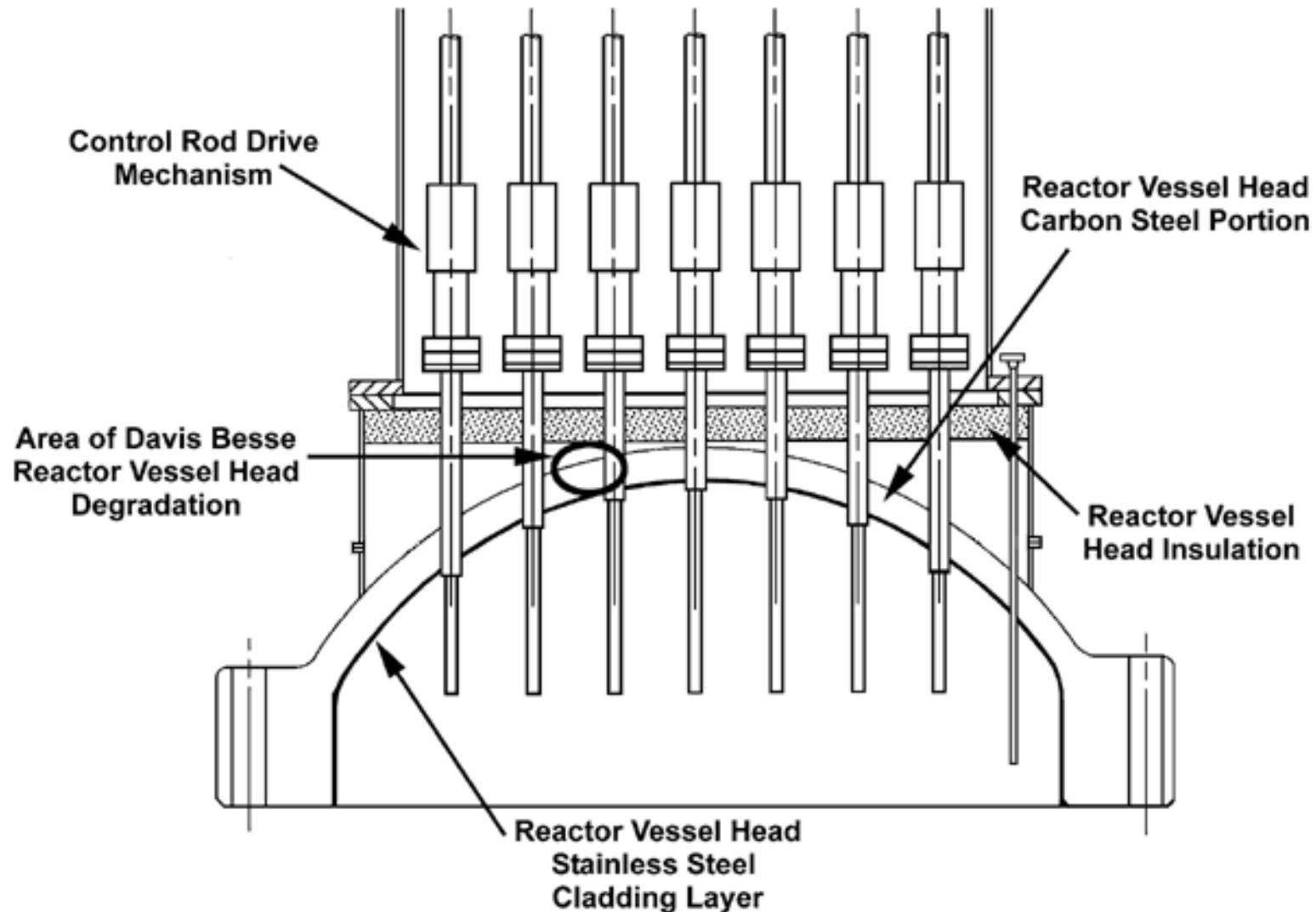
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# NRC Augmented Inspection Team Findings

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Reactor Vessel Head Degradation Location



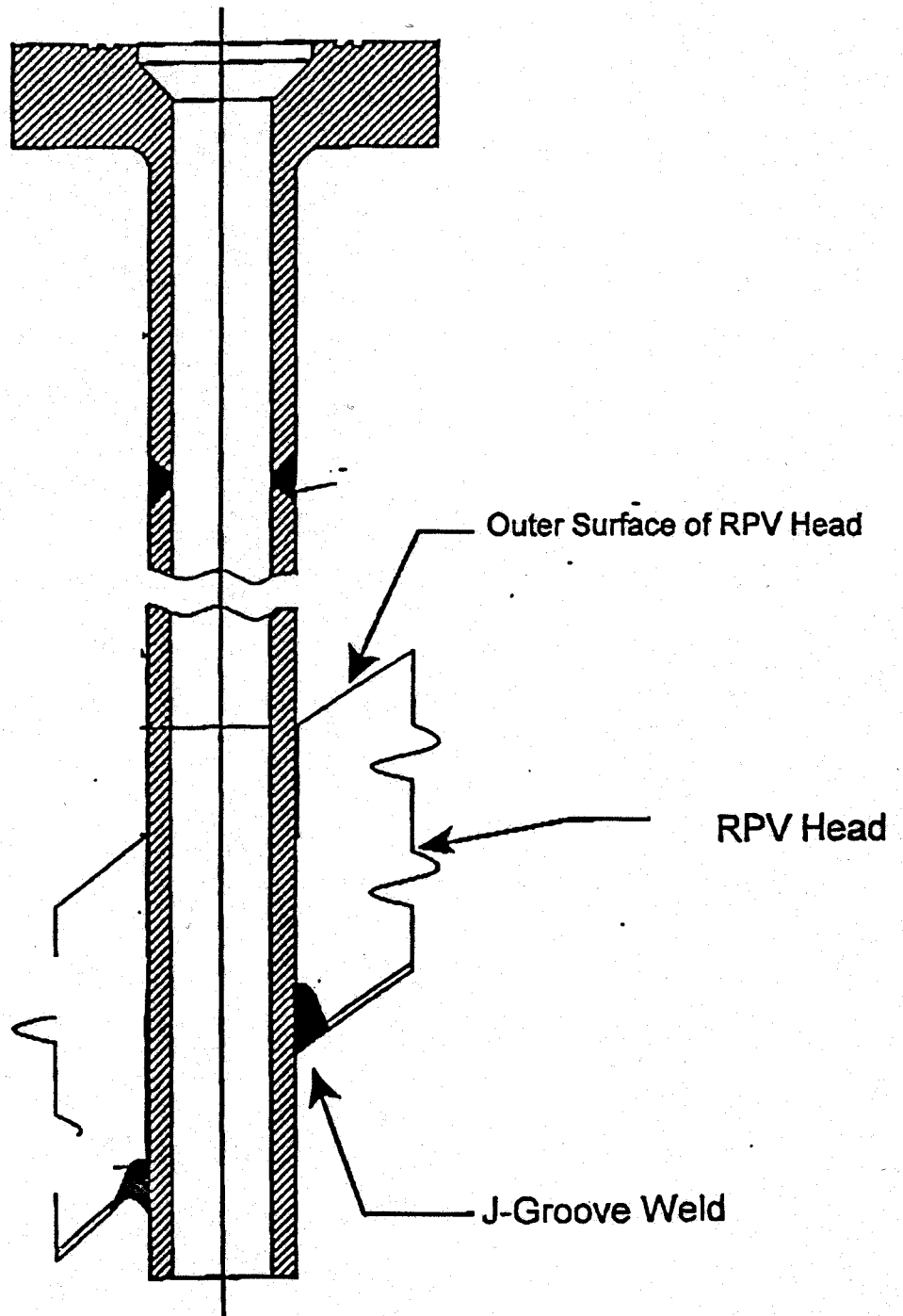
# Reactor Vessel Head Cavities

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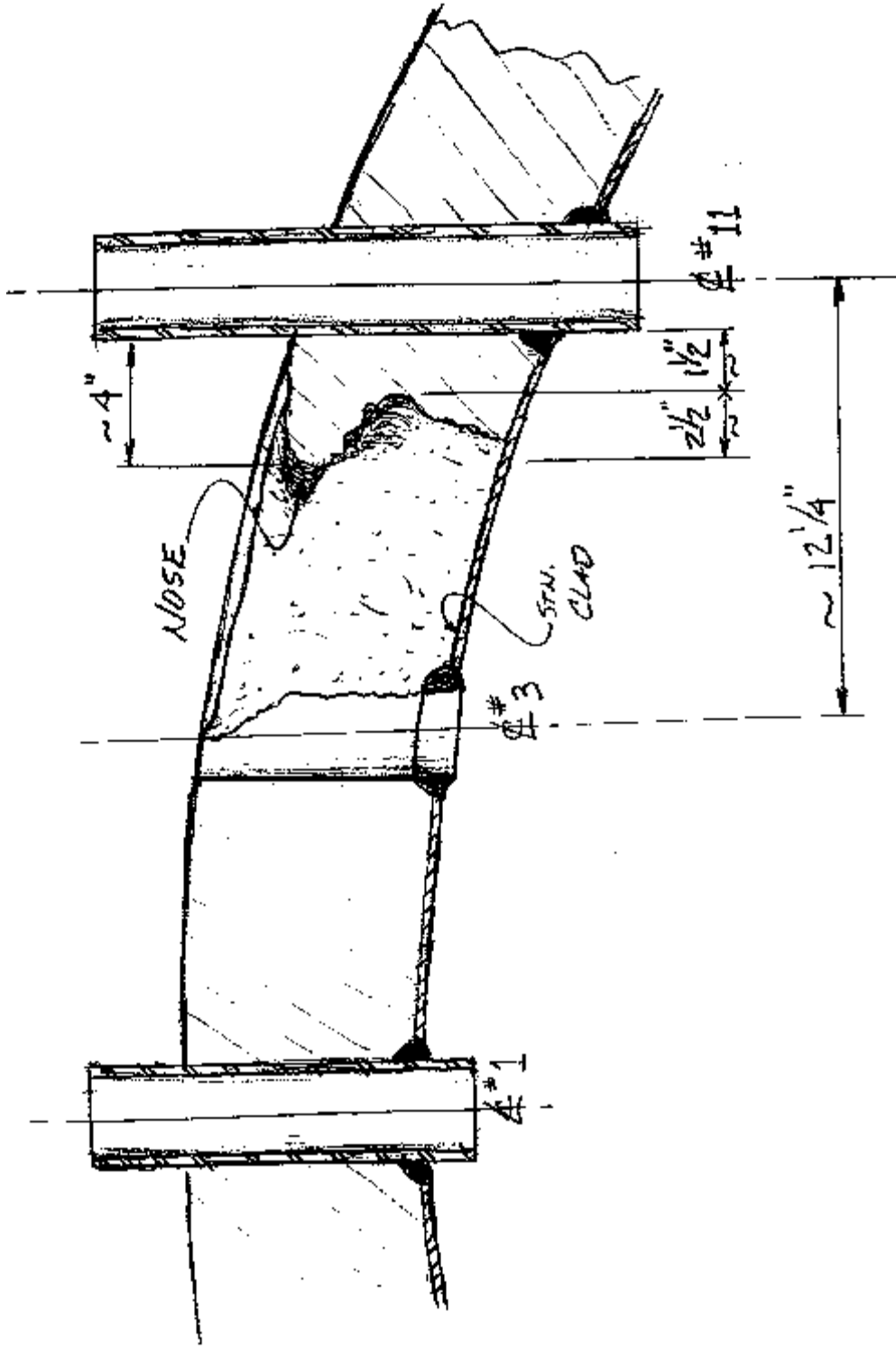
P 5 Nozzles Cracked; 3 Went All the Way Through the Nozzle Wall

P Description of Cavity Near Nozzle #3

P Metal Loss Near Nozzle #2

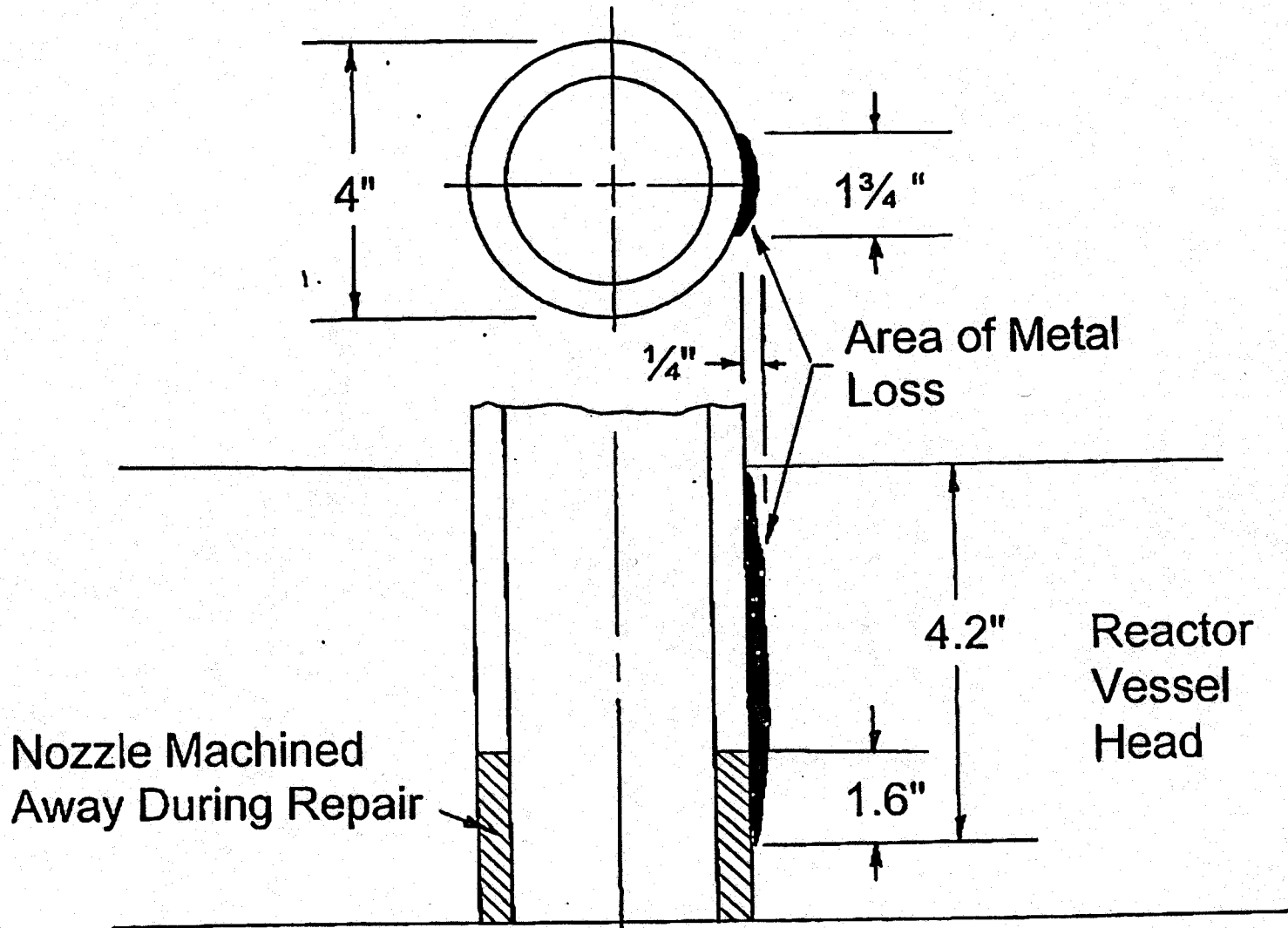


Schematic Figure of Typical CRDM Nozzle Penetration





# Nozzle 2 Metal Loss



11:35:20 03/08/02

DAVIS BESSE

NOZZLE 3

RFO 13

QUAD B

11:36:06 3/8/02



# Missed Opportunities to Identify Corrosion

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P Containment Air Cooler Clogging

P Containment Radiation Monitor Filter Clogging

P Boric Acid Buildup and Corrosion on Reactor Head

# Containment Air Cooler Clogging

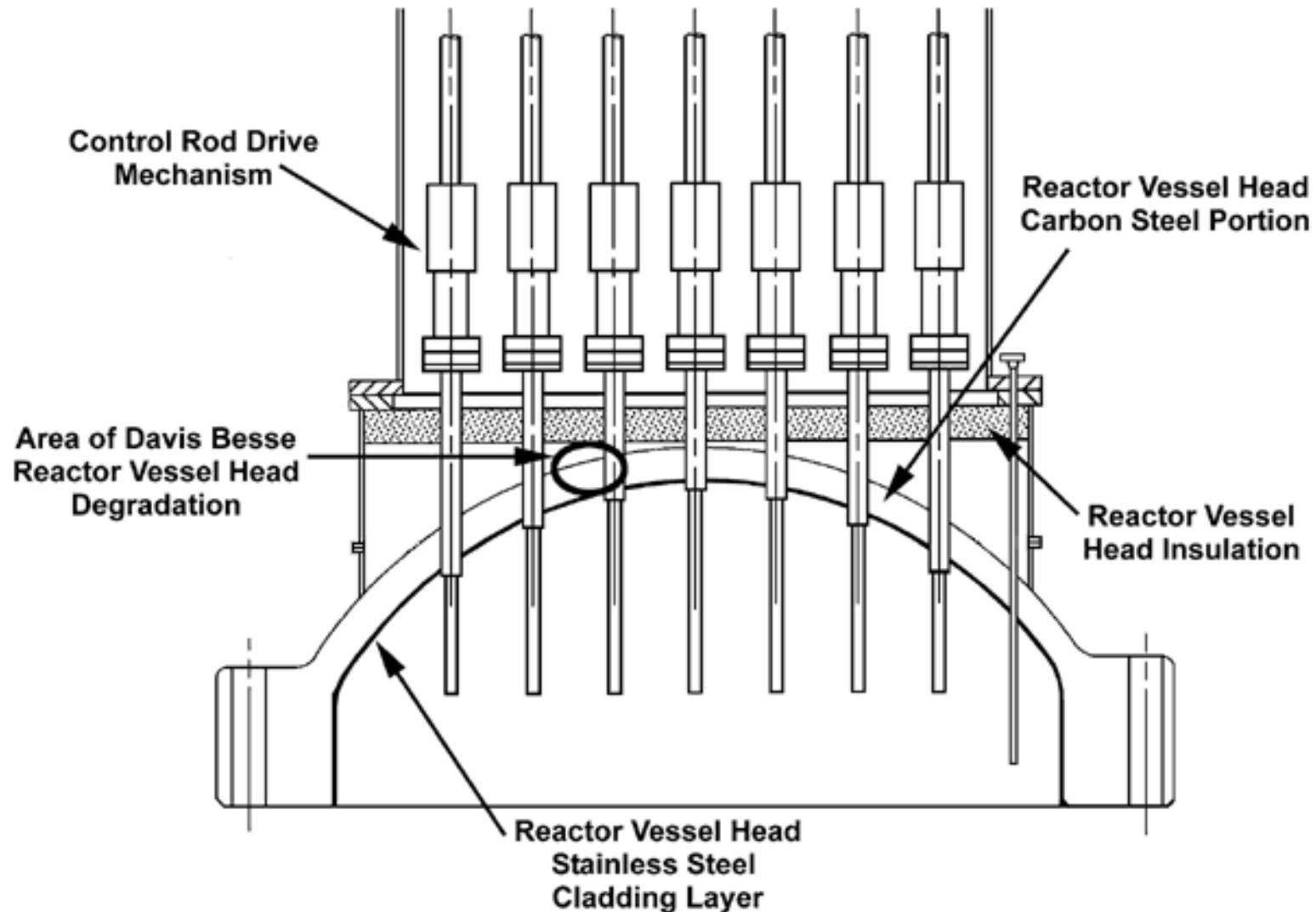
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- P Safety System Used to Cool Containment
- P Increase in Boric Acid Collected on Cooling Coils in 1999
- P Change in the Color of Boric Acid Deposits in 1999
- P DB Staff Assumed Changes in Volume of Boric Acid Deposits Due to Flange Leakage
- P DB Staff Assumed Changes in Boric Acid Color Due to Corrosion of Air Cooler

# NRC Augmented Inspection Team Findings

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Reactor Vessel Head Degradation Location



# Containment Radiation Monitor Filters

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- P Detect Radioactivity in Containment Air from Reactor Coolant Leakage
- P Beginning in May 1999, Frequency of Filter Changes Increased from Monthly to Every Other Day
- P Filters Clogged with Corrosion Products from Reactor Coolant Leakage

# **Boric Acid Corrosion Control Program**

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**P** Required By NRC in 1988

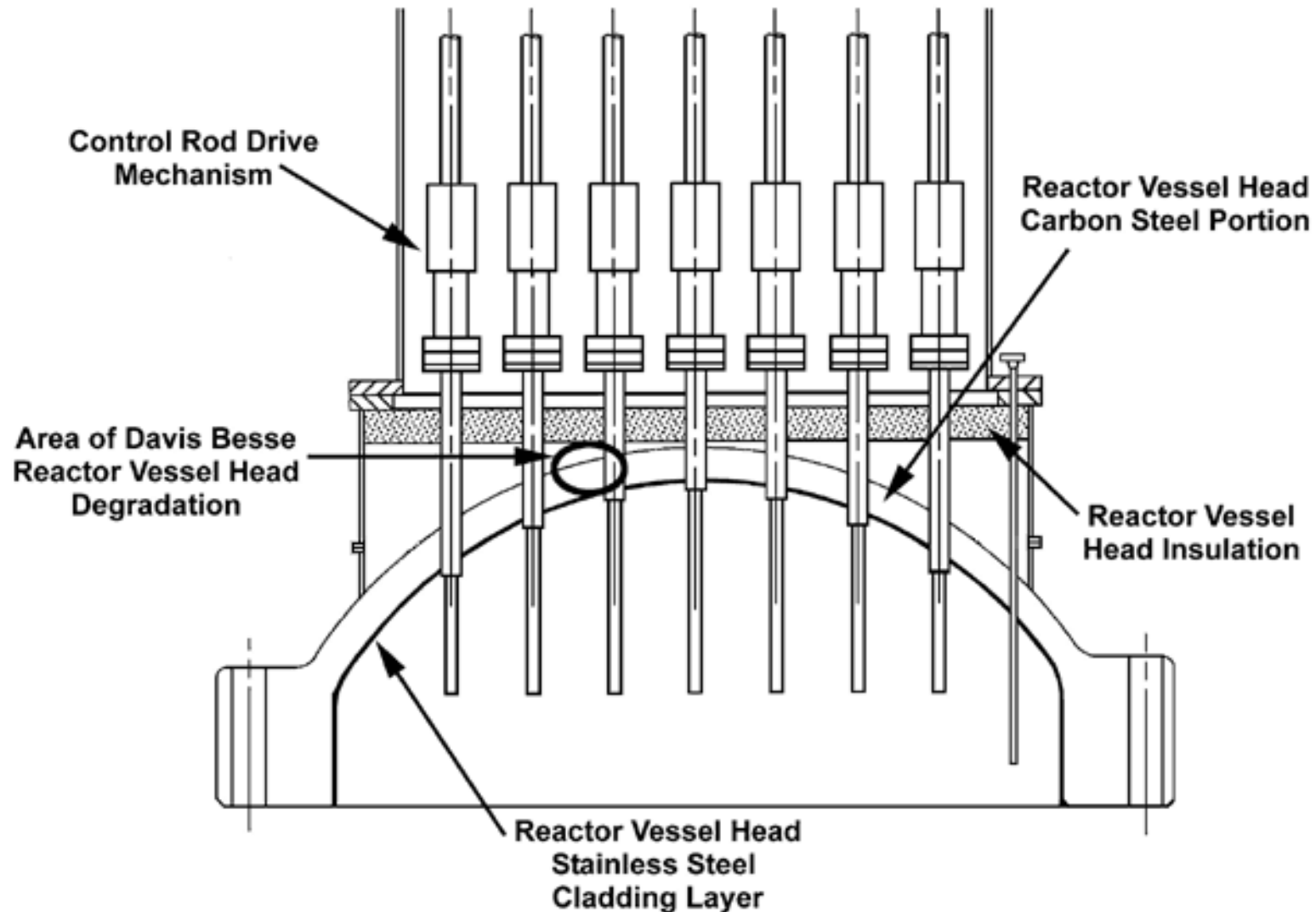
**P** Sensitive and Reliable Indicator of Reactor  
Coolant System Leakage

**P** One Drop per Second ( $\approx 0.001$  gpm) Will Leave  
15 Pounds of Boric Acid in 1 Year

# NRC Augmented Inspection Team Findings

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Reactor Vessel Head Degradation Location





# **Boric Acid Program Activities**

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- P** Ongoing Nozzle Flange Leakage Continued to be a Source of Boric Acid Deposits
- P** 1990 Modification to Improve Reactor Vessel Head Access Was Not Installed
- P** Reactor Vessel Head Boric Acid Deposits Were Not Completely Removed
- P** Indications of Reactor Vessel Head Corrosion Were Not Recognized or Evaluated



# Preliminary Root Cause

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P Cavity Caused by Boric Acid Corrosion From Leakage Through Cracks in the Nozzle

P Significant Corrosion Began at Least 4 Years Ago

# Root Cause Areas Yet To Be Addressed

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P Determination of Corrosion Process (Chemistry)

P Role of Deposits Left on Reactor Head

P Role of Reactor Head Temperature on the Rate of Corrosion

P Rate at Which Cracks and Corrosion Progressed

P Correlation of Davis Besse and Industry Experience

# Confirmatory Action Letter

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**P**Determine the Root Cause

**P**Evaluate the Reactor Coolant System for Other Corrosion

**P**NRC Must Approve Any Repair or Modification

**P**Obtain NRC Restart Approval

# **NRC Further Actions**

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- P Special Inspections for Compliance Issues**
- P Special Inspections for Modifications, Repair or Replacement**
- P Evaluating Implications on Other Plants**
- P NRC Identifying Improvements to Regulatory Processes and Inspection Programs**

**P Summary and Concluding Remarks**

**P Public Questions and Answers**

# For Additional Information

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**P** NRC Website: [www.nrc.gov](http://www.nrc.gov)

**P** Headquarters Operator

- ▶ 1-800-426-8096
- ▶ 1-800-368-5642
- ▶ Tony Mendiola