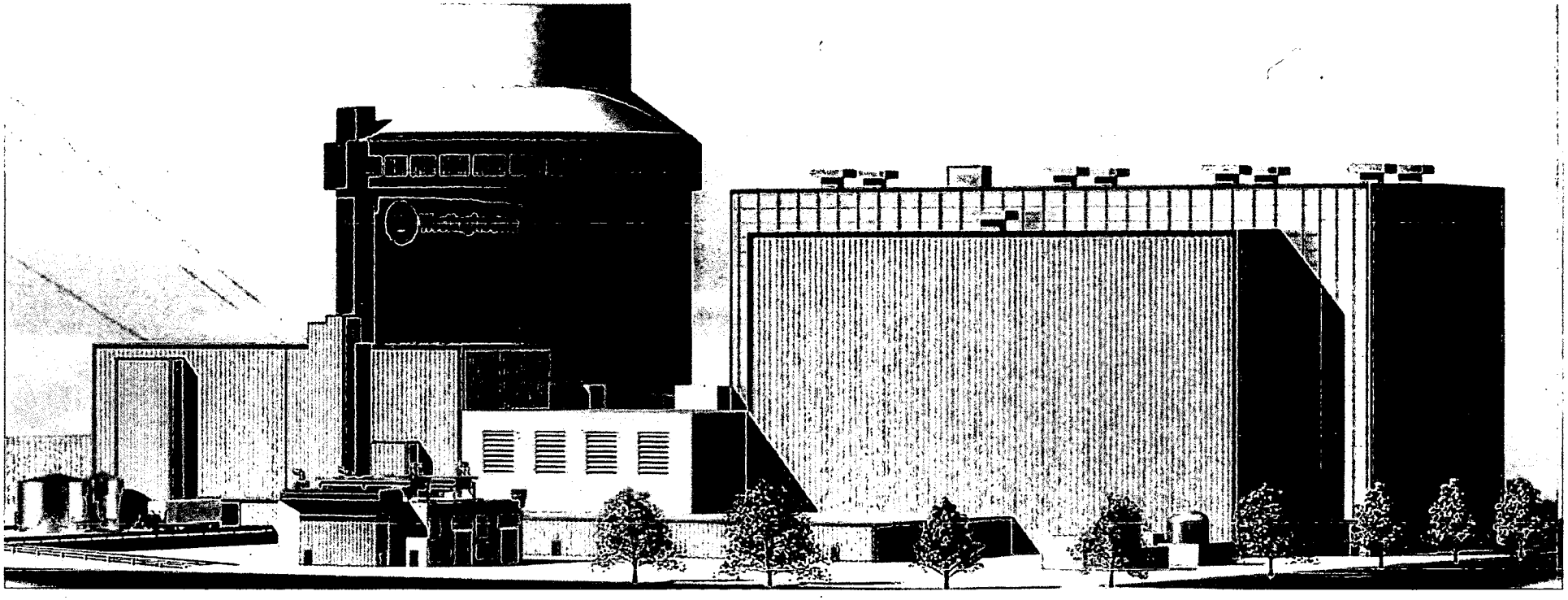
ENCLOSURE 6

AP1000 Shield Building – Advisory Committee on Reactor Safeguards –
November 17, 2010 – (Non- Proprietary)

AP1000 Shield Building

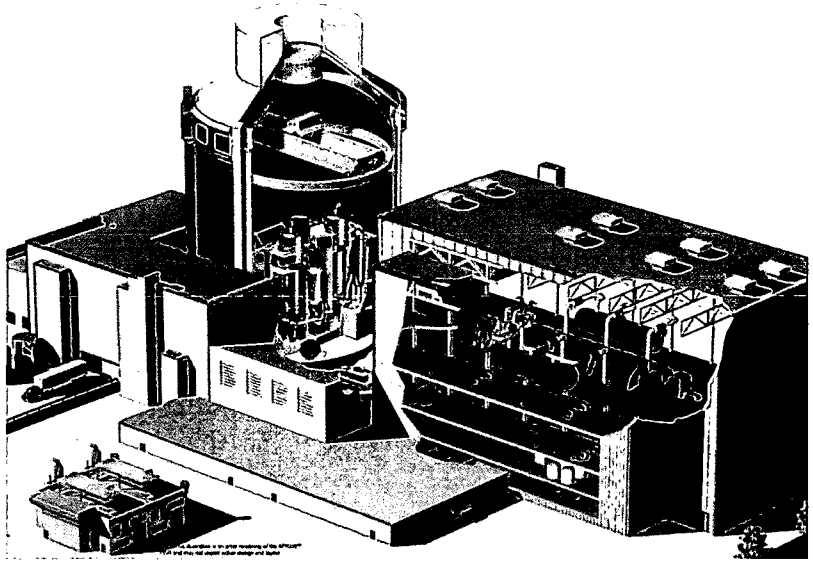
Advisory Committee on Reactor Safeguards

November 17, 2010

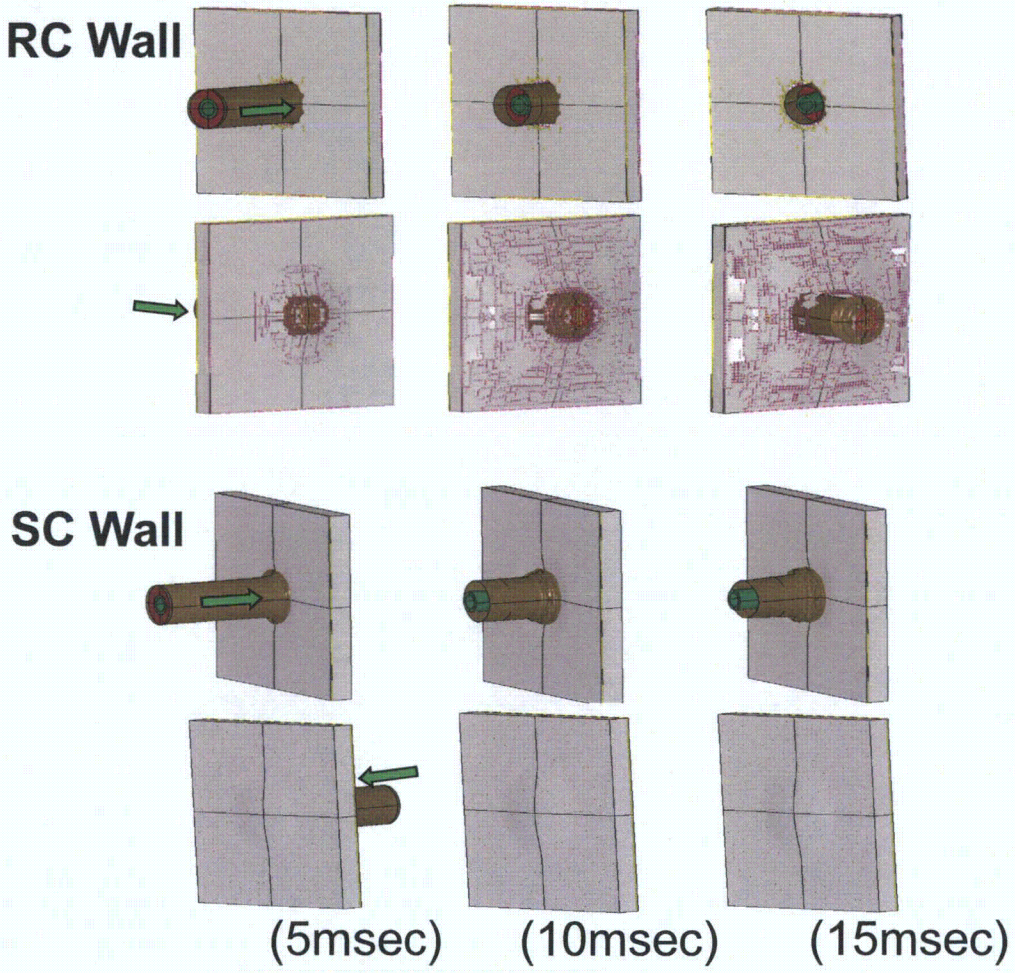


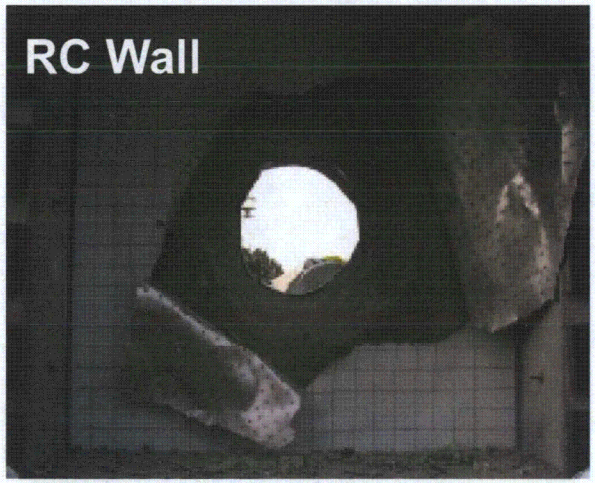
AP1000 Shield Building

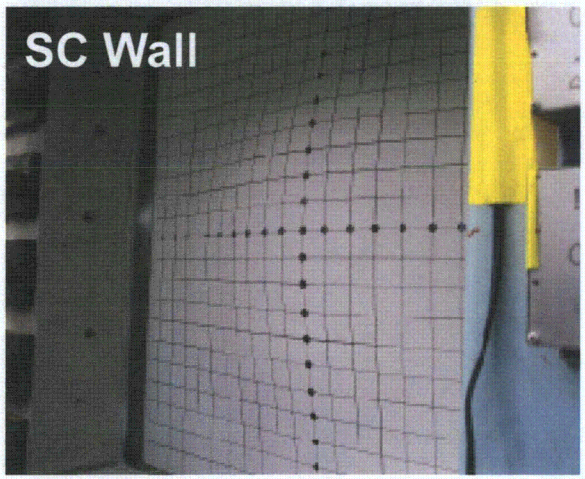
- Shields the containment vessel and systems within the containment from external events during normal operations, such as tornados and tornado-driven objects
- Supports the passive containment cooling water storage tank (PCSWST)
- Provides for natural air circulation cooling of the containment vessel
- Provides an additional radiological barrier for radioactive systems and components inside the containment vessel



SC Construction Provides Superior Performance against Missiles

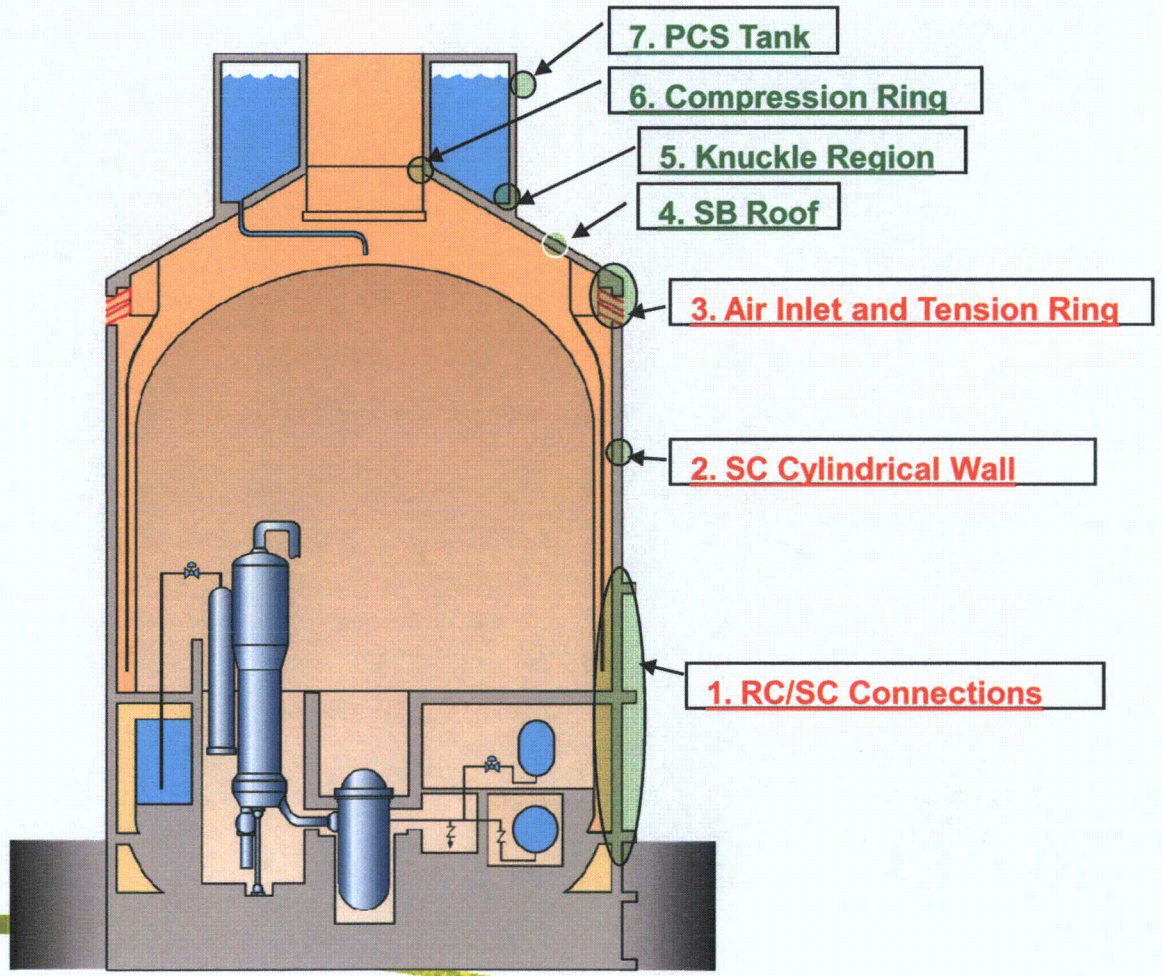




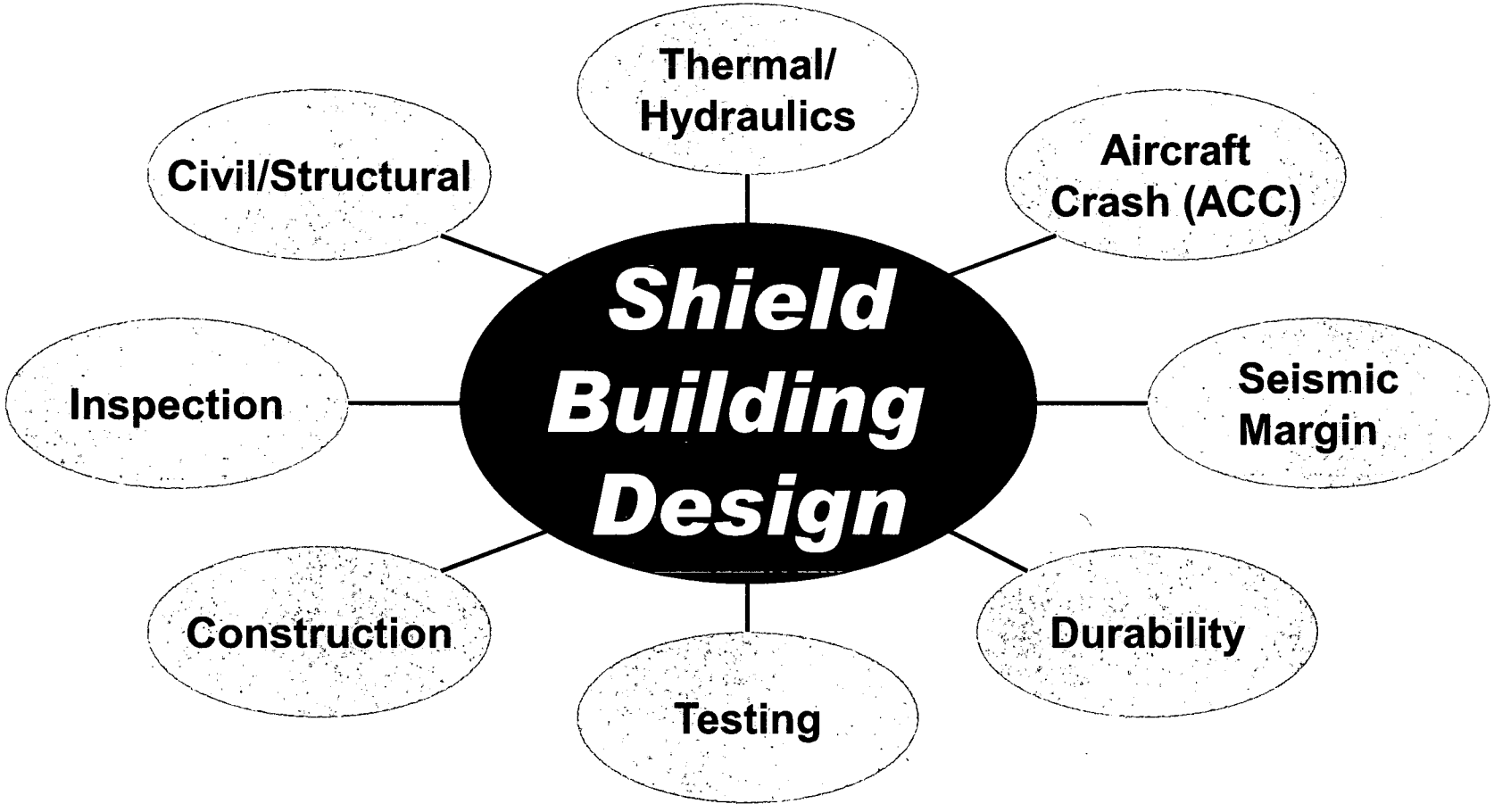


Shield Building Design Features

- Revised the air inlet/ tension ring design for constructability and strength
- Reinforced cylindrical wall with tie bars between steel plates
- Increased SC plate thickness to improve strength and ductility
- RC/SC connection redesigned to improve ductility



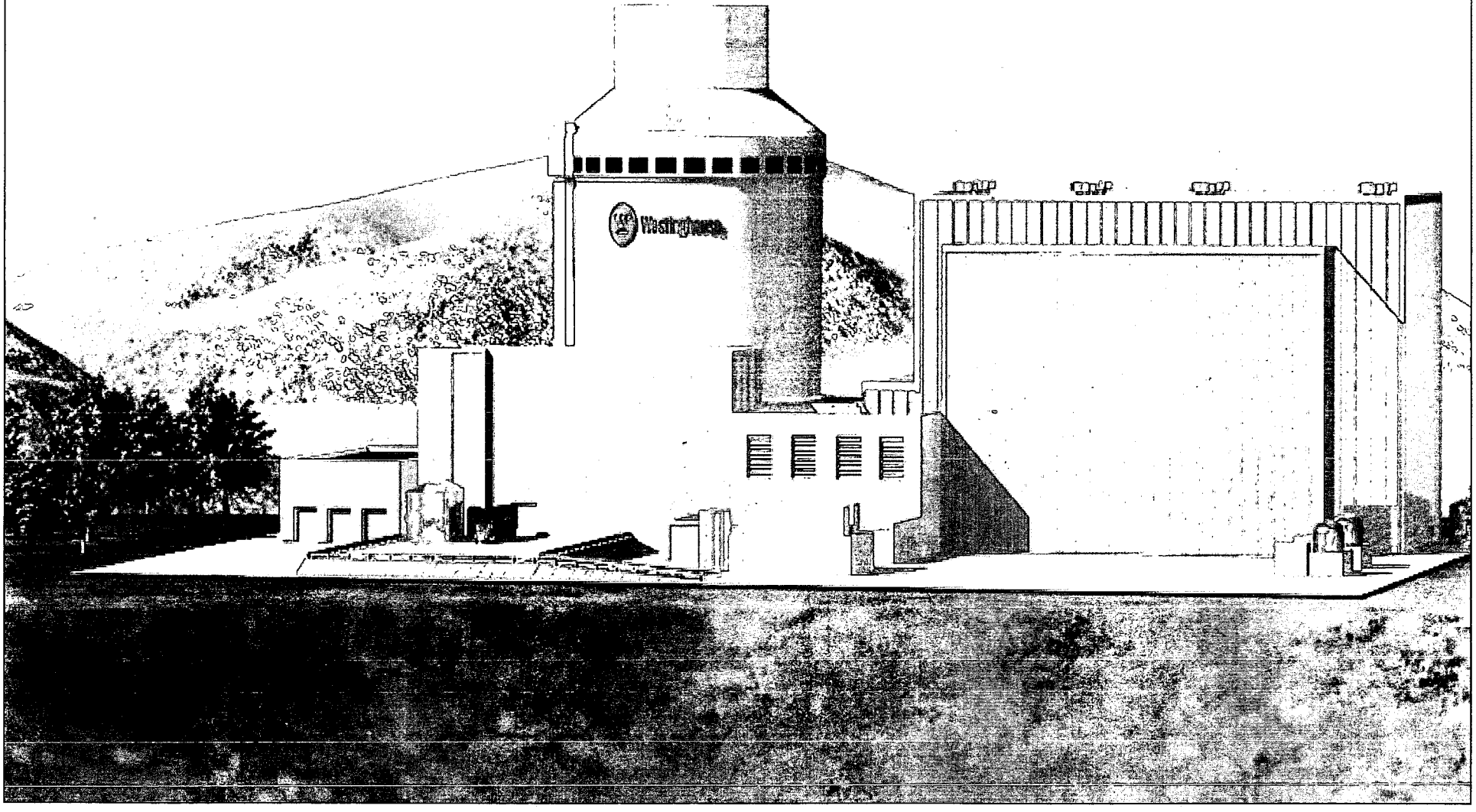
Integrated Design Process



AP1000 Shield Building Design – All Open Issues Resolved

- The SC was adopted for the Shield Building because of its superior performance in resisting aircraft crash
- The adequacy of the Shield Building to meet regulatory requirements with large margin has been demonstrated through testing and benchmarked nonlinear analyses
- Design has undergone substantial improvements. Features have been implemented into the Shield Building design that increase the safety margin and make the SC Shield Building act more as a unit
- The design changes have been implemented through an integrated design approach that has considered all aspects of design, including durability, construction, and safety
- The out-of-plane shear capacity is much larger than the force demands in all regions of the Shield Building
- Pushover analyses demonstrate that the Shield Building has large margin and can withstand SSE and beyond RLE level earthquakes and system failure occurs by ductile membrane action and not by out-of-plane shear brittle failure

Proprietary Portion of Presentation
Closed Session



WEC Has Successfully Addressed NRC Concerns from October Letter

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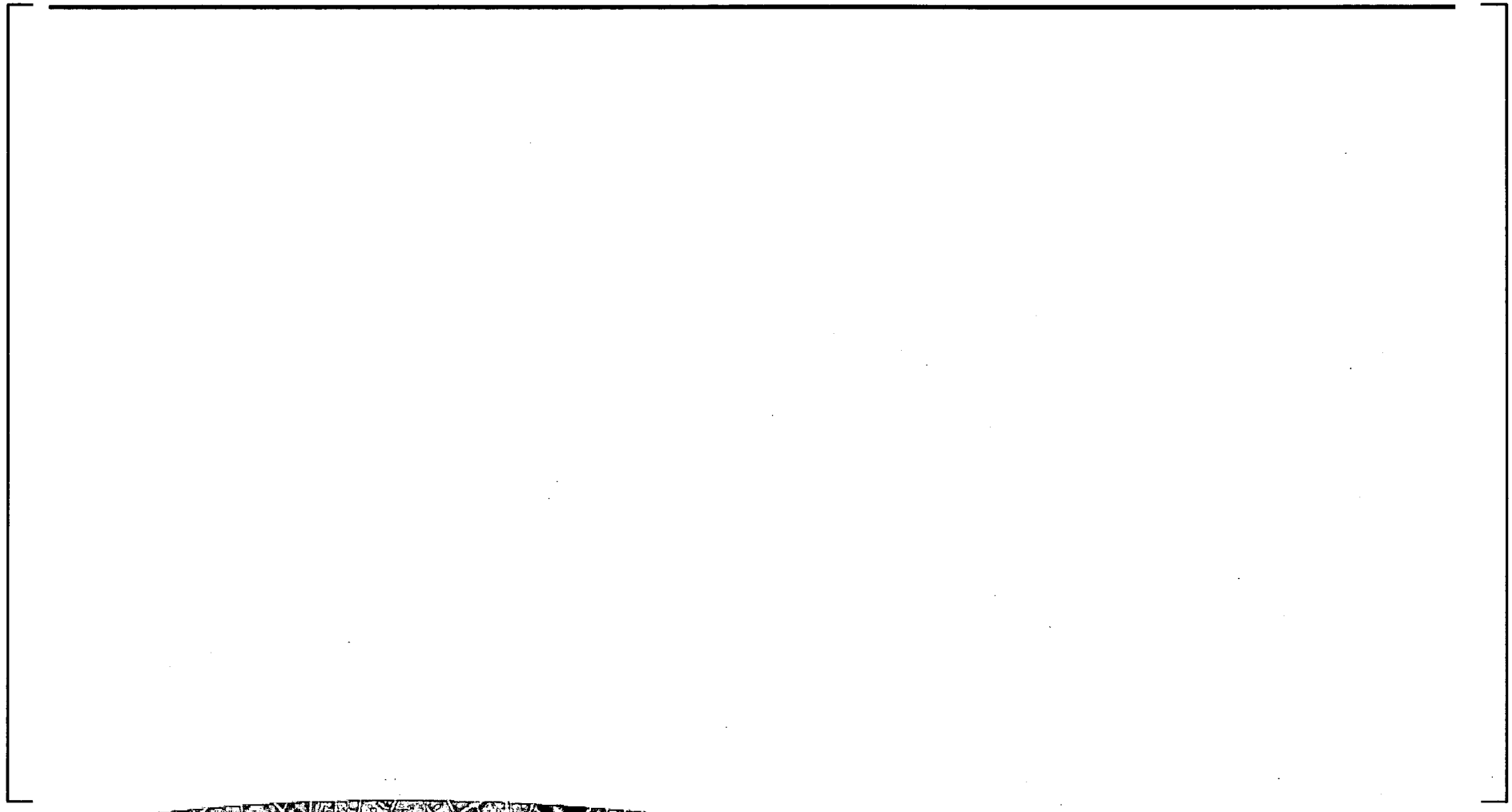
a,c



ACRS Actions Items *(from Information Session)*

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Comprehensive Analysis Plan

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Comprehensive Testing

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Out-of-Plane Shear Tests

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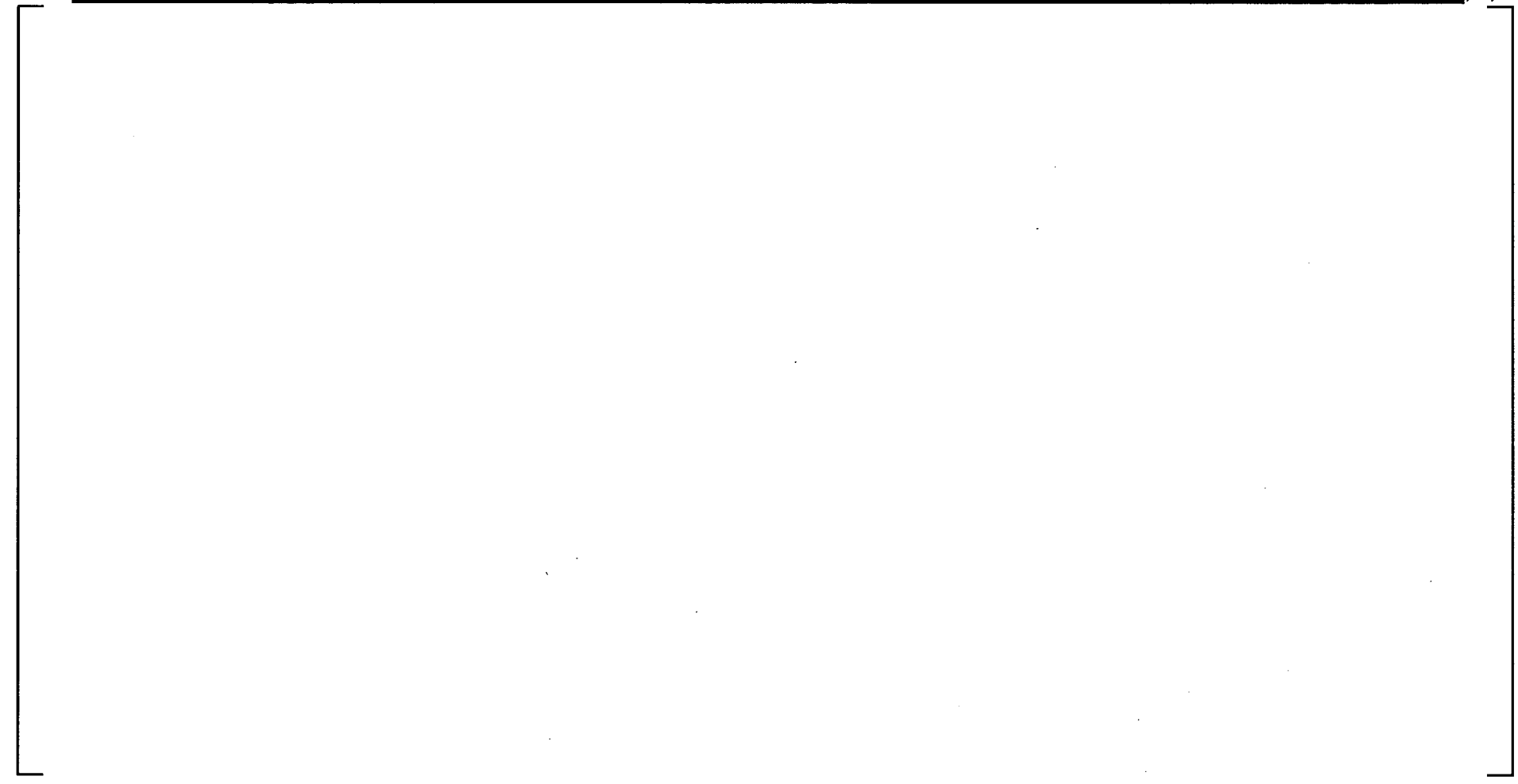
Detailed Finite Element Models Predicted Experimental Results

a,b,c



Benchmarking of Detailed 3D Finite Element Models

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Construction and Inspection

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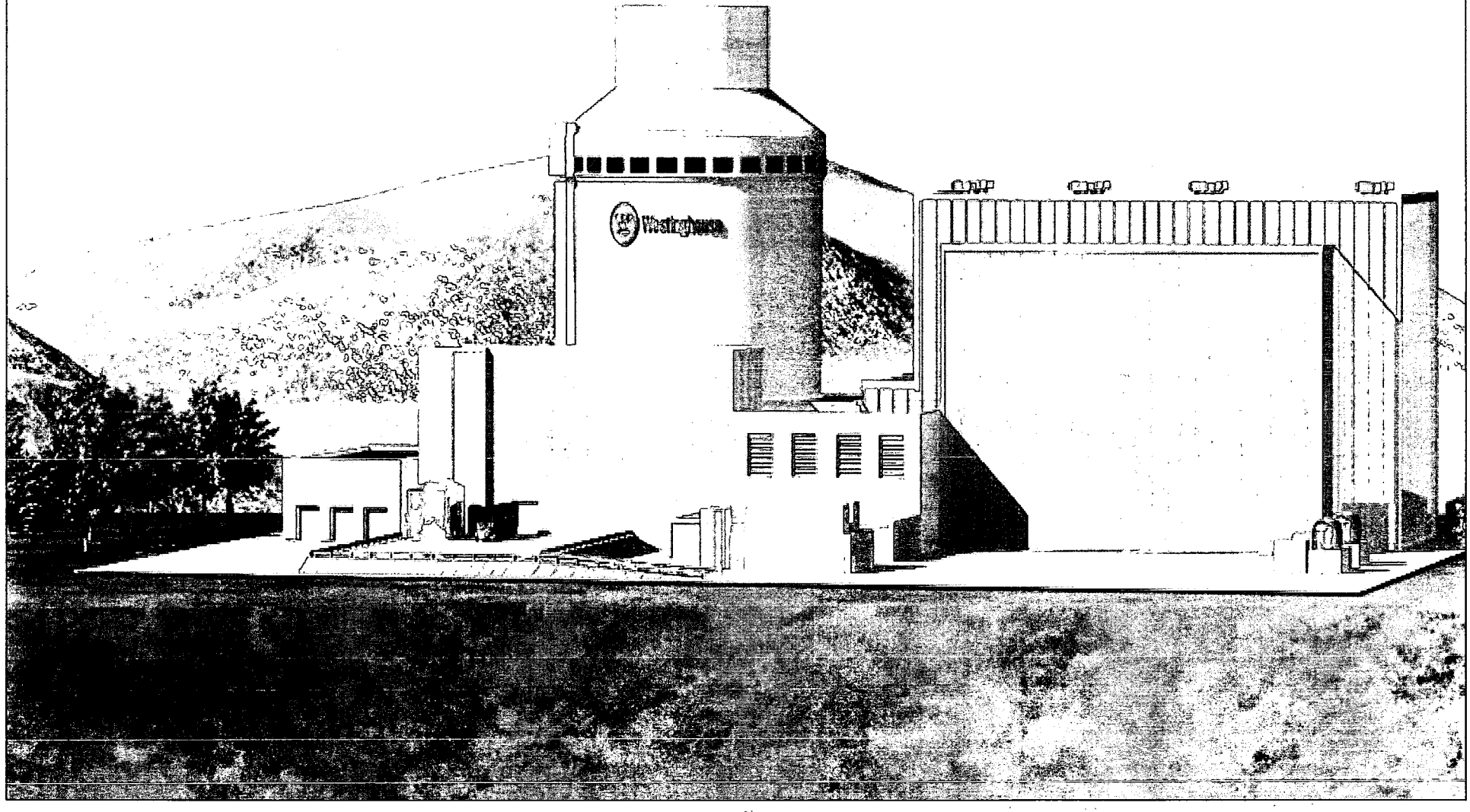
Shield Building Design Features
Proprietary Information
Closed Session



Design Features

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Mechanical Connection Elevation 100ft

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Typical Configuration of Concrete-Filled Steel Plate Wall

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Weld of SB Liner Plates

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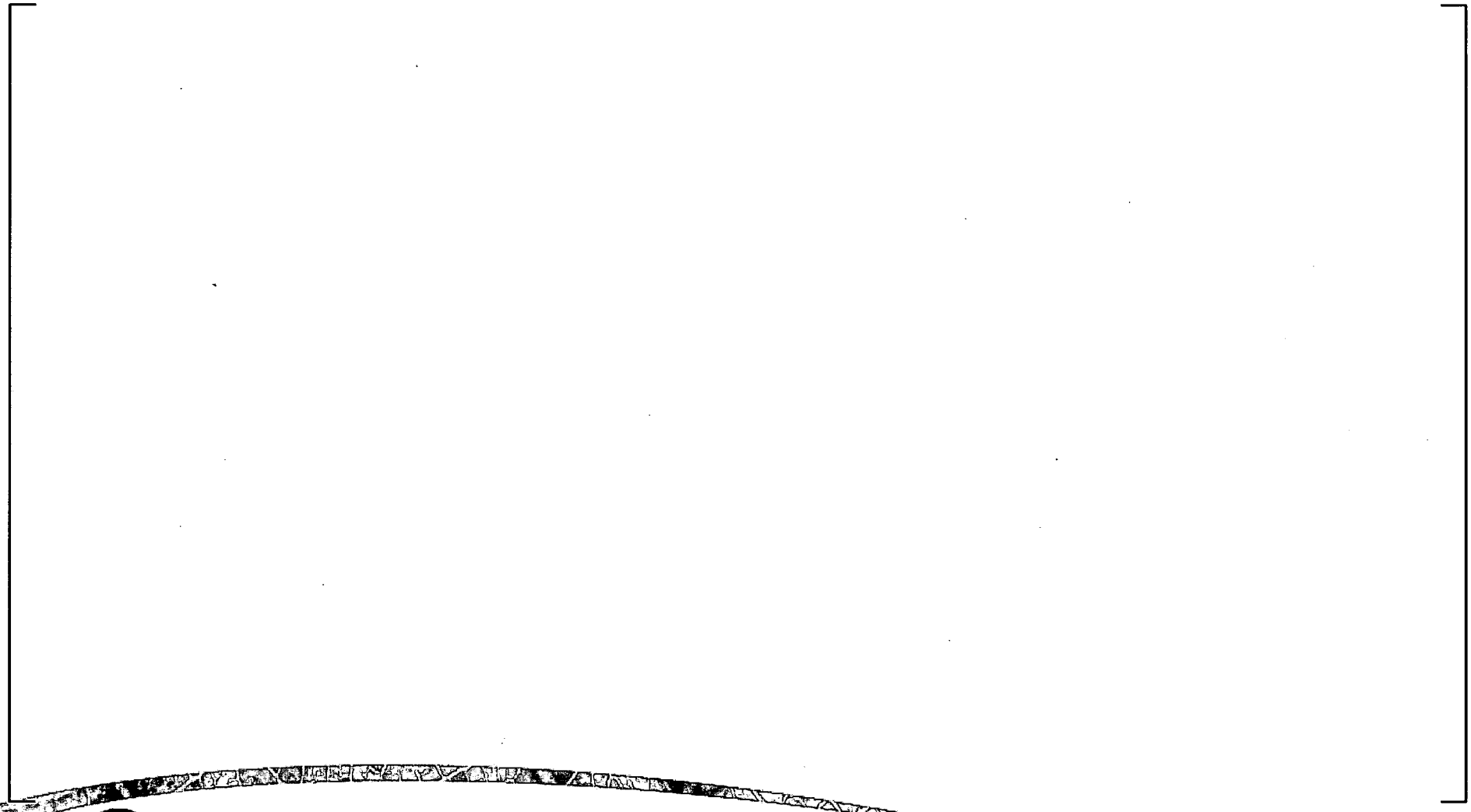
Tension Ring and Air Inlet Detail

a,c



Tension Ring – Vertical Section

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Beam Seat Detail

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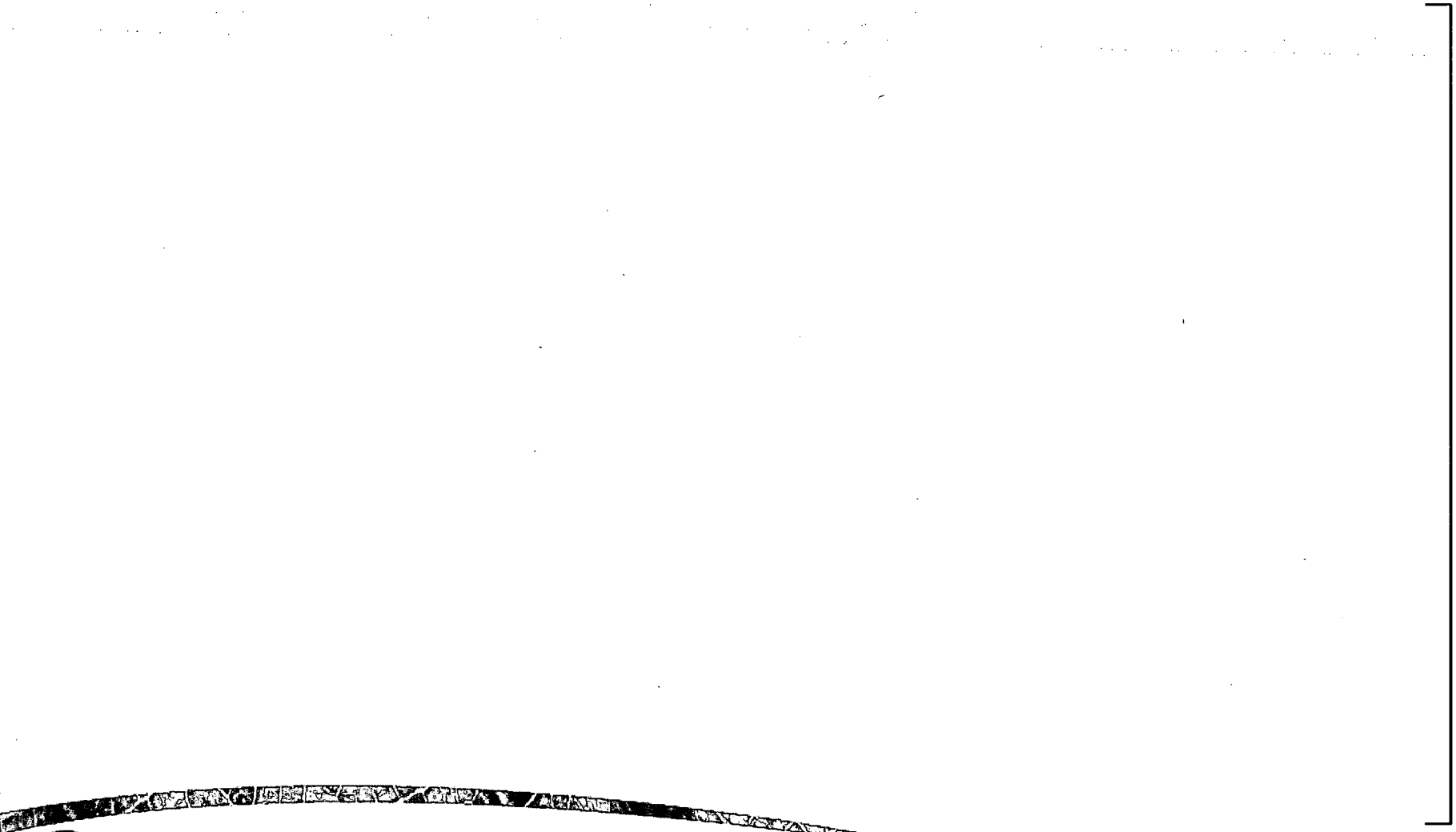

AP1000 Shield Building Design

Conclusions

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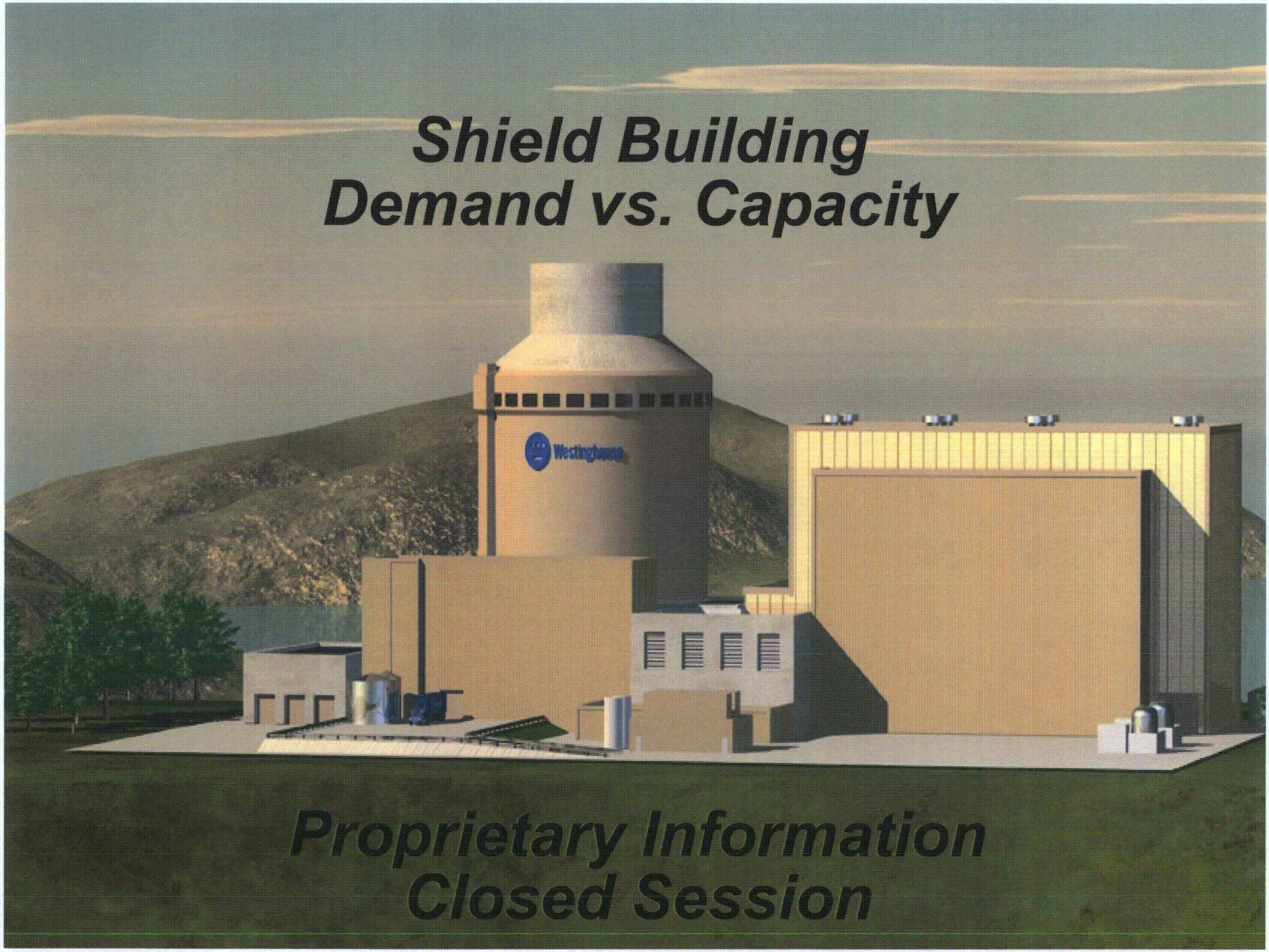
Shield Building
Demand vs. Capacity



Proprietary Information
Closed Session

Demand vs Capacity

Locations of Paths

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Demand vs. Capacity

Axial Demand along West Side

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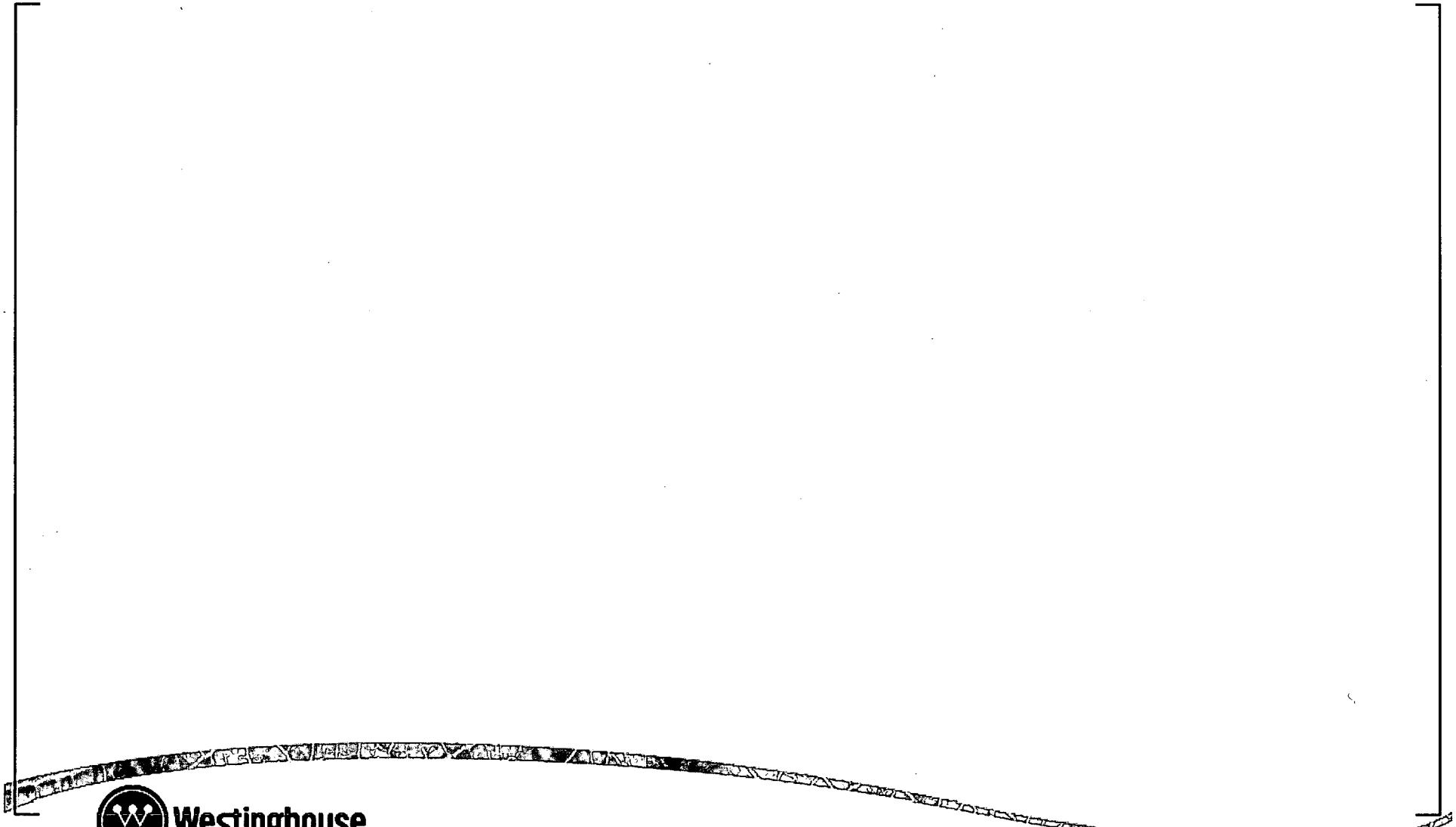

Demand vs. Capacity

In-Plane Shear

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Demand vs. Capacity

Out-of-Plane Shear

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Demand vs. Capacity

Summary

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Demand vs. Capacity

Conclusions

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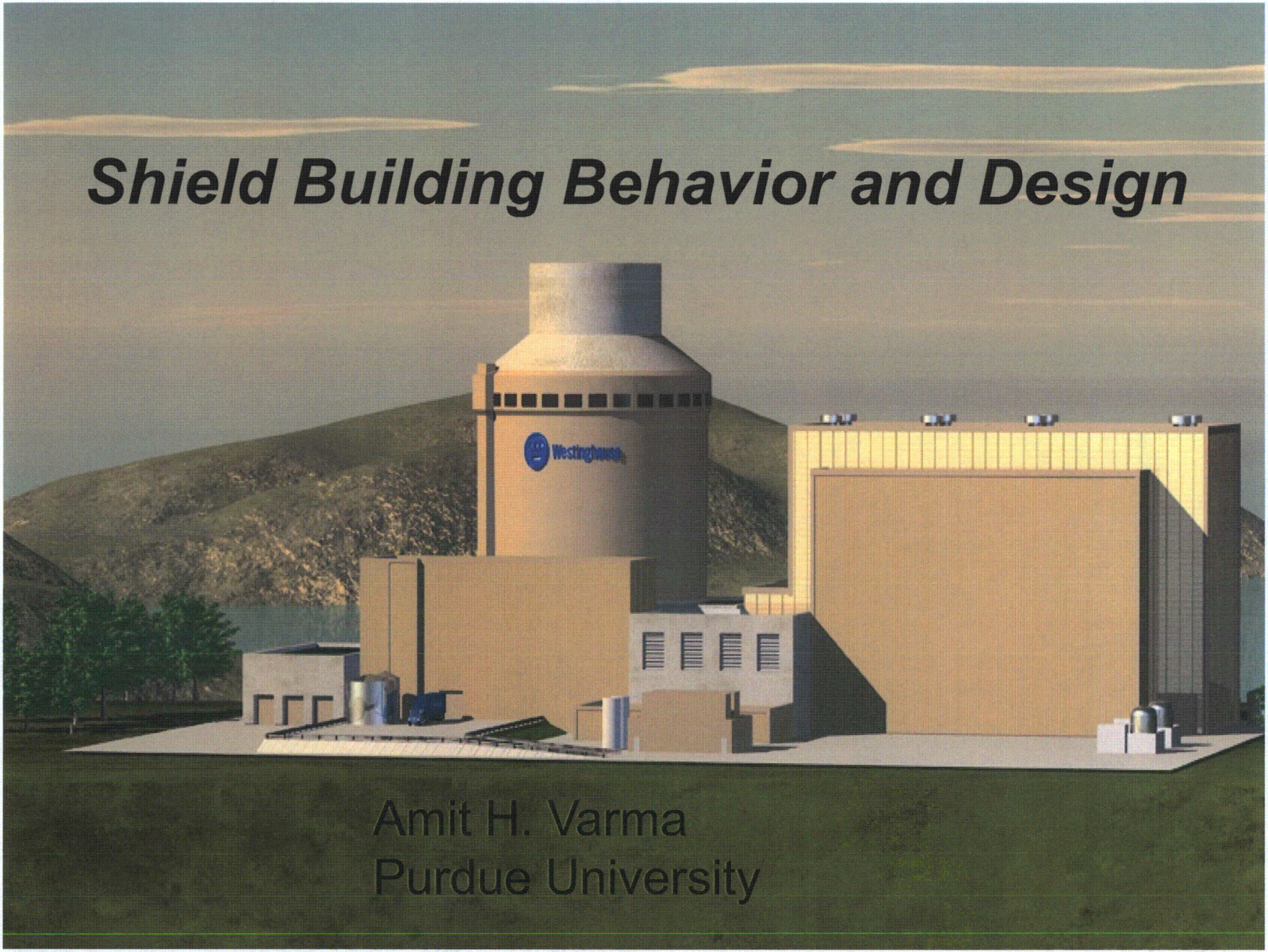
ACRS Action Item (53)

Pushover Analyses
Assessment of System Ductility beyond RLE a,c

Shield Building Behavior and Design



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Purdue University

Seismic Design Philosophy

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Capacity Design Example

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Capacity Design Examples

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Shield Building Model for Global Analysis

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Shield Building Behavior

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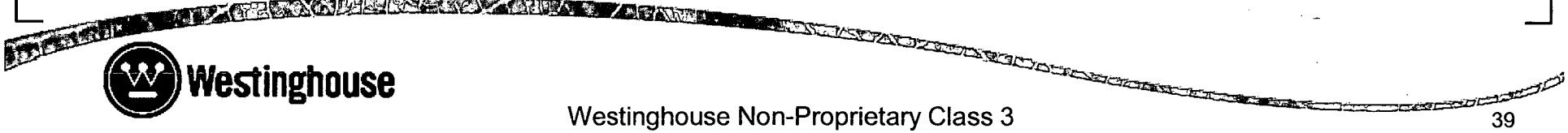

Shield Building Global Behavior

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Shield Building Global Behavior

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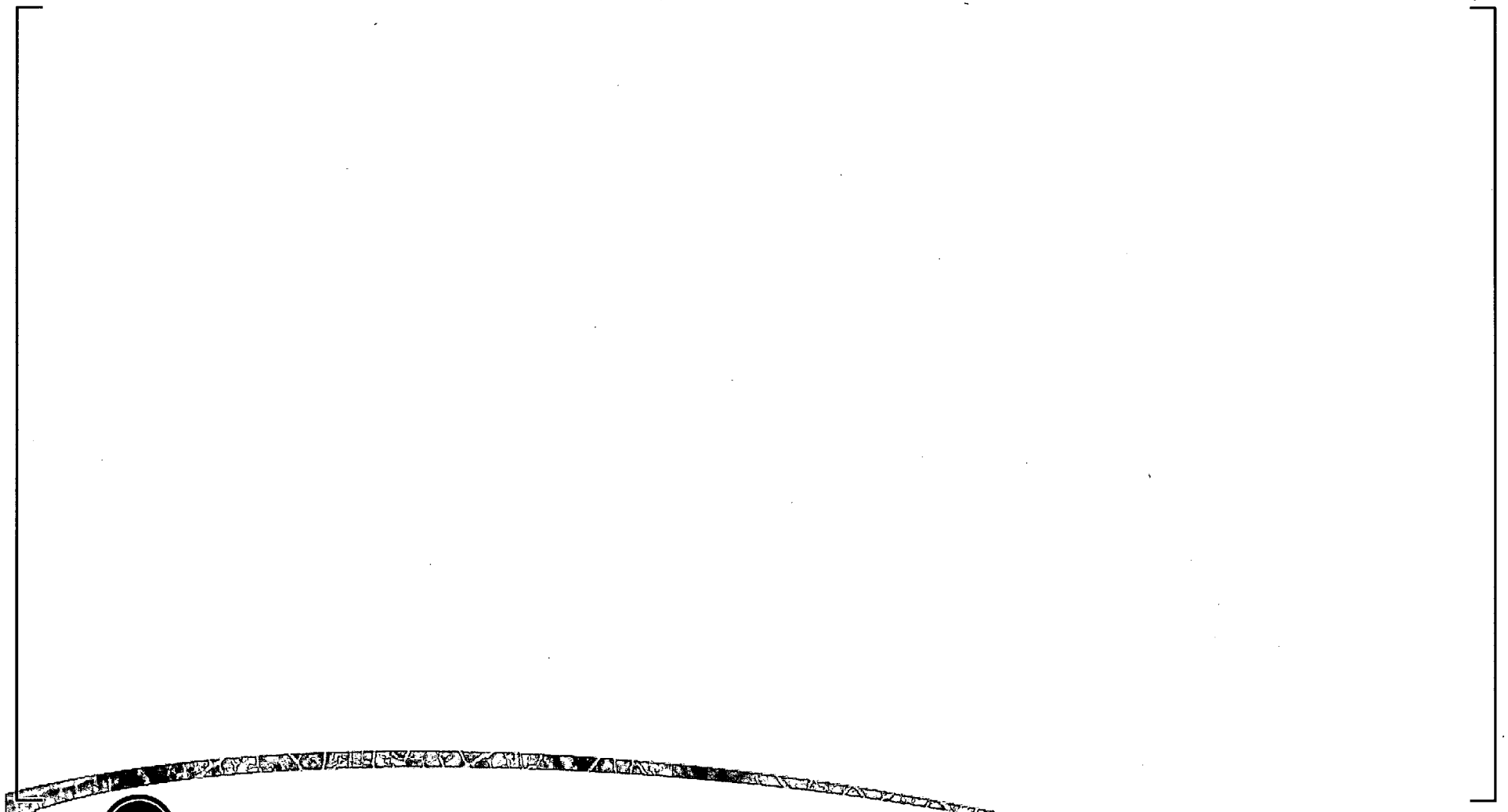

Shield Building Global Behavior

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Seismic Design Detailing

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Experimental Demonstration of Fuse Ductility

Specimen 1 with 6 in. tie bar spacing

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Detailing of Non-Fuse Regions

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Detailing of Non-Fuse Regions

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Experimental Demonstration of Non-Fuse Strength

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Membrane Shear Behavior

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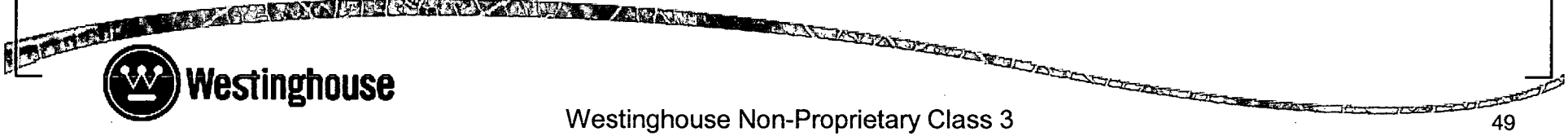

Membrane Shear Behavior

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Membrane Shear Behavior

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Membrane Shear Behavior

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Membrane Shear Behavior

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Membrane Shear Behavior
Comparison with Theory and FEM Analysis a,c

AP1000 Shield Building Design Wrap Up

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