

University of Delaware Center for the Arts Newark, DE



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Mechanical Option
Spring 2006

Presentation Outline

- Project Information
- Building Information
- Existing Conditions
- Redesign Goals
- Mechanical Redesign
- Structural Analysis
- Acoustical Analysis
- Conclusions
- Acknowledgements
- Questions

Project Information

- Location – Newark, DE
- Building Use –
Performing Arts Center
- Delivery Method –
Design-Bid-Build
- Construction – May
2004 to June 2006
- 2nd of 3 bid package
construction project



Project Team

- Owner – University of Delaware
- Architect – Ayers Saint Gross
- Construction Manager – Whiting Turner
- MEP Engineer – Mueller Associates
- Structural Engineer – McLaren Engineering Group
- Civil Engineer – Tetra Tech
- Acoustical Consultant – Kirkegaard Associates

Building Information

- 92,000 sq ft
- Building uses
 - Recital Hall
 - Proscenium Theater
 - Orchestra Rehearsal Room
 - Theater Rehearsal room
 - Practice Rooms
- 2" Open joint complete separation between structural systems

Existing Conditions

- Mechanical
 - 6 Air Handling Units
 - 4 constant volume single zone
 - 2 variable air volume
 - Chilled water and steam provided by the university

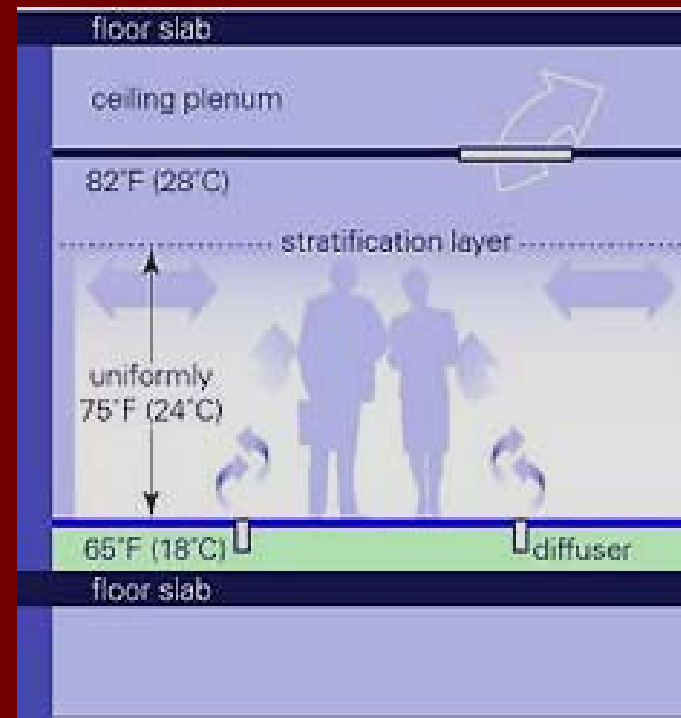
Redesign Goals

- Primary redesign goal
 - Implement an underfloor air distribution system in the Proscenium Theater
- Secondary redesign goals
 - Improved indoor air quality
 - Reduced outdoor airflow
 - Reduced supply fan horsepower

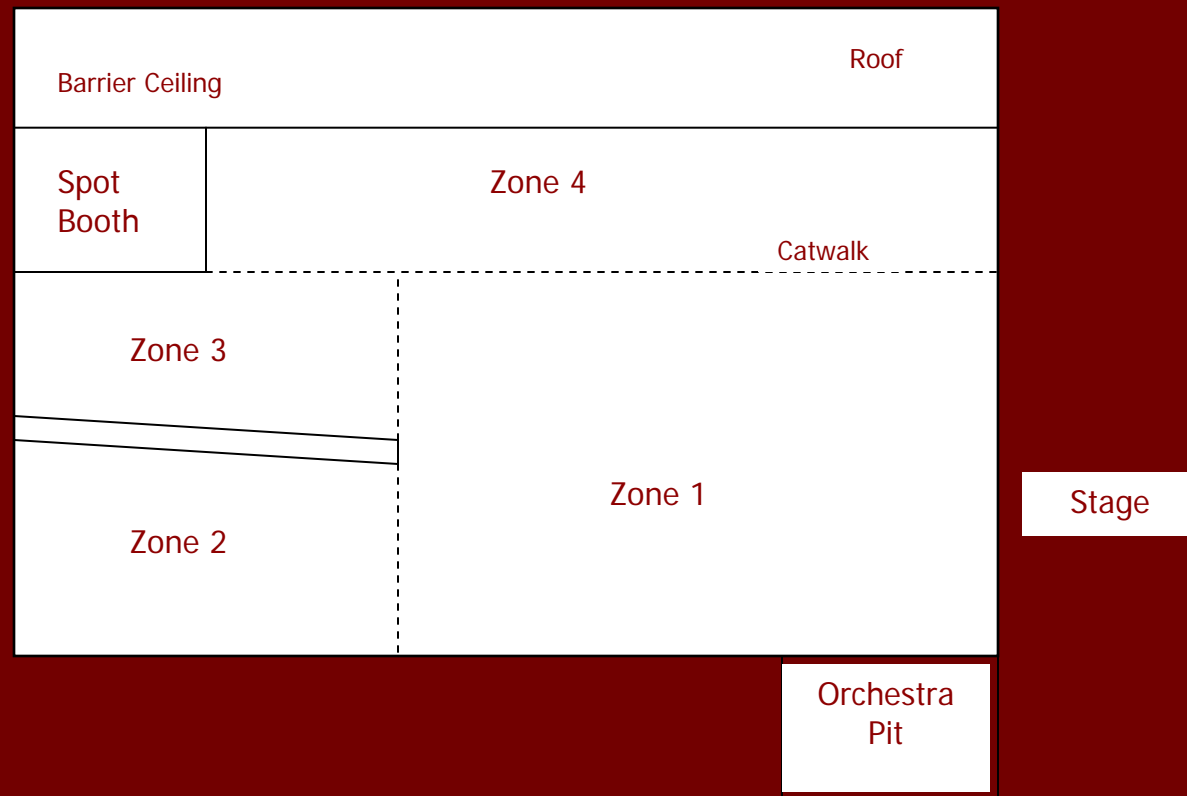


Underfloor Air Distribution

- Conditioned air supplied from plenum
 - Pressurized Plenum
 - Passive Diffusers
 - Zero-Pressure Plenum
 - Active Diffusers
- Warmer supply air temperatures
- Stratification
- Ceiling plenum return
 - Collection of contaminants
 - Ceiling lighting loads



Mechanical Redesign



Mechanical Redesign

■ Underfloor System

- Airflow – 14,200 cfm
- Cooling Coil Capacity – 315 Mbh
- Minimum OA % - 22%
 - 20% overall reduction
- Supply Air Fan Static Pressure – 2.5in WG

■ Overhead System

- Airflow – 7,900 cfm
- Cooling Coil Capacity – 420 Mbh
- Minimum OA % - 44%
- Supply Air Fan Static Pressure – 5.0in WG

Structural Analysis

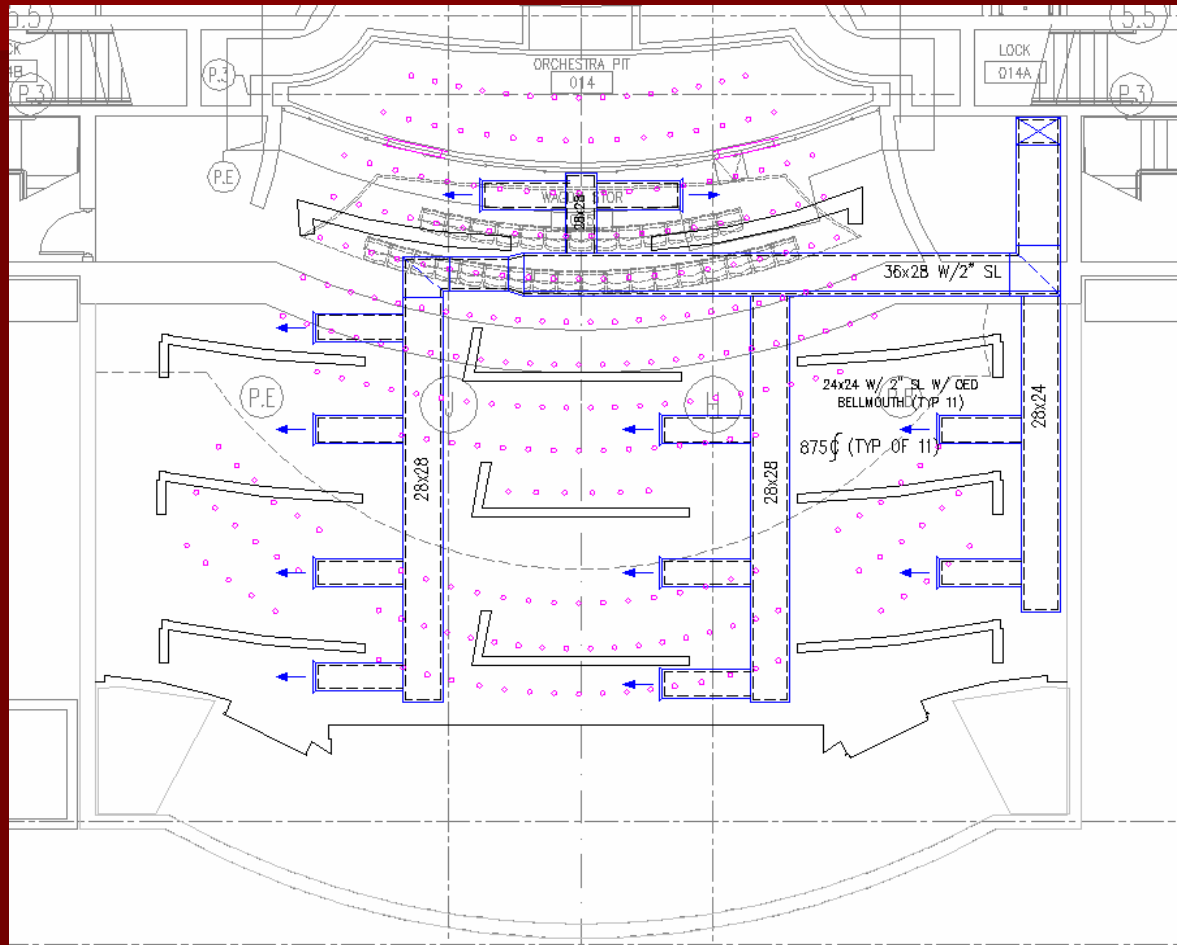
■ First Level

- Depress foundation and slab on grade 4'
- Elevated slab with grouted CMU blocks for support
- Cut minimum amount of rebar for diffusers

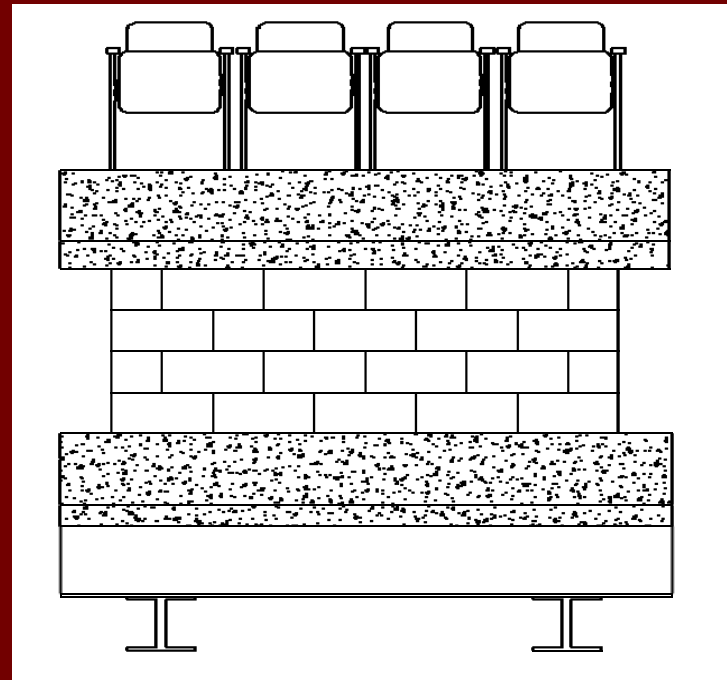
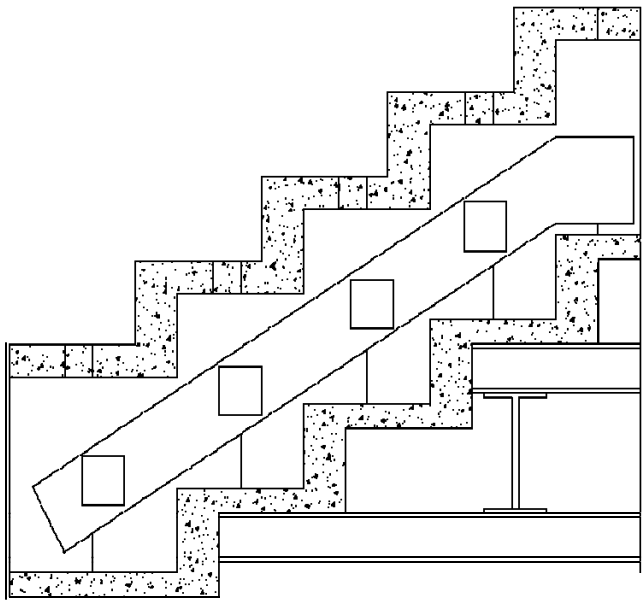
■ Second Level

- Elevated slab with grouted CMU blocks for support
- Increase beam and column sizes to support increased weight of balcony
- Cut minimum amount of rebar for diffusers

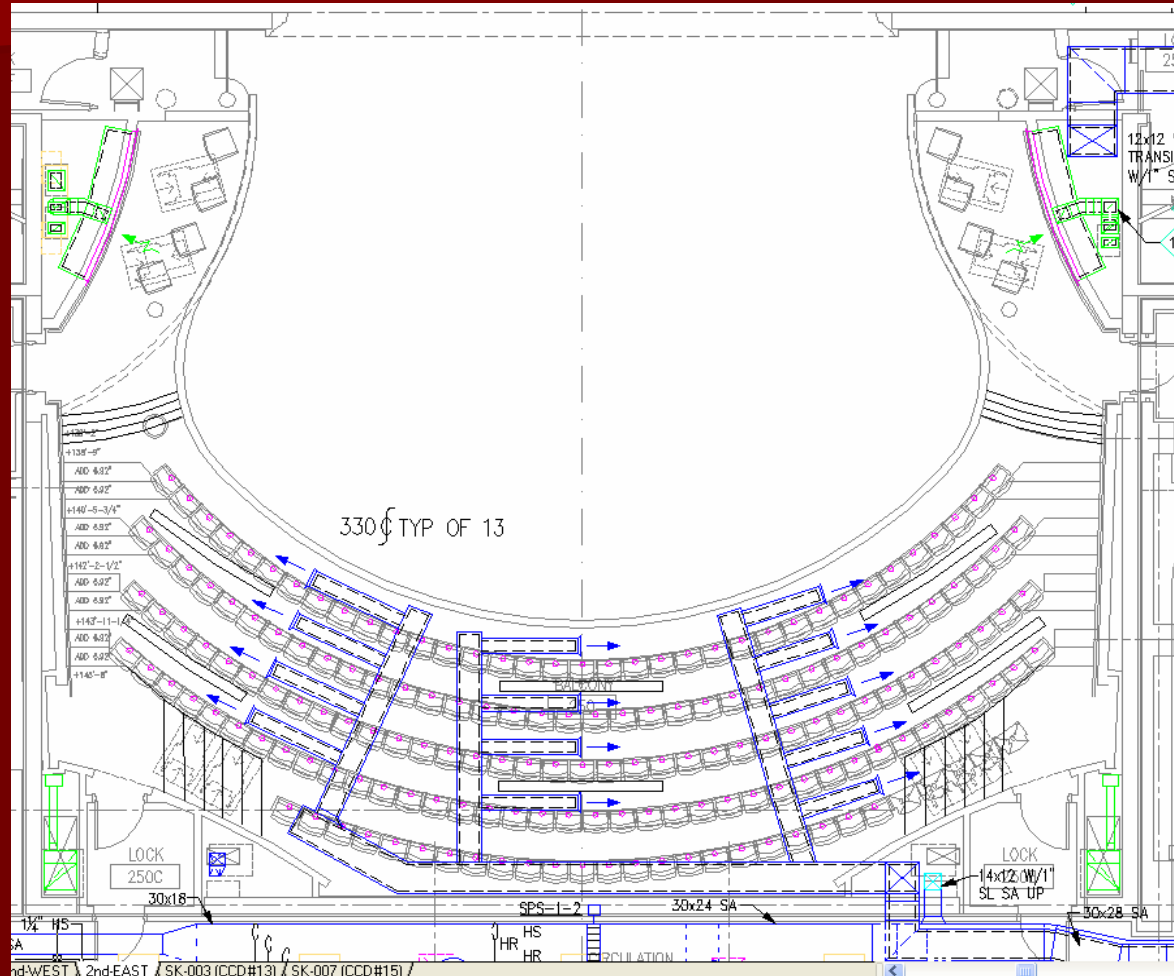
1st Level Structural Analysis



2nd Level Structural Analysis

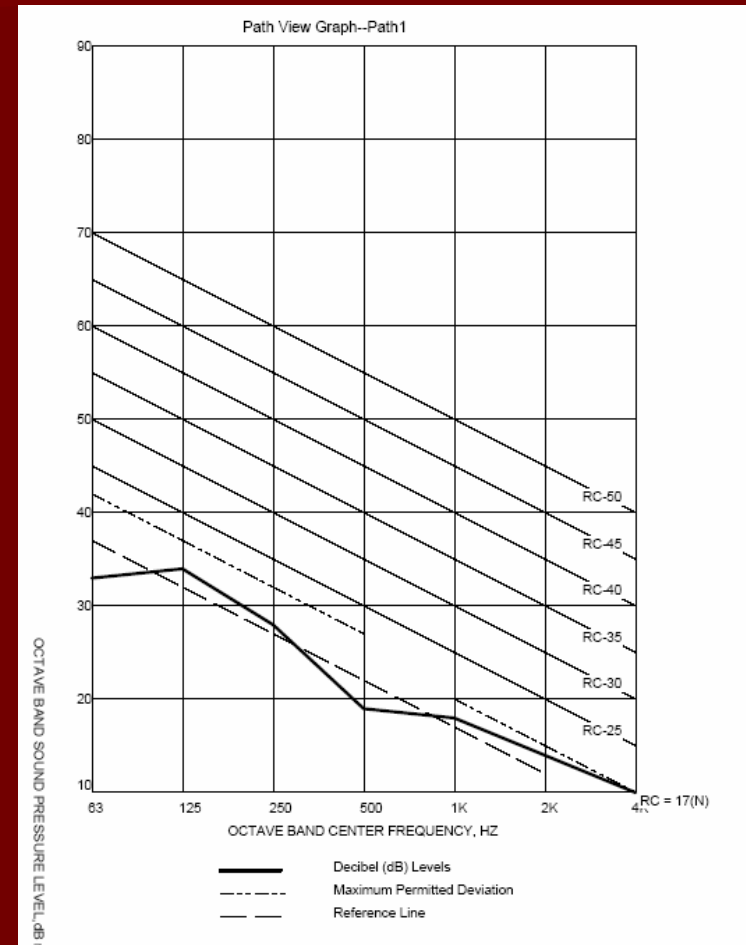


2nd Level Structural Analysis



Acoustical Analysis

- Proscenium Theater
 - Acoustically Critical
 - RC 18-22 (N)
 - Underfloor Air Distribution
 - RC-17 (N)
 - NC-16



Conclusions

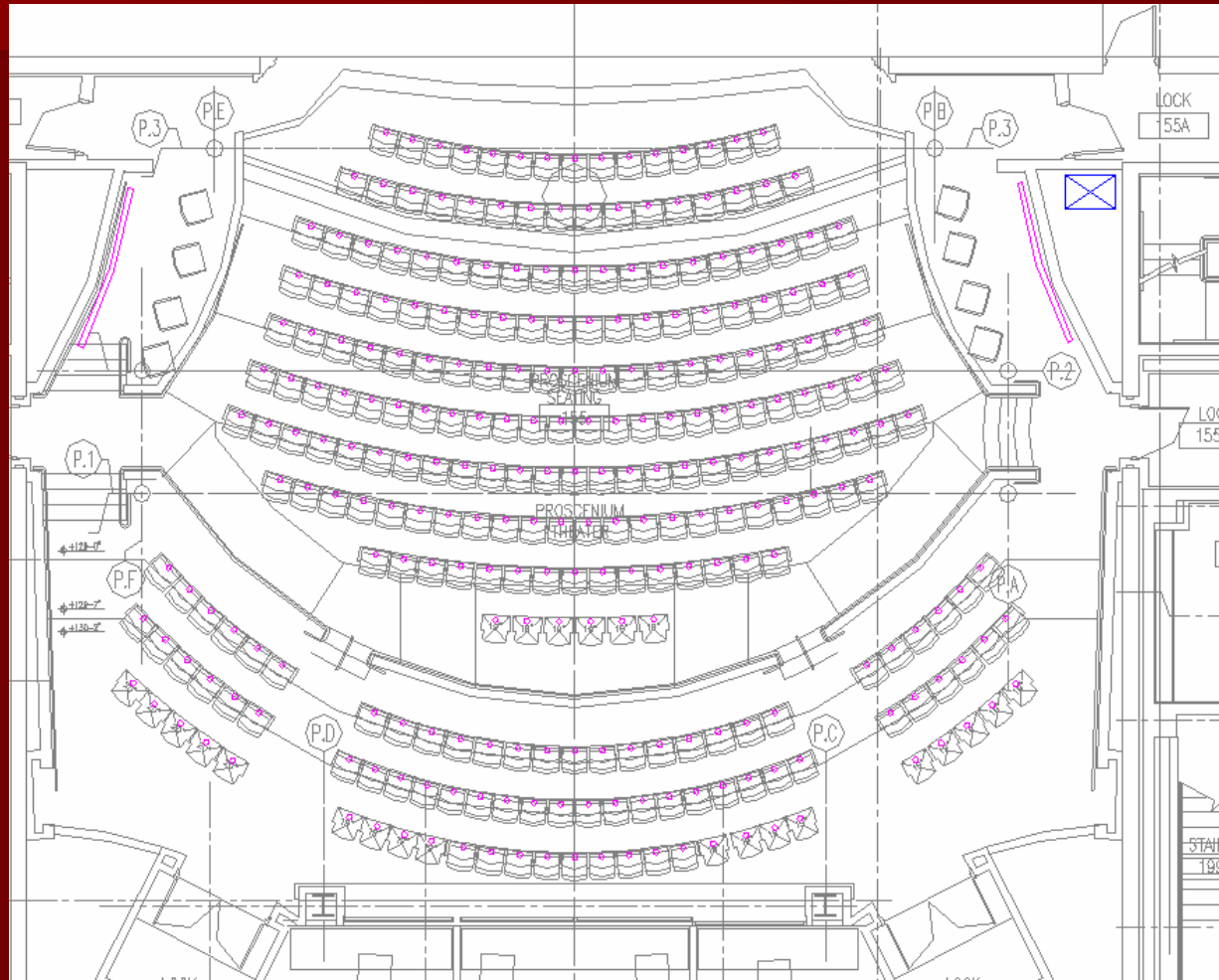
- Improved indoor air quality
- Increased required airflow
- Decreased minimum amount of outdoor air
- Decreased cooling coil load
- Increased coordination with concrete contractor and placement of diffusers
- Meets acoustical criteria

Acknowledgements

- AE Faculty
- AE Colleagues
- Mueller Associates
- Family
- Friends (That means you, Spisis)

Questions?

1st Level Diffuser Layout



2nd Level Diffuser Layout

