Wenger

Your Performance Partner
Ohio MEA 2015

Critical Design Factors of Effective Music Facilities

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The Fundamental Requirements of a Music Suite
Project Sequence

- Bond Referendum
- Pre-Planning
- Schematic Design
- Programming
- Construction Documents
- Bidding
- Equipment Sourcing
- School Opening
What makes the Music Suite so unique?

- Learning by listening
- Large spaces/groups
- Expensive large instruments
- Supporting multiple spaces for activities
- Dynamics of sound
4 Critical Factors

1. Acoustics
2. Floor plan
3. Storage
4. Equipment
Critical factor number 1:

1  Acoustics
Acoustic Problems/Solutions
Four Elements of Acoustics

- Cubic VOLUME
- Sound ISOLATION
- Acoustical TREATMENT
- Mechanical SYSTEMS
Element of Acoustics

Cubic VOLUME
Why is Cubic Volume so important?

TOO SMALL
- Student cannot hear self well
- Primary reflections return too quickly
- Short reverberation time
- Too loud
Acoustics

Why is Cubic Volume so important?

BETTER
- Slight delay of primary reflections
- Sound energy dissipated – loudness
- Provides envelopment “presence”
- More reverberation time
## Acoustics

### Cubic Volume Requirements *(recommended)*

<table>
<thead>
<tr>
<th>Room</th>
<th>Class Size</th>
<th>Ceiling Height</th>
<th>Minimal Floor Space</th>
<th>Resulting Cubic Volume Per Musician</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choral Rehearsal</td>
<td>60-80 Students</td>
<td>16-20 Feet</td>
<td>1,800 Square Feet</td>
<td>350-500 Cubic Feet</td>
</tr>
<tr>
<td>Band/Orchestra Rehearsal</td>
<td>60-75 Students</td>
<td>18-22 Feet</td>
<td>2,500 Square Feet</td>
<td>550-700 Cubic Feet</td>
</tr>
</tbody>
</table>
Acoustics

**Interior equipment can reduce cubic volume**
Cubic Volume Summary

- Foundation of excellent acoustics
- Ceiling height is critical!
- Flat floor vs. built-in risers
Room Shape

Untreated Parallel Walls Cause Flutter Echo
Room Shape

Square Rooms Create Standing Waves
Room Shape

Domed walls or ceilings focus sound creating a hot spot
So what is the right room shape?

Trapezoidal • Rectangular • Treated
Room Shape Summary

- Rectangular best utilization of space
- Non parallel okay but will cost more
- Plan dimension ratio: 3:2
- Avoid cubes, domes and curves
Element of Acoustics

Sound ISOLATION
Room Configuration

Be critical of adjoining walls between rooms.
The Complexity of Sound Isolating Wall Construction

1. Acoustics

Normal Construction

Proper Sound-Isolating Construction

- Staggered Studs
- Thermafiber Insulation
- Double Layer 3/4" Gypsum
- Continuous Sealant
- Cavity Creates Sound Isolation
The Complexity of Sound Isolating Wall Construction

Wall must extend to permanent roof deck and seal at floor.
Acoustics

The Complexity of Sound
Isolating Wall Construction
Wall Must Seal at Roof Deck and Floor

The Complexity of Sound Isolating Wall Construction
Acoustics

The Complexity of Sound Isolating Wall Construction

Wall must extend to permanent roof deck and seal at floor
Acoustics

Buffer Zones

Sound ISOLATION

- Storage
- Band Rehearsal Room
- Choral Rehearsal Room
- Storage
- Office
- Practice Rooms
Non-adjacent rooms can often be designed with pathways for sound.
Acoustics

Buffer Zones

Don’t forget the doors! They need to be sound isolation rated!
Sound Isolation Summary

• Walls sealed at base and ceiling
• Use buffer zones
• Wall construction factors
• Factoid: 1” hole in wall reduces isolation by up to 80%
Element of Acoustics

Acoustical TREATMENT
Acoustics

Absorption and Diffusion
Thin Absorber = High Frequency Absorption Only
Thick Absorber = High & Low Frequency Absorption
Sound Diffusion

Diffusion is the scattering and blending of sound.
Sound Diffusion

Diffusion is the scattering and blending of sound.
# Reverberation Guidelines

<table>
<thead>
<tr>
<th>Room Style</th>
<th>Choral Rehearsal</th>
<th>Band/Orchestra Rehearsal</th>
<th>Performance Area</th>
<th>Room Reverberation Times</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Recommended Reverberation)</td>
<td>up to 1.3 seconds</td>
<td>0.8 - 1.0 seconds</td>
<td>1.25 - 2.25 seconds</td>
<td></td>
</tr>
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</table>
Acoustical Treatment Summary

• Use correct combination of absorption and diffusion
• Minimum thickness for wall absorption = 3”
• For ceiling, 1” thick fiberboard that is NRC .95 rated
• Use hard surface floor covering
1 Acoustics

Element of Acoustics

Mechanical SYSTEMS
Sound isolation in practice rooms

Ventilation Systems

Incorrect ventilation

Correct ventilation

Supply uses acoustically lined take off branches

Supply

Plenum Return

Plenum Return

Sound isolation in practice rooms
**Acoustics**

**Airborne Noise**

**PROBLEM**
Airborne noise from restrictive air vents.

**SOLUTION**
Replace restrictive air vents with open grille.

Increase duct size.

*Larger is quieter*
PROBLEM
Some fluorescent and tungsten light bulbs cause an audible “buzz”.

SOLUTION
Replace with incandescent or other lighting.
Technology Advancements for Rehearsal Room Treatment

- Creates “flexibility” for rehearsal spaces
**Problem:** Satisfying the acoustical needs of various types of ensembles, including instrumental and choral in the same rehearsal room.
Solutions:
Recommended Reverberation Times For Rehearsal Rooms:

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Acoustical Results

Tunable type system provides up to .8 seconds of change
Virtual Acoustic Technology for Rehearsal Rooms

- Changes the acoustics of rehearsal room into a larger performance space through active acoustic technology
- Bridges the gap between rehearsal and performance
- Students learn to adapt more easily to larger acoustic spaces
- Teaches students to listen differently to their voice or instrument in these spaces
The Power of Digital Signal Processing
Rehearse in Your Performance Environment
Technology for Performance Spaces
Variable Acoustics Technology

- Transforms current acoustics of performance space in two ways:
  - Makes a “dry” space more “live”
  - Makes a “live” space more dampened

- Turns performance space into a multi-purpose venue
• “Live” acoustic spaces need to be dampened for speech, lecture, drama to gain clarity of sound

• Recommended reverberation times for musical performance in performance spaces:
  – 1.3 to 2.2 seconds
For “live” spaces, motorized acoustical banners is one solution for dampening space
For spaces that are more acoustically “dry,” active acoustic solutions create more reverberant spaces
• Active acoustic systems provide:
  - Ability to program pre-set acoustic spaces for any type of performance or event
  - More uniformity of sound throughout the performance space
  - Enhancement of sound for performers and audience members
“Zone” Control
Technology Summary

• Use to create more flexible rehearsal spaces
• Advance the musicianship of your students
• Turn your performance spaces into multi-purpose venues
• Enhance the listening experience for both performers and audience
Critical factor number 2:

Floor Plan
How should the space be arranged?
CONSIDERATIONS
Floor Plan

LINE OF SIGHT
Floor Plan

Band Rehearsal Room
Floor Plan

Choral Rehearsal Room
Critical factor number 3:

Storage
Instrument storage areas are among the toughest to plan.
Protect your investment with proper storage

A typical new high school can spend between $500,000 and $750,000 on instruments ALONE!

Examples:
One Cello = $2,500 to $4,000+
One Tuba = $3,500 to $5,000+
One Violin = $800 to over $2,000
Types of Storage

- Small Instruments
- Large Instruments
- Percussion
- Orchestra
- Marching Band
- Robes
- Uniforms
- Costumes
- Flags
- Props
- Sheet Music
- DVD & Video Storage
Storage Location

Improves traffic flow, reduces congestion and saves space.
Storage

Typical set of cabinets for 100 Band Instruments

Typical set of cabinets for 50 Orchestra Instruments
Storage

- Plan ahead and Plan for ENOUGH.

Don’t forget about traffic flow.
Critical factor number 4:

4 Equipment
What kinds of equipment are needed?

Portable folios, stereo cabinets, percussion cabinets, sorting racks, music library, conductor’s stand, podium, seated risers, etc.

WE HAVE TOOLS TO HELP YOU. Use the checklist in your Planning Guide or go to www.wengercorp.com to start planning your space.
Durable, High Quality Equipment is Less Expensive in the Long Run
Final Thoughts

• Get involved early with architect
• Document your program needs
• It’s in the details – follow through
• Enjoy the fruits of your labor!
Planning and Designing for a World Class Music Facility

Thank you!

Questions?
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