ACOUSTICS AND FIRE SAFETY

- Partitions are expected to do more than simply surround a space.
- A partition may also be expected to give a person a level of acoustical privacy and a degree of safety from fire.
Quick Selector

- Gypsum wallboard manufacturers provide tables showing the fire and acoustical performance of various partition assemblies.
- Performance tests are performed by independent laboratories such as Underwriters Laboratories

<table>
<thead>
<tr>
<th>Fire Rating</th>
<th>Ref.</th>
<th>Design No.</th>
<th>Description</th>
<th>STC</th>
<th>Test No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 hr.</td>
<td>UL</td>
<td>U305</td>
<td>5/8&quot; Fire-Shield Gypsum Wallboard or Fire-Shield MR Board nailed on both sides 2 x 4 wood studs, 16&quot; o.c.</td>
<td>35</td>
<td>NGC 2403</td>
</tr>
<tr>
<td></td>
<td>FM</td>
<td>W16A–1 hr.</td>
<td>Based on 5/8&quot; Fire-Shield Gypsum Wallboard or 5/8&quot; Fire-Shield MR Board screw attached vertically to both sides 2 1/2&quot; screw studs, 24&quot; o.c. Wallboard joints staggered.</td>
<td>40</td>
<td>NGC 2438</td>
</tr>
<tr>
<td></td>
<td>GA</td>
<td>WP 3605</td>
<td>Based on T-3296 With 2 1/2&quot; of mineral wool or glass fiber in cavity.</td>
<td>45</td>
<td>NGC 2391</td>
</tr>
<tr>
<td>1 hr.</td>
<td>FM</td>
<td>W16–1 hr.</td>
<td>Based on 5/8&quot; Fire-Shield Gypsum Wallboard or 5/8&quot; Fire-Shield MR Board screw attached vertically to both sides 2 1/2&quot; screw studs, 24&quot; o.c. Wallboard joints staggered.</td>
<td>40</td>
<td>NGC 2438</td>
</tr>
<tr>
<td></td>
<td>GA</td>
<td>WP 1340</td>
<td>Based on T-3296 With 2 1/2&quot; of mineral wool or glass fiber in cavity.</td>
<td>45</td>
<td>NGC 2391</td>
</tr>
<tr>
<td>2 hr.</td>
<td>UL</td>
<td>U 411</td>
<td>Base layer 5/8&quot; Fire-Shield Gypsum Wallboard screw attached vertically both sides to 2 1/2&quot; screw studs 24&quot; o.c. Face layer laminated or screw attached vertically both sides. 2 1/2&quot; mineral wool or glass fiber in cavity. Wallboard joints staggered.</td>
<td>55</td>
<td>NGC 2382</td>
</tr>
<tr>
<td></td>
<td>WHI</td>
<td>495-0236</td>
<td>Two layers 5/8&quot; Fire-Shield Gypsum Wallboard screw attached horizontally with vertical and horizontal joints staggered. 2 1/2&quot; mineral wool or glass fiber in cavity.</td>
<td>55</td>
<td>Based on NGC 2382</td>
</tr>
<tr>
<td></td>
<td>GA</td>
<td>WP 1548</td>
<td>Two layers 5/8&quot; Fire-Shield Gypsum Wallboard screw attached horizontally with vertical and horizontal joints staggered. 2 1/2&quot; mineral wool or glass fiber in cavity.</td>
<td>55</td>
<td>Based on NGC 2382</td>
</tr>
<tr>
<td>3 hr.</td>
<td>UL</td>
<td>X510</td>
<td>Three layers 5/8&quot; Fire-Shield Gypsum Wallboard furred from column by 1 5/8&quot; screw studs at each corner.</td>
<td>55</td>
<td>Based on NGC 2382</td>
</tr>
</tbody>
</table>

Excerpt from National Gypsum “Quick Selector for Sound and Fire Rated Assemblies” (note that “Fire Shield” is National Gypsum’s brand for Type X fire-rated GWB”)
Fire Rated Partitions

- Partitions are rated according to the number of hours until a fire breaks through the partition.
- A **one-hour** rated partition is typically required to surround an exit corridor or passageway and allows a person one hour to reach a safer location such as a fire stair.
- A **two-hour** rated partition is typically required to surround a fire stair and other building core elements and allows a person two hours to reach the street and safety.
- A **three-hour** rated partition is typically required to protect the building structure.
- A **four-hour** rated partition is typically required to separate buildings – a party wall- so that even if one building is destroyed, adjacent buildings have a degree of safety.
Type X Gypsum Wallboard

- Fire-rated partitions use type X gypsum wallboard.
- Type X is denser than regular GWB and typically contains fiberglass reinforcement
- One layer of Type X will provide one hour of protection, two layers will provide two hours of protection, and so on.
One Hour Rated Partition with Metal Framing
vertical section detail

base building
floor and deck

install runners
and studs

install type x GWB
to deck

install ceiling
and base
Two Hour Rated Partition with Metal Framing
vertical section detail

- base building
- install runners and studs
- install two layers type x gwb
- install ceiling and base
Three Hour Rated Column Furring
plan detail
Sound Control

- Two types of sound control of concern to interior designers are:
  - Control of sound between rooms
  - Control of sound within a room
Sound Levels

- Sound is the vibration of molecules in a medium such as air.
- Sound levels are measured in decibels.
- Typical sound levels:
  - jet aircraft 140 dB
  - rock music 120 dB
  - industrial plant 100 dB
  - loud street noise 90 dB
  - noisy office 80 dB
  - average street noise 70 dB
  - department store 60 dB
  - moderate restaurant 50 dB
  - school classroom 40 dB
  - bedroom 30 dB
  - rustling leaves 20 dB
Sound Transmission Between Rooms

- A partition may act as a barrier to sound
- Its effectiveness is measured by its Sound Transmission Class (STC) rating
- An STC rating of 40 means that between two rooms a conversation may be faintly heard and one word in ten may be intelligible
- An STC rating of 45 means that a conversation may be faintly heard but no words will be intelligible
- An STC rating of 55 means that a normal conversation will not be heard
- Consult manufacturers' catalogs for STC ratings of various partition assemblies.
Acoustical Materials

• Gypsum wallboard is effective in blocking sound transmission.
• Batt insulation is effective in absorbing sound.
• Acoustical caulking or sealant is effective in sealing flanking paths where air (and therefore sound) can travel between rooms.
Acoustical Partition – 55 STC Rating
vertical section detail

- Base building floor and deck
- Install runners and studs
- Install ac. sealant, batt insulation, two layers GWB
- Install ceiling and base