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Acoustics affect critical aspects of a building's function, from productivity in office settings and performance quality in theaters and auditoriums, to the price an apartment, condominium or single-family house can command. Understanding how to select a combination of building materials, system designs and construction technologies that will provide the most appropriate sound control is key to creating a successful acoustical design.


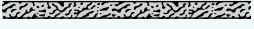










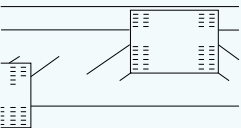



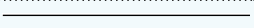

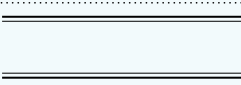


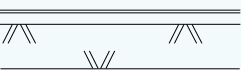
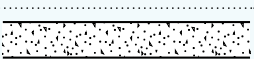


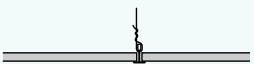

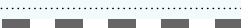
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While the science behind sound is well understood, using that science to create the desired acoustical quality within a building or room is complex. No single acoustical "solution" can be universally applied to all designs. Each environment features unique parameters the architect and designer must consider when developing floor plans, selecting materials and designing assemblies. Virtually every material—from furniture and wall and floor coverings to computer equipment—will affect sound to some degree. However, designing wall partitions, ceiling systems and floor/ceiling assemblies for the distinct qualities of a space will achieve the most effective sound control.

Sound is defined as a vibration in an elastic medium, that is, any material (air, water, physical object) that returns to its normal state after being deflected by an outside force such as a sound vibration. The more elastic a substance, the better it can conduct sound. Lead, for instance, is very inelastic and therefore a poor sound conductor. Steel, on the other hand, is highly elastic, making it an excellent conductor of sound.

Sound travels not only in a straight path from its source but also bounces off partitions, bends around barriers and squeezes through small openings, all of which can allow noise to reach surprisingly far beyond its point of origin. Designers must consider the dynamics of sound when determining how they will control noise within a building.

# Legend

|  | Architectural Elements |   |   | Architectural Elements       |               |   |
|--|------------------------|---|---|------------------------------|---------------|---|
|  | Component              | Cross Section   | Profile   | Component                    | Cross Section | Architectural Material Symbols  |
| <p>This legend contains the symbols used throughout the Architectural Reference Library to represent various architectural elements. Profile and cross-section views are shown where appropriate, along with architectural material symbols.</p> | C-H studs              |    |   | Polystyrene insulation       |               |    |
|  | Z-furring              |    |   | Blanket insulation           |               |    |
|  | Engineered joist       |    |   | Solid wall                   |               |    |
|  | Decking                |   |    | Plywood                      |               |    |
|  | Decking                |   |    | Cement board                 |               |    |
|  | Lath                   |   |    | Poured gypsum                |               |    |
|  | Wood truss             |   |  | Gypsum board or plaster      |               |   |
|  | Wood joist or stud     |  |  | Veneer finish                |               |  |
|  | Steel joist or stud    |  |  | Tile                         |               |  |
|  | Steel truss            |  |  | Concrete or precast concrete |               |  |
|  | RC-1 channel           |  |  | Ceiling panel                |               |  |
|  | Furring channel        |  |  |                              |               |   |

## Steel Framed



| Non-loadbearing     |   | Acoustical Performance |  | Fire Performance |                                      | Reference      |            |
|---------------------|---|------------------------|--|------------------|--------------------------------------|----------------|------------|
| Construction Detail | Description   | STC                    | Test Number  | Rating           | Test Number                          | ARL            | Index      |
| wt. 6<br>           | <ul style="list-style-type: none"> <li>• 5/8" SHEETROCK® Brand FIRECODE® Core Gypsum Panels or IMPERIAL® Brand FIRECODE Core Abuse-Resistant Gypsum Base, FIBEROCK® Brand Panels</li> <li>– 3-5/8" 25 gauge steel studs 24" o.c.</li> <li>– joints finished</li> <li>• optional veneer plaster</li> </ul> | 40                     | <b>USG-860808</b>  | 1 hour           | <b>UL Des U419</b><br>or <b>U465</b> | SA700<br>SA920 | <b>A-1</b> |
|                     |   | 49                     | <b>SA-870717</b><br>Based on 3" SAFB in cavity   |                  |                                      |                |            |
|                     |   | 51                     | <b>RAL-TL-90-166</b><br>Based on 5/8" FIRECODE C Core panels and 3" SAFB, and veneer finish surface SAFB 25" wide, creased to fit cavity |                  |                                      |                |            |
| wt. 7<br>           | <ul style="list-style-type: none"> <li>• 1/2" SHEETROCK Brand FIRECODE C Core Gypsum Panels</li> <li>– 2-1/2" 25 gauge steel studs 24" o.c.</li> <li>– 1-1/2" THERMAFIBER SAFB</li> <li>– joints finished</li> </ul>  | 41                     | <b>RAL-TL-69-148</b><br>Based on same construction without THERMAFIBER SAFB  | 1 hour           | <b>UL Des U419</b><br>or <b>U448</b> | SA920          | <b>A-2</b> |
|                     |   | 50                     | <b>SA-800504</b>   |                  |                                      |                |            |
| wt. 7<br>           | <ul style="list-style-type: none"> <li>• Face layer 1/2" SHEETROCK Brand FIRECODE C Core Gypsum Panels</li> <li>– 1-5/8" 25 gauge steel studs 24" o.c.</li> <li>• base layer 1/4" SHEETROCK Brand Gypsum Panels</li> <li>– joints finished</li> </ul>   | 53                     | <b>CK-684-13</b><br>Based on 1-1/2" mineral wool batt and 2-1/2" studs   | 1 hour           | <b>GA-WP-1090</b>                    |                | <b>A-3</b> |
| wt. 7<br>           | Alternate based on 2-1/2" 25 gauge steel studs and 1/2" face layer laminated  | 53                     | <b>NGC-2318</b><br>Based on 2" glass fiber   | 1 hour           | <b>GA-WP-1051</b>                    |                | <b>A-4</b> |
| wt. 5<br>           | <ul style="list-style-type: none"> <li>• 1/2" SHEETROCK Brand FIRECODE C Core Gypsum Panels</li> <li>– 3-5/8" 25 gauge steel studs 24" o.c.</li> <li>– 3" THERMAFIBER SAFB</li> <li>– RC-1 channel or equivalent one side spaced 24" o.c.</li> <li>• optional veneer plaster</li> </ul>                   | 50                     | <b>RAL-TL-87-156</b>   | 1 hour           | <b>UL Des U419</b><br>or <b>U451</b> | SA920          | <b>A-5</b> |
|                     |   | 54                     | <b>RAL-TL-83-216</b><br>Based on 5/8" thick panels   |                  |                                      |                |            |
| clg. wt. 5<br>      | <ul style="list-style-type: none"> <li>• 1/2" SHEETROCK Brand FIRECODE C Core Gypsum Panels</li> <li>– 6" 20 gauge steel studs 24" o.c.</li> <li>– 5" THERMAFIBER SAFB</li> <li>– RC-1 channel or equivalent one side spaced 24" o.c.</li> </ul>  | 56                     | <b>RAL-TL-87-139</b>   | 1 hour           | <b>UL Des U419</b><br>or <b>U451</b> | SA920          | <b>A-6</b> |
|                     |   | 56                     | <b>RAL-TL-84-141</b><br>Based on 5/8" thick SHEETROCK Brand FIRECODE C Core Gypsum Panels  |                  |                                      |                |            |
| wt. 14<br>          | <ul style="list-style-type: none"> <li>• 1/2" DUROCK Brand Cement Board and 1/4" ceramic tile</li> <li>– 3-5/8" 20 gauge steel studs 16" o.c.</li> <li>– 3" THERMAFIBER SAFB</li> <li>– alternate design 5/8" SHEETROCK Brand FIRECODE Core Gypsum Panels, one side</li> </ul>                            | 48                     | <b>SA-840321</b>   | 1 hour           | <b>UL Des U442</b>                   | SA934          | <b>A-7</b> |
|                     |   | 50                     | <b>SA-840313</b><br>Based on alt design  |                  |                                      |                |            |

# A

# Partitions

## Steel Framed



| Non-loadbearing     |   | Acoustical Performance |  | Fire Performance |                                      | Reference |             |
|---------------------|---|------------------------|--|------------------|--------------------------------------|-----------|-------------|
| Construction Detail | Description   | STC                    | Test Number  | Rating           | Test Number                          | ARL       | Index       |
| wt. 7<br>           | <ul style="list-style-type: none"> <li>• 1/2" SHEETROCK Brand FIRECODE C Core Gypsum Panels</li> <li>– 3-5/8" 20 gauge studs 24" o.c.</li> <li>– 3" THERMAFIBER SAFB</li> <li>– RC-1 channel or equivalent one side spaced 24" o.c.</li> <li>– 2 layers gypsum panels</li> <li>– face layer joints finished</li> <li>• optional veneer plaster</li> </ul>   | 58                     | <b>RAL-TL-83-215</b>   | 1-1/2 hour       | <b>UL Des U452</b>                   | SA920     | <b>A-8</b>  |
|                     |   | 59                     | <b>RAL-TL-84-140</b><br>Based on 3-5/8" stud assembly without mineral wool batt                        |                  |                                      |           |             |
| wt. 9<br>           | <ul style="list-style-type: none"> <li>• 1/2" SHEETROCK Brand FIRECODE C Core Gypsum Panels each side</li> <li>– 1-5/8" 25 gauge steel studs 24" o.c.</li> <li>– face layer joints finished</li> <li>• optional veneer plaster</li> </ul>   | 50                     | <b>USG-840817</b><br>Based on 3-5/8" stud assembly without mineral wool batt                           | 2 hour           | <b>UL Des U419</b><br>or <b>U412</b> | SA920     | <b>A-9</b>  |
|                     |   | 52                     | <b>SA-860932</b><br>Based on lamin. face layer, 1-1/2" mineral wool batt and 2-1/2" studs              |                  |                                      |           |             |
|                     |   | 54                     | <b>CK-654-40</b><br>Based on 2-1/2" studs, screw-attached face layer and 1-1/2" mineral wool batt      |                  |                                      |           |             |
|                     |   | 55                     | <b>SA-800421</b><br>Based on 3-5/8" studs and 1-1/2" mineral wool batt                                 |                  |                                      |           |             |
| wt. 11<br>          | <ul style="list-style-type: none"> <li>• 5/8" SHEETROCK Brand FIRECODE Core Gypsum Panels, or FIBEROCK Brand Panels</li> <li>– 1-5/8" 25 gauge steel studs 24" o.c.</li> <li>– face layer joints finished</li> <li>• optional veneer plaster</li> </ul>   | 48                     | <b>BBN-770408</b><br>Based on 3-5/8" studs and 5/8" SHEETROCK Brand FIRECODE C Core Gypsum Panels      | 2 hour           | <b>UL Des U419</b><br>or <b>U411</b> | SA920     | <b>A-10</b> |
|                     |   | 56                     | <b>USG-840818</b><br>Based on 3-5/8" studs and 3" mineral wool batt                                    |                  |                                      |           |             |
| wt. 7<br>           | <ul style="list-style-type: none"> <li>• 3/4" SHEETROCK Brand ULTRACODE Core Gypsum Panels</li> <li>– 3-1/2" 25 gauge steel studs 24" o.c.</li> <li>– 3" THERMAFIBER SAFB</li> <li>– joints finished</li> </ul>   | 50                     | <b>USG-910617</b>  | 2 hour           | <b>UL Des U419</b><br>or <b>U491</b> |           | <b>A-11</b> |
| wt. 7<br>           | <ul style="list-style-type: none"> <li>• 1/2" SHEETROCK Brand FIRECODE C Core Gypsum Panels</li> <li>– 3-5/8" 20 gauge studs 24" o.c.</li> <li>– 3" THERMAFIBER SAFB</li> <li>– RC-1 channel or equivalent one side spaced 24" o.c.</li> <li>– single-layer gypsum panels screw-attached to studs</li> <li>– double layer screw-attached to channel</li> <li>– face layer joints finished</li> <li>• optional veneer plaster</li> </ul> | 59                     | <b>RAL-TL-84-136</b><br>Based on 5/8" thick panels, 6" 20 gauge structural studs, 5" mineral wool batt | 2 hour           | <b>UL Des U419</b><br>or <b>U453</b> | SA920     | <b>A-12</b> |
|                     |   | 60                     | <b>RAL-TL-87-140</b><br>Based on 1/2" thick panels, 6" 20 gauge structural studs, 5" mineral wool batt |                  |                                      |           |             |

## Steel Framed



| Non-loadbearing     |  | Acoustical Performance |   | Fire Performance |                                      | Reference |             |
|---------------------|--|------------------------|---|------------------|--------------------------------------|-----------|-------------|
| Construction Detail | Description  | STC                    | Test Number   | Rating           | Test Number                          | ARL       | Index       |
| wt. 9<br>           | <ul style="list-style-type: none"> <li>• 1/2" SHEETROCK Brand FIRECODE C Core Gypsum Panels</li> <li>– 2-1/2" 25 gauge steel studs 24" o.c.</li> <li>– 1" THERMAFIBER SAFB</li> <li>– RC-1 channel or equivalent one side, spaced 24" o.c.</li> <li>– double layer gypsum panels screw-attached to channel, 2 layers screw-attached to steel studs</li> <li>– face layer joints finished</li> <li>• optional veneer plaster</li> </ul> | 57                     | <b>USG-871207</b><br>Based on 5/8" thick panels   | 2 hour           | <b>UL Des U454</b>                   | SA920     | <b>A-13</b> |
|                     |  | 60                     | <b>RAL-TL-87-154</b>  |                  |                                      |           |             |
|                     |  | 61                     | <b>RAL-TL-83-214</b><br>Based on 5/8" thick panels  |                  |                                      |           |             |
|                     |  | 63                     | <b>RAL-TL-87-141</b><br>Based on 6" 20 gauge structural studs and 5" mineral wool batt  |                  |                                      |           |             |
|                     |  | 62                     | <b>RAL-TL-84-139</b><br>Based on 5/8" thick panels, 6" 20 gauge structural studs and 5" mineral wool batt   |                  |                                      |           |             |
| wt. 18<br>          | <ul style="list-style-type: none"> <li>• 1/2" DUROCK Brand Cement Board and 1/4" ceramic tile</li> <li>• base layer 1/2" SHEETROCK Brand FIRECODE C Core Gypsum Panels</li> <li>– 3-5/8" 20 gauge steel studs 16" o.c.</li> <li>– 3" THERMAFIBER SAFB</li> <li>– face layer joints taped</li> <li>• alternate design 2 layers 1/2" SHEETROCK Brand FIRECODE C Core Gypsum Panels, one side</li> </ul>                                  | 56                     | <b>SA-851016</b><br>Based on alternate design   | 2 hour           | <b>UL Des U443</b>                   | SA934     | <b>A-14</b> |
|                     |  | 58                     | <b>SA-851028</b>  |                  |                                      |           |             |
| wt. 13<br>          | <ul style="list-style-type: none"> <li>• 1/2" SHEETROCK Brand FIRECODE C Core Gypsum Panels</li> <li>– 1-5/8" 25 gauge steel studs 24" o.c.</li> <li>• optional veneer plaster</li> </ul>  | 59                     | <b>SA-830112</b><br>Based on assembly with 1-1/2" mineral wool batt in cavity   | 3 hour           | <b>UL Des U419</b><br>or <b>U435</b> | SA920     | <b>A-15</b> |
| wt. 11<br>          | <ul style="list-style-type: none"> <li>• 1/2" SHEETROCK Brand FIRECODE C Core Gypsum Panels</li> <li>– 3-5/8" 20 gauge studs 24" o.c.</li> <li>– 3" THERMAFIBER SAFB</li> <li>– RC-1 channel or equivalent one side, spaced 24" o.c.</li> <li>– face layer joints finished</li> </ul>  | 61                     | <b>RAL-TL-87-153</b><br>Based on 5/8" thick panels  | 3 hour           | <b>UL Des U419</b><br>or <b>U455</b> | SA920     | <b>A-16</b> |
|                     |  | 62                     | <b>RAL-TL-83-213</b><br>Based on 5/8" thick panels  |                  |                                      |           |             |
|                     |  | 63                     | <b>RAL-TL-84-138</b><br>Based on 5/8" thick panels, 6" 20 gauge structural studs and 5" THERMAFIBER SAFB  |                  |                                      |           |             |
|                     |  | 64                     | <b>RAL-TL-87-142</b><br>Based on 6" 20 gauge structural studs and 5" THERMAFIBER SAFB   |                  |                                      |           |             |
|                     |  | 65                     | <b>RAL-TL-84-150</b><br>Based on 5/8" thick panels, 6" 20 gauge structural studs, 5" THERMAFIBER SAFB, acoustical sealant bead between panels and studs, dabs 8" o.c. between panel layers on stud side |                  |                                      |           |             |

## Steel Framed



| Non-loadbearing     |   | Acoustical Performance |   | Fire Performance |                                      | Reference |             |
|---------------------|---|------------------------|---|------------------|--------------------------------------|-----------|-------------|
| Construction Detail | Description   | STC                    | Test Number   | Rating           | Test Number                          | ARL       | Index       |
| wt. 13<br>          | <ul style="list-style-type: none"> <li>• 1/2" SHEETROCK Brand FIRECODE C Core Gypsum Panels</li> <li>– 3-5/8" 20 gauge studs 24" o.c.</li> <li>– 3" THERMAFIBER SAFB</li> <li>– RC-1 channel or equivalent one side, spaced 24" o.c.</li> <li>– face layer joints finished</li> </ul>   | 63                     | <b>RAL-TL-87-152</b>  | 3 hour           | <b>UL Des U419</b><br>or <b>U455</b> |           | <b>A-17</b> |
|                     |   | 65                     | <b>RAL-TL-87-143</b><br>6" 20 gauge structural studs,<br>5" THERMAFIBER SAFB  |                  |                                      |           |             |
| wt. 17<br>          | <ul style="list-style-type: none"> <li>• 4 layers 1/2" SHEETROCK Brand FIRECODE C Core Gypsum Panels, each side</li> <li>– 1-5/8" 25 gauge steel studs 24" o.c.</li> <li>• optional veneer plaster</li> </ul>   | 62                     | <b>SA-830113</b><br>Based on assembly with 1-1/2" mineral wool batt in cavity | 4 hour           | <b>UL Des U419</b><br>or <b>U435</b> | SA920     | <b>A-18</b> |
| wt. 13<br>          | <ul style="list-style-type: none"> <li>• 2 layers 3/4" SHEETROCK Brand ULTRACODE Core Gypsum Panels, each side</li> <li>– 2-1/2" 25 gauge steel studs 24" o.c.</li> <li>– 2" THERMAFIBER SAFB</li> <li>– face layer joints finished</li> </ul>  | 56                     | <b>SA-910907</b>  | 4 hour           | <b>UL Des U419</b><br>or <b>U490</b> |           | <b>A-19</b> |
| <b>Chase Walls</b>  |   |                        |   |                  |                                      |           |             |
| wt. 6<br>           | <ul style="list-style-type: none"> <li>• 5/8" SHEETROCK Brand FIRECODE Core Gypsum Panels, each side or FIBEROCK Brand Panels</li> <li>– 1-5/8" 25 gauge steel studs 24" o.c. in 2 rows</li> <li>– 5/8" gypsum panel gussets or steel runner braces spanning chase screw-attached to studs</li> <li>• optional veneer plaster</li> </ul>  | 52                     | <b>RAL-TL-76-155</b><br>Based on 3-1/2" insulation, one side                  | 1 hour           | <b>UL Des U420</b>                   | SA920     | <b>A-20</b> |
| wt. 17<br>          | <ul style="list-style-type: none"> <li>• 1/2" DUROCK Brand Cement Board and 1/4" ceramic tile</li> <li>– 1-5/8" 20 gauge steel studs 16" o.c. in two rows with horizontal braces</li> <li>– 1-1/2" THERMAFIBER SAFB</li> <li>• alternate design 5/8" SHEETROCK Brand FIRECODE Core Gypsum Panels, one side</li> </ul>   | 60                     | <b>SA-840515</b><br>Based on 3" THERMAFIBER SAFB and alternate design         | 1 hour           | <b>UL Des U404</b>                   | SA934     | <b>A-21</b> |
|                     |   | 61                     | <b>SA-840524</b><br>Based on 3" THERMAFIBER SAFB and 3-5/8" studs             |                  |                                      |           |             |
| wt. 18<br>          | <ul style="list-style-type: none"> <li>• 1/2" DUROCK Brand Cement Board and 1/4" ceramic tile</li> <li>• base layer 1/2" SHEETROCK Brand FIRECODE C Core Gypsum Panels</li> <li>– 1-5/8" 25 gauge steel studs 16" o.c. in two rows with horizontal braces</li> <li>– 1-1/2" THERMAFIBER SAFB</li> <li>• alternate design 2 layers 1/2" SHEETROCK Brand FIRECODE C Core Gypsum Panels, one side</li> </ul> | 65                     | <b>SA-841112</b>  | 2 hour           | <b>UL Des U444</b>                   | SA934     | <b>A-22</b> |
|                     |   | 62                     | <b>SA-841102</b><br>Based on 3" THERMAFIBER SAFB and alternate design         |                  |                                      |           |             |

# A

# Partitions

## Wood Framed

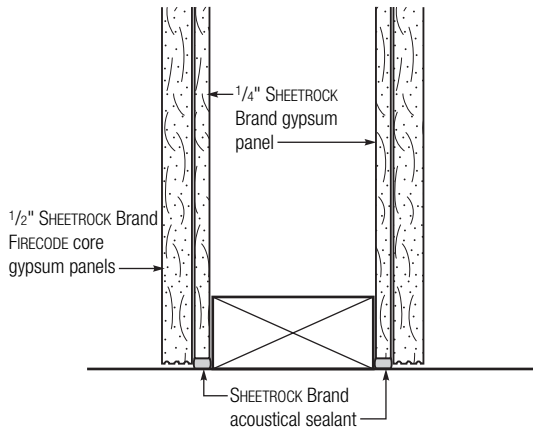


| Loadbearing             |   | Acoustical Performance |  | Fire Performance |                          | Reference |             |
|-------------------------|---|------------------------|--|------------------|--------------------------|-----------|-------------|
| Construction Detail     | Description   | STC                    | Test Number  | Rating           | Test Number              | ARL       | Index       |
| <p>wt. 7<br/>4 3/4"</p> | <ul style="list-style-type: none"> <li>• 5/8" SHEETROCK Brand FIRECODE Core Gypsum Panels or FIBEROCK Brand Panels – 2x4 wood stud 16" or 24" o.c.</li> <li>– joints finished</li> <li>• optional veneer plaster</li> </ul>   | 34                     | <b>USG-30-FT-G&amp;H</b><br>Based on 16" stud spacing and screws 6" o.c.                                     | 1 hour           | <b>UL Des U305, U314</b> | SA920     | <b>A-25</b> |
|                         |   | 37                     | <b>USG-860807</b><br>Based on 24" stud spacing   |                  |                          |           |             |
|                         |   | 46                     | <b>BBN-700725</b><br>Based on 24" stud spacing and 3" mineral wool batt                                      |                  |                          |           |             |
| <p>wt. 7<br/>5 1/4"</p> | <ul style="list-style-type: none"> <li>• 5/8" SHEETROCK Brand FIRECODE C Core Gypsum Panels</li> <li>– 2x4 wood stud 16" or 24" o.c.</li> <li>– 3" THERMAFIBER SAFB</li> <li>– RC-1 channel or equivalent one side</li> <li>– joints finished</li> </ul>                                      | 50                     | <b>BBN-760903</b>  | 1 hour           | <b>UL Des U327</b>       |           | <b>A-26</b> |
| <p>wt. 12<br/>6"</p>    | <ul style="list-style-type: none"> <li>• 5/8" SHEETROCK Brand FIRECODE Core Gypsum Panels or SHEETROCK Brand Water-Resistant FIRECODE Core Gypsum Panels or FIBEROCK Brand Panels</li> <li>– 2x4 wood studs 16" o.c.</li> <li>– joints finished</li> <li>• optional veneer plaster</li> </ul> | 52                     | <b>USG-810218</b><br>Based on same assembly (non-fire rated) with RC-1 channel and without mineral wool batt | 2 hour           | <b>UL Des U301</b>       | SA920     | <b>A-27</b> |
|                         |   | 58                     | <b>USG-810219</b><br>Based on same assembly with RC-1 channel and 2" mineral wool batt                       |                  |                          |           |             |
| <b>Chase Walls</b>      |   |                        |  |                  |                          |           |             |
| <p>12 1/4"</p>          | <ul style="list-style-type: none"> <li>• 1/2" SHEETROCK Brand FIRECODE C Core Gypsum Panels, both outside both walls double layer and inside single layer</li> </ul>  | 57                     | <b>RAL-TL-73-224</b><br>3-1/2" glass fiber   | 1 hour           | <b>GA-WP-3810</b>        |           | <b>A-28</b> |
|                         |   | 51                     | <b>RAL-TL-69-214</b>   |                  |                          |           |             |
| <p>10 1/2"</p>          | <ul style="list-style-type: none"> <li>• 5/8" SHEETROCK Brand FIRECODE Core Gypsum Panels, or FIBEROCK Brand Panels</li> <li>– 2 rows 2x4 wood studs 16" o.c. on separate plates 1" apart</li> <li>– joints finished</li> </ul>   | 56                     | <b>USG-710120</b><br>Based on 3-1/2" thick insulation in one cavity  | 2 hour           | <b>GA-WP-3820</b>        |           | <b>A-29</b> |
|                         |   | 58                     | <b>GA-NGC-3056</b>   |                  |                          |           |             |
|                         |   | 47                     | <b>RAL-TL-69-211</b>   |                  |                          |           |             |
| <p>8"</p>               | <ul style="list-style-type: none"> <li>• 5/8" SHEETROCK Brand FIRECODE C Core Gypsum Panels or FIBEROCK Brand Panels</li> <li>– 2x4 wood studs 16" o.c. on 2x6 common plate</li> <li>– joints finished</li> </ul>   | 51                     | <b>GA-NGC-2377</b>   | 2 hour           | <b>GA-WP-3910</b>        |           | <b>A-30</b> |

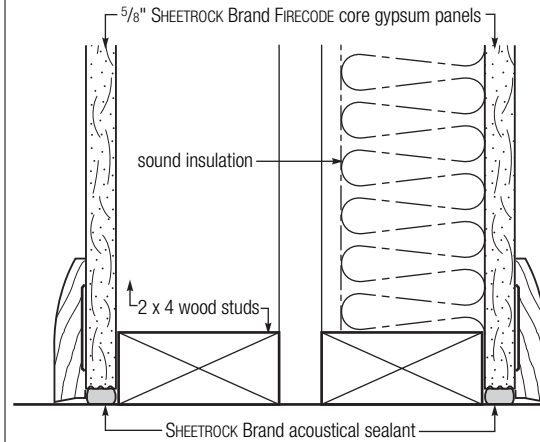
# Design Details

## Wood Framed

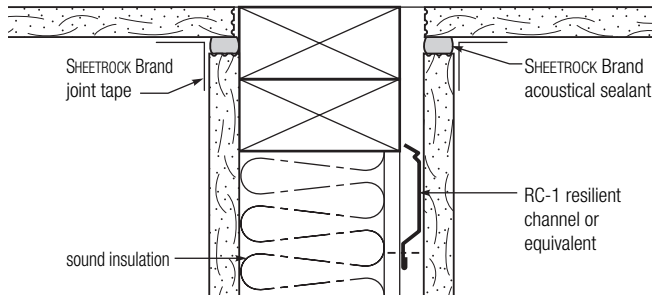
**Sound isolating partition**



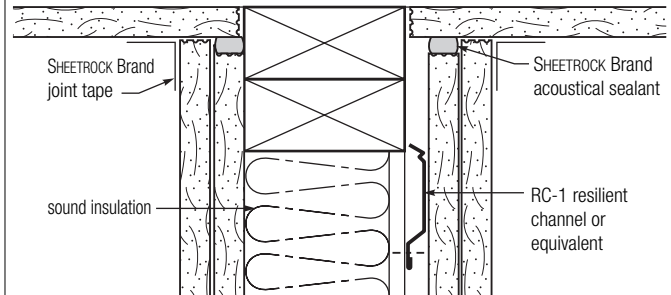
**Sound isolating partition — chase wall**



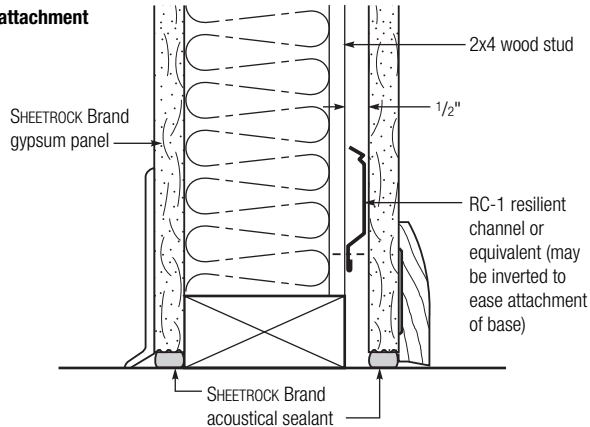
**Ceiling/floor attachment — SHEETROCK Brand gypsum panel**



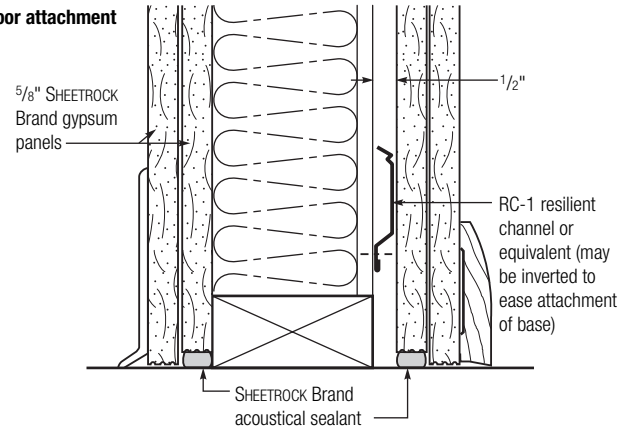
**Ceiling/floor attachment/SHEETROCK Brand gypsum panel, FIRECODE C Core panel**



**Floor attachment**



**Floor attachment**

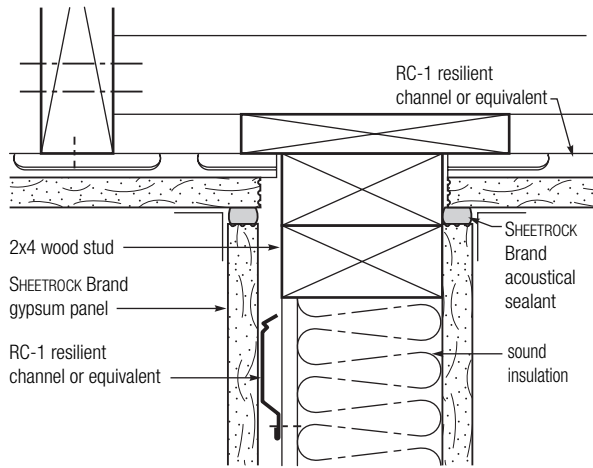




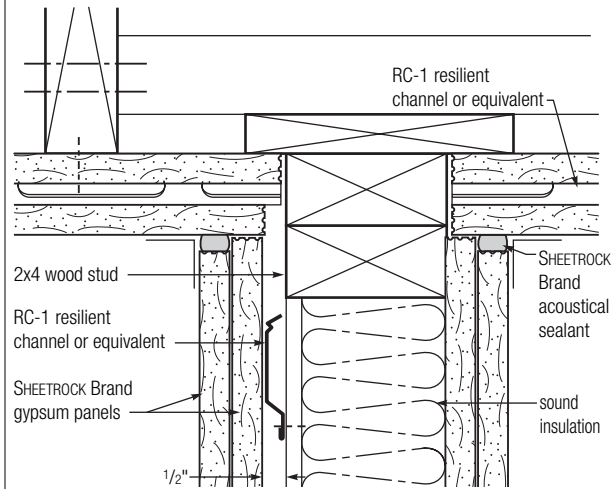
# Design Details

## Wood Framed

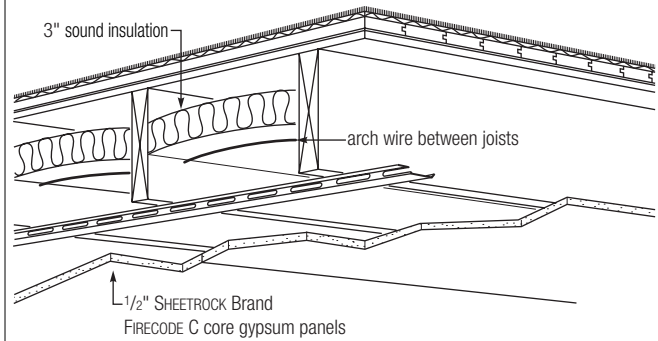
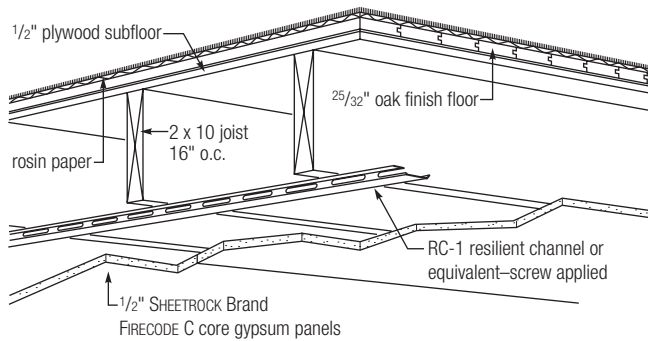
**Single-layer panels with RC-1 Channel**



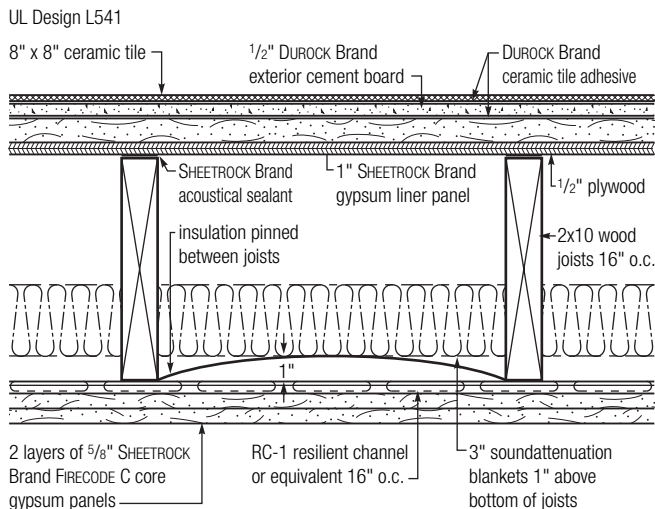
**Double-layer panels with RC-1 Channel**



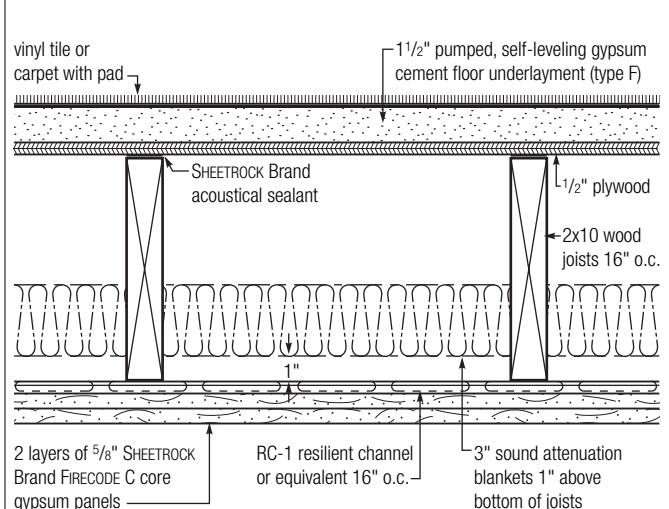
**Ceiling and floor assemblies**



**Ceramic tile**



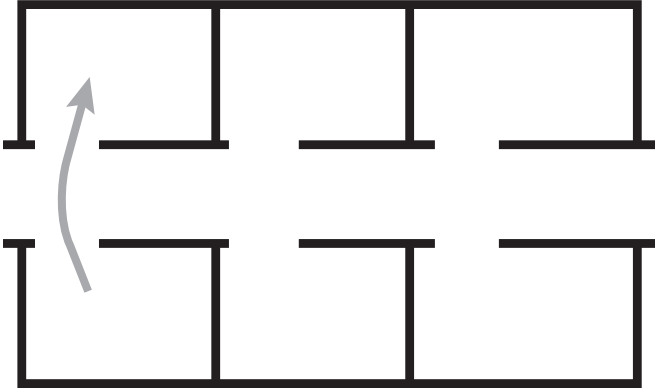
**Vinyl tile or carpet/pad**



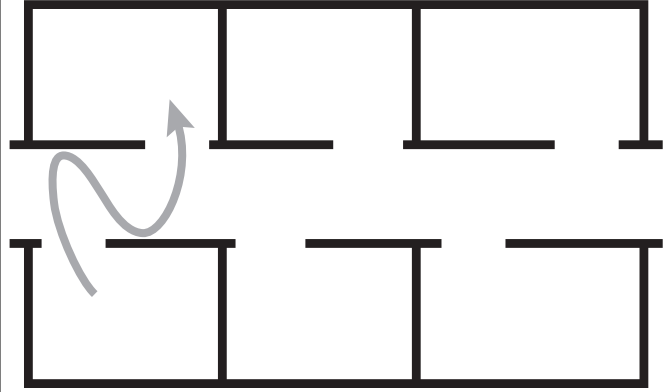
# Flanking Path Details

## Typical Flanking Paths

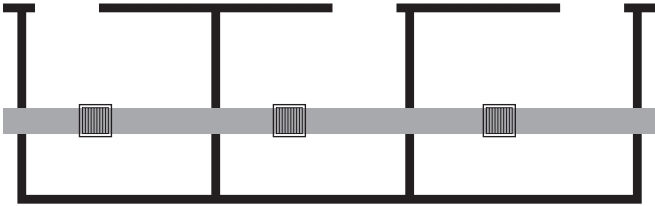
Doorway Placement – Avoid



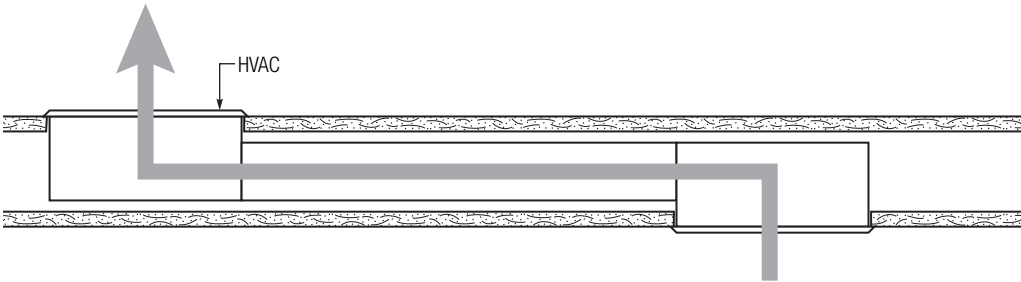
Doorway Placement – Better



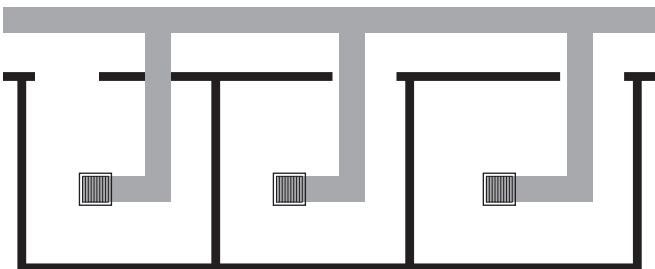
HVAC Design – Avoid



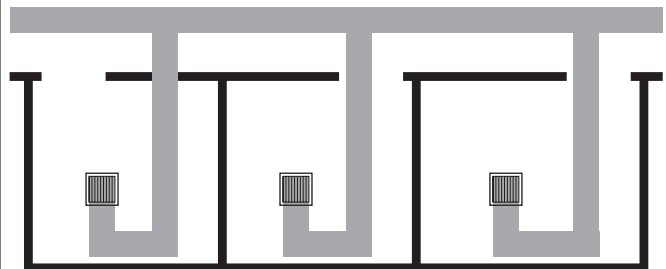
HVAC Design – Avoid



HVAC Design – Better

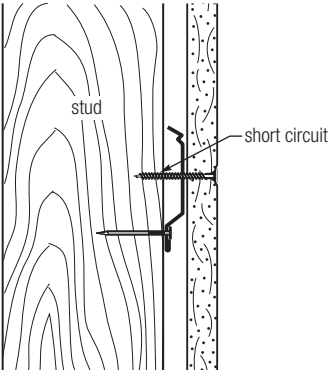


HVAC Design – Recommended

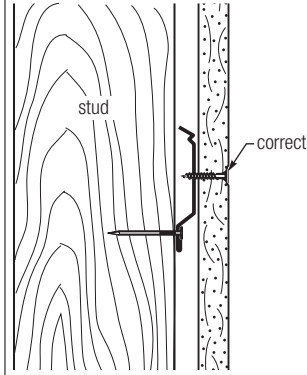


## Interrupting Flanking Paths

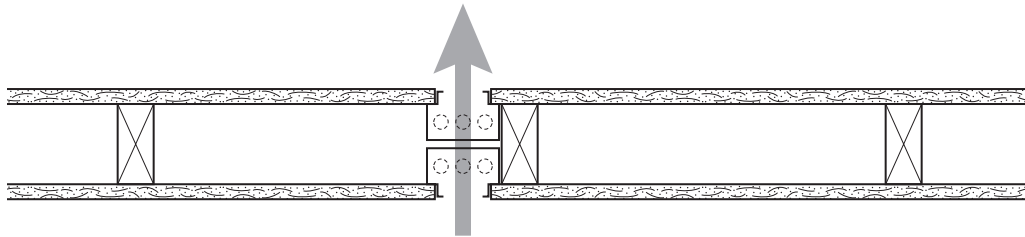
**Resilient Channel Wall Framing – Avoid**



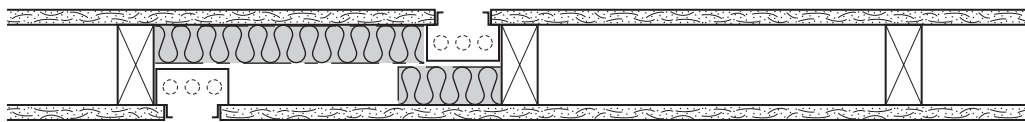
**Resilient Channel Wall Framing – Recommended**



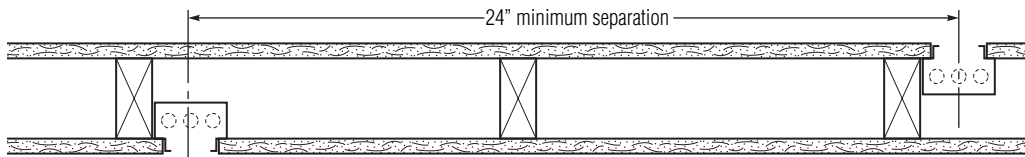
**Electrical Boxes – Avoid**



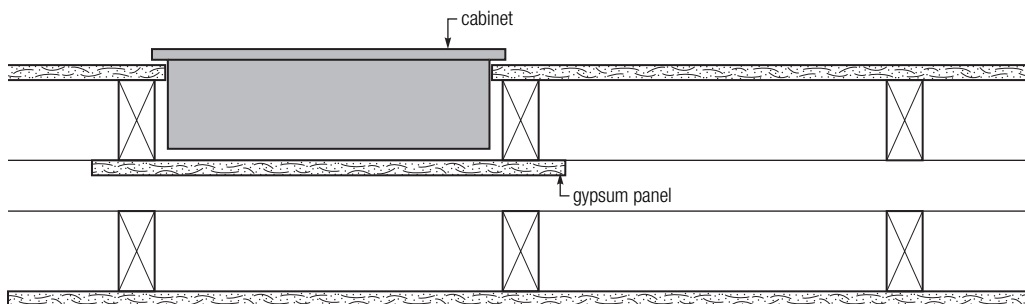
**Electrical Boxes – Better**



**Electrical Boxes – Recommended**



**Cabinet Cutout**



# Good Design Practices

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In most building design, the No. 1 acoustical goal is to specify wall partitions, ceiling systems and floor/ceiling assemblies that will minimize transmission of airborne and impact sound beyond their areas of origin. This performance can be achieved with a combination of materials, assembly designs and construction methods tested for acoustical performance on a variety of parameters. Here is an overview of design strategies for key components that can make spaces more pleasant, comfortable and productive.

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## Ceilings

### Absorb Sound in Open Spaces

Select high-NRC ceiling panels for open areas to absorb a significant amount of the sound generated within these spaces. Acoustics are further improved with partitions having high STC values to help block sound and prevent transmission across large spaces.

### Block Sound in Enclosed Spaces

Choose high-CAC ceiling panels for private offices, meeting rooms and other enclosed areas to block sound from traveling up into the plenum and out to adjacent spaces. This approach will reduce distractions for those outside and improve speech privacy for those within.

### Cover Sound in All Areas

Sound masking covers noise that is not absorbed or blocked by introducing uniform, ambient, background sound into the space. Sound masking produces an electronic sound spectrum similar to that of softly blowing air; it is amplified through speakers above the suspended ceiling to unobtrusively raise the background sound level. Sound masking makes noise in open spaces less distracting, increases speech privacy in enclosed spaces and provides greater acoustical balance throughout.

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## Walls

### Increase mass

As partition mass increases, sound waves lose more energy passing through the medium, reducing their ability to vibrate air on the other side. Relying on mass alone, however, poses limitations. Doubling the mass of a partition can reduce sound transmission by up to 5 dB. Thus, achieving a 60 dB reduction would require total mass of 320 pounds per square foot, the equivalent of approximately 3' of solid concrete, not a feasible solution for most building designs.

### Enlarge air spaces

Isolating air space within a partition can increase STC performance. But like increasing mass, performance increases are limited. Doubling partition air space can reduce sound transmission by up to 5 dB, so achieving a 60 dB reduction would require an isolated air space 4' wide, hardly practical for most applications.

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**Add sound insulation**

Adding a layer of fibrous sound-absorbing insulation material such as mineral wool into the partition cavity will dissipate sound by creating friction, which transforms a portion of sound wave energy into heat. However, sound attenuation blankets cannot completely counter the conductivity of the wood or steel studs in the framing assembly, which provide a path of least resistance for sound energy.

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**Decouple wall panels**

Attaching the wall surface diaphragm (e.g. drywall panels) directly to framing members provides an uninterrupted path for sound travel. This route can be interrupted by mounting the surface diaphragm to resilient channels attached to the wall studs and placing sound insulation inside the partition cavity.

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**Seal flanking paths**

Closing off gaps or penetrations in the wall assembly is critical to controlling noise. One of the most effective methods is to apply acoustical sealant at the intersection of the gypsum panel, floor system (wood or concrete), and the leg of the steel runner or wood sole plate; sealant should be applied at this location on both sides of the partition. A properly sealed wall assembly with one 5/8" gypsum panel on each side and a 1-1/2" thick sound attenuation blanket installed in the air cavity achieves an STC of 53. Without acoustical sealant, this assembly would produce an STC of only 29—a dramatic 45 percent reduction.

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**Increase isolation with steel studs**

A single-layer partition with 5/8" gypsum panels and 3-5/8" stud achieves 40 STC with 25-ga. steel and 38 STC with 20-ga. steel. STC falls to 35 with a traditional 2' x 4' stud due to the greater stiffness of wood.

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**Floor/Ceiling Assemblies****Isolate sound**

Whether constructed with joists, trusses or concrete slabs, floor systems can develop gaps or cracks, providing a flanking path for sound to travel between levels of a building. Even properly sealed assemblies can transmit noise from footsteps, falling objects, closing doors and other impacts. These acoustical problems can be significantly reduced with a flooring system that includes a layer of sound absorbing material topped with a poured cementitious underlayment. The poured underlayment finds and seals cracks and other sound channels, then hardens to form a solid barrier isolated from the structure below by the sound mat or board. This system can provide STC ratings as high as 66 and increase IIC by as much as 13 points, a significant improvement.

# STC Guidelines

| Building Type   | Room                | Adjacent Room Room | STC                  |        |      |    |
|---|---------------------|--------------------|----------------------|--------|------|----|
|   |                     |                    | Minimum <sup>d</sup> | Medium | High |    |
| Residential, including motels, hospitals, and dormitories | Bedroom             | Bedroom            | 45                   | 50     | 55   |    |
|   |                     | Living room        | 50                   | 55     | 60   |    |
|   |                     | Kitchen            | 50                   | 55     | 60   |    |
|   |                     | Bathroom           | 50                   | 55     | 60   |    |
|   |                     | Corridor           | 45                   | 50     | 55   |    |
|   |                     | Lobby              | 50                   | 55     | 60   |    |
|   | Mech. room          | 55                 | 60                   | 60+    |      |    |
|   | Living Room         | Living room        | 40                   | 45     | 55   |    |
|   |                     | Kitchen            | 45                   | 50     | 60   |    |
|   |                     | Bathroom           | 45                   | 50     | 60   |    |
|   |                     | Corridor           | 45                   | 45     | 55   |    |
|   |                     | Lobby              | 50                   | 55     | 60   |    |
|   |                     | Mech. room         | 50                   | 60     | 60+  |    |
|   | Kitchen or Bathroom | Kitchen            | 40                   | 45     | 50   |    |
|   |                     | Bathroom           | 40                   | 45     | 50   |    |
|   |                     | Corridor           | 40                   | 40     | 50   |    |
|   |                     | Lobby              | 45                   | 50     | 60   |    |
|   |                     | Mech. room         | 45                   | 55     | 60+  |    |
|   | Business            | Office             | Office               | 45     | 50   | 55 |
|   |                     |                    | General area         | 40     | 45   | 50 |
|   |                     |                    | Corridor             | 40     | 45   | 50 |
| Washroom  |                     |                    | 45                   | 50     | 55   |    |
| Kitchen   |                     |                    | 45                   | 50     | 55   |    |
| Conference room   |                     |                    | 45                   | 50     | 55   |    |
| Conference Room   |                     | General area       | 40                   | 45     | 50   |    |
|   |                     | Corridor           | 40                   | 40     | 45   |    |
|   |                     | Washroom           | 40                   | 45     | 50   |    |
|   |                     | Kitchen            | 45                   | 50     | 55   |    |
|   |                     | Conference room    | 40                   | 45     | 50   |    |
| General Area  |                     | Corridor           | 40                   | 40     | 45   |    |
|   |                     | Washroom           | 40                   | 45     | 50   |    |
|   |                     | Kitchen            | 45                   | 50     | 55   |    |
| School  |                     | Classroom          | Classroom            | 45     | 50   | 55 |
|   | Laboratory          |                    | 45                   | 50     | 55   |    |
|   | Corridor            |                    | 40                   | 40     | 45   |    |
|   | Kitchen             |                    | 50                   | 55     | 55   |    |
|   | Shop                |                    | 55                   | 60     | 60   |    |
|   | Recreation area     |                    | 45                   | 50     | 55   |    |
|   | Music room          |                    | 60                   | 60     | 60   |    |
|   | Mech. room          |                    | 50                   | 55     | 60   |    |
|   | Washroom            |                    | 45                   | 50     | 55   |    |
|   | Music Room          | Laboratory         | 45                   | 50     | 55   |    |
|   |                     | Corridor           | 45                   | 50     | 55   |    |
|   |                     | Shop               | 50                   | 55     | 60   |    |
|   |                     | Recreation area    | 50                   | 55     | 60   |    |
|   |                     | Music room         | 55                   | 60     | 60   |    |
| Mech. room  | 50                  | 55                 | 60                   |        |      |    |

**Note**

(d) Current model building codes require a minimum STC (and IIC) separation of dwelling units. The 2003 International Building Code requires a minimum separation of 50 STC and 50 IIC for apartments, condominiums and townhouses. Local jurisdictions using the 2003 International Residential Code may require a minimum separation of 45 STC for townhouses.