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John Wiley & Sons, Inc. is pleased to present the second edition of Interior Graphic Standards, Student Edition. It is our hope that students of interior design will find in this volume a companion for all aspects of their design education. The student edition serves as a reference for the core classes required by all curriculums, including construction methods and materials, furniture selection, design studio, acoustics, lighting, mechanical, electrical, and other building systems, construction detailing and documentation, and human factors. Although this student edition is an abridgment of the second edition of Interior Graphic Standards, it contains more than half of the original material.

Students of interior design are at the beginning of a lifetime of building the skills and acquiring the knowledge and resources required for an inspired design practice. It is our hope that Interior Graphic Standards, Student Edition will serve as both a launching pad and touchstone in these endeavors to all who seek its guidance.

The second edition of Interior Graphic Standards Student Edition has been completely updated and reorganized. The content has been expanded to include more information on residential—as well as commercial—interior design. The book has been divided into two sections, followed by an appendix, a glossary, and an index.

Design Principles and Process, the first section, addresses issues which students will use across many areas of study. These include environmental and behavioral issues, acoustical principles, accessible design, sustainable design, and design basics. Evidence-based design, building codes, programming, contract documents, and computing technologies are included as design basics.

Building Elements, the second section, uses concise text and clear line drawings to detail building structure and shell, interior construction, and equipment and furnishings. Building structure and shell topics include basics of substructure, floor, ceiling and roof construction, stairs and ramps, and exterior walls. Interior construction topics include fire resistive and seismic considerations that affect interiors, interior construction components and finishes, and building services. This section ends with a chapter of interior project types, including commercial, residential, healthcare, retail, hospitality, and educational spaces. Performance spaces, museums, athletic and fitness spaces, animal care facilities, and existing building interiors are also represented here. This chapter is ideal for finding information for specific design projects.

The material at the end of the book—the Appendix, Glossary, and Index—makes it easy for students to look up basic information. From front to back, Interior Graphic Standards Student Edition, 2nd Edition is designed with the needs of students and their teachers in mind. There are additional materials on the book’s website, www.wiley.com/go/interiorgraphicstandards2e, including a list of websites by topic for student use, and for teachers, additional extra images and PowerPoint presentations that can be customized for in-class presentations.

Corky Binggeli, ASID
Editor-in-Chief
Arlington, Massachusetts
SECTION 1
DESIGN PRINCIPLES AND PROCESS

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ENVIRONMENTAL AND
BEHAVIORAL ISSUES

HUMAN FACTORS

Human factors information refers to the variables that affect human performance in the built environment, such as human physiology and human psychology. Data accumulated from the fields of engineering, biology, psychology, and anthropology are integrated in this multidisciplinary field.

**ANTHROPOMETRICS AND ERGONOMICS**

The field of anthropometrics provides information about the dimensions and functional capacity of the human body. Static anthropometrics measures the body at rest; dynamic anthropometrics measures the body while it is performing activities defined as “work.” Dimensional variation occurs in anthropometric data because of the large range of diversity in the human population. To utilize anthropometric charts effectively, a designer must identify where a subject user group falls in relationship to these variables. The factors that cause human variations are gender, age, ethnicity, and race. Patterns of growth affected by human culture cause variation in human measure as well. Percentiles that refer to the frequency of occurrence describe dimensional variations on anthropometric charts: that is, the mean percentile (50%), the small extreme percentile (2.5%), and the large extreme percentile (97.5%).
4 ENVIRONMENTAL AND BEHAVIORAL ISSUES

MEASURE AND DEVELOPMENT OF TODDLERS—2.5 TO 4 YEARS

1.1

2.5 TO 3 YEARS

- Cannot turn on stop suddenly or quickly.
- Can jump a distance of 11 to 14 yards (10 to 13 ft).
- Can ascend stairs with knees alternated.

BEGINNINGS OF CONSIDERATION: EMERGENCE IN ATTENTION TO COMMUNICATION

NEWLY ACQUIRED ABILITIES: OVER EVERYDAY

- Comprehension is excellent, although child (2.5) makes many mistakes in grammar.
- Uncoverable reaches 5 ft. Usually, adults help and will teach with proper modeling and syntactic mistakes are repeated.

COGNITIVE DEVELOPMENT: EXPLORE LOGICAL THOUGHTS

- Children can perform mental representations of things, but they cannot yet manipulate these representations.
HUMAN FACTORS  ENVIRONMENTAL AND BEHAVIORAL ISSUES

MEASURE AND DEVELOPMENT OF YOUTHS—7 TO 8 YEARS

1.2

<table>
<thead>
<tr>
<th>7 YEARS</th>
<th>8 YEARS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 YR</td>
<td>CHILD REALIZES THAT OTHERS MAY INTERPRET A SITUATION IN A WAY DIFFERENT FROM HIS OR HER OWN</td>
</tr>
<tr>
<td>6 YR</td>
<td>CHILDREN CAN THINK LOGICALLY ABOUT MORE AND MORE, BUT NOT YET ABOUT ABSTRACTLY</td>
</tr>
<tr>
<td>10 YR</td>
<td></td>
</tr>
</tbody>
</table>

- **PHYSICAL DEVELOPMENT**
  - Balancing on one foot without looking becomes possible.
  - Can hop and jump accurately into small squares.
  - Can accurately perform jumping jacks exercises.

- **SOCIAL DEVELOPMENT**
  - Deep strength in prehensile (dexterity) activities.
  - Child can throw a small ball 4 ft (1.2 m).

- **COGNITIVE DEVELOPMENT**
  - Child can think logically about more and more, but not yet about abstractly.
MEASURE OF MAN—SIDE VIEW

99 PERCENTILE MAN

50 PERCENTILE MAN

1 PERCENTILE MAN
Contributor:
Ergonomics is the application of human factors data to design. This term was coined by the U.S. Army when it began to design machines to fit humans, rather than trying to find humans to fit machines.

HUMAN BEHAVIOR

Human behavior is motivated by innate attributes such as the five senses and by learned cultural attributes. Each human has a unique innate capacity to gather sensual information. How that information is understood is determined by personal and cultural experience.

Proxemics is the study of human behavior as it relates to learned cultural behavior. Human behavior originates in the expression of a person’s genetic code, modified by his or her experience.

HIERARCHY OF NEEDS

Psychologist Abraham Maslow created a theoretical model that describes human needs and motivations. His hierarchy of needs is presented as a constantly evolving process, such that when a person satisfies one need, another presents itself, and the individual will be driven to satisfy that set of needs.

Maslow’s hierarchy of needs is presented as a pyramid depicting the levels of psychological and physical human needs. The two levels at the pyramid’s base—physiological and safety—are required for survival in a hostile environment. Physiological needs include air, food, water, sex, sleep, and other drives that sustain life and health. Safety includes security, order, and stability necessary to protect an individual’s body, family, and property.

The three levels at the top of the pyramid—belonging, self-esteem, and self-actualization—are the focus of programming for most interior spaces. Belonging is associated with love and with membership in friendships, family life, and sexual relationships. Self-esteem relates to confidence, achievement, and mutual respect. The final level at the top of the pyramid is self-actualization, which involves fulfilling one’s own highest needs and striving for one’s fullest potential as a human being; it is associated with morality, creativity, problem solving, and other open-minded behaviors.

DISTANCE RELATIONSHIPS

Some aspects of human behavior related to territoriality are cultural. The space between objects has form, but the space between people is kinetic. The dimension of human territoriality varies in dimension because of cultural forces.

- Defensible space occurs when designed form reinforces meaning for the user and where boundary and ownership are visible in public space.
- Intimate space is where lovers, family, small children, and close friends are allowed to enter.
- Personal space is a protected area, where strangers are not welcome.
- Social space is the range of space in which most public interactions occur. Speech and expression are clear and communications are efficient and accurate.
- Public distance is the range of space where it is not considered rude to ignore someone, and interaction is not allowed.
Wayfinding refers to the way people orient themselves in a given environment and find their destination. The ability to orient oneself is based on many pieces of information, including visual clues, memories, and knowledge of a place, along with the ability to reason. Environmental psychology terms the ability to acquire, code, store, recall, and decode information about the physical environment cognitive mapping. Successful wayfinding is the ability to naturally orient oneself in the environment and to easily locate a destination without experiencing stress.

Mapping

Three components for the analysis of environmental imaging include:

- **Identity**, or objects in background
- **Structure**, or objects in relationship to each other
- **Meaning**, or personal, societal, or figurative belief

A highly imageable space has components that relate in a well-structured manner. The way a space is mapped for an individual varies, depending on the person. Certain images and visual clues are perceived similarly by groups of people who share similar backgrounds, activities, or routines, and recurrent features in their environment. For example, a group of schoolchildren may be of a similar age, share the learning and play activities of a school, and be aware of the physical features of the school building.

Mapping elements

Lynch's research resulted in the identification of five categories of elements that people use to map an environment:

- **Paths**: Channels of movement
- **Edges**: Boundaries that break, contain, or run parallel to forms
- **Districts**: Areas of recognizable identity
- **Nodes**: Places of intense activity
- **Landmarks**: Points of reference that are visually distinguishable

Cognitive maps

Cognitive maps are psychological impressions or representations of an individual's ability to understand space and the organizing elements by which they orient themselves. Cognitive maps usually combine several of the mapping elements. Three-dimensional characteristics of a space, material choices, colors, and lighting can all impact the formation of edges, districts, or nodes.

Where the boundaries of the districts meet, an edge may be formed, providing a sense of having exited one area and entered another. A node may occur at an intersection of activities or along paths where activity is concentrated. Landmarks may be used by the designer to mark entrances or points of interest.

Wayfinding and age

The process of learning involves an increase in perception of detail as a person develops. Adults navigate wide-reaching, complex environments on a daily basis, whereas children's environments are more limited in range and tend to be perceived on the basis of reference points.

The designer of environments for small children should be aware that children are naturally oriented in relation to their own positions. Children see the world always in relation to themselves. For example, an especially enjoyable piece of equipment at the playground and its relationship to the toilet facility a child uses while at the playground may be the elements by which he or she organizes and understands that environment. A child's cognitive map will likely include detailed aspects of a space with which he or she is directly involved.
The adolescent child's orientation system may be based on a local hangout, the path of travel between home and school, local landmarks within the community, and similar points of reference. As adults, people tend to rely on maps, diagrams, and more highly abstract information for orientation and finding their way within a new area. An adult who is visiting an unfamiliar city may use a city map to reach a destination.

SIGNAGE AND WAYFINDING CLUES

Signage is an important part of directing people through a space. Building signage can include building identification, building layout illustration, directional signs, and place signs. Signs should be designed and placed consistently throughout the facility. The overuse of signage and cluttered signage becomes ineffective, and should be avoided. Signs should be placed strategically at decision-making areas.

WAYFINDING CLUES

In addition to signage, visual clues can be utilized to help orient the user. Architectural elements like lobbies, stairs, elevators, and areas of special use can create a framework into which users can place themselves. The following interior treatments typically used for aesthetic effect can also assist the designer in creating a highly understandable environment:

- Change of wall color, type, or texture
- Change in flooring
- Use of lighting to highlight or minimize areas
- Change of ceiling treatments
- Furniture arrangement or type.

The extent of wayfinding clues incorporated in the environment should vary from public to private spaces. Public areas require more information to be presented to aid visitors in locating their destinations. As the spaces become more private, fewer clues will be needed because of the occupant's knowledge of the environment.
ACOUSTICAL PRINCIPLES

2

BASICS OF ACOUSTICAL DESIGN

SOUND

Sound is energy produced by a vibrating object or surface and transmitted as a wave through an elastic medium. Such a medium may be air ( airborne sound) or any solid common building material, such as steel, concrete, wood, piping, gypsum board, and so on (structure-borne sound). A sound wave has amplitude and frequency.

The amplitude of sound waves is measured in decibels (dB). The decibel scale is a logarithmic scale based on the logarithm of the ratio of a sound pressure to a reference sound pressure (the threshold of audibility). The values of a logarithmic scale, such as the decibel levels of two noise sources, cannot be added directly. Instead, use the simplified method described in Table 2.1. For example, 90 dB + 20 dB = 90 dB; 60 dB + 60 dB = 63 dB.

FREQUENCY

The frequency of sound waves is measured in hertz (Hz; also known as cycles per second) and grouped into octaves. An octave band covers the range from one frequency (Hz) to twice that frequency (2 Hz). The range of human hearing covers the frequencies from 20 to 16,000 Hz. Human hearing is most acute in the 1,000- to 4,000-Hz octave bands.

The human ear discriminates against low frequencies in a manner matched by the A-weighting filter of a sound-level meter, measured in dBA, or A-weighted decibels. This is the most universally accepted single-number rating for human response to sound.

SOUND AND FREQUENCY

The sound absorption coefficient for a given material may vary depending on the thickness of the material, how it is supported or mounted, the depth of the air space behind the material, and the facing in front of the material. In general, thicker, porous materials absorb more sound. The air space behind a material will increase the absorption efficiency, especially at low frequencies. Thin facings degrade high-frequency absorption.

SOUND ABSORPTION PROPERTIES OF MATERIALS

All materials and surfaces absorb some sound. The percentage of incident sound energy that is absorbed by a material, divided by 100, equals the coefficient of absorption, which ranges from 0 to 0.99. The coefficient varies as a function of frequency, measured in hertz.


Impact isolation class (IIC): Measures impact sound transmission through floor assemblies.

Noise criteria (NC): Standard spectrum curves used to describe a given measured noise.

Noise reduction (NR): Measures actual difference in sound pressure levels at any two points along a sound path.

SOUND ENERGY ABSORPTION MECHANISMS

There are three mechanisms by which sound energy is absorbed or dissipated as it strikes a surface. In all cases, sound energy is converted to heat, although not enough heat to be felt.

Porous absorption entails the use of soft, porous, fuzzy materials such as glass fiber, mineral wool, and carpet. The pressure fluctuations of a sound wave in air cause the fibers of such materials to move, and the friction of the fibers dissipates the sound energy.

Panel absorption involves installation of thin lightweight panels such as gypsum board, glass, and plywood. Sound waves cause these panels to vibrate. Sound absorption for a panel is greatest at its natural or resonant frequency.

Cavity absorption entails the movement of air pressure fluctuations across the narrow neck of an enclosed air cavity, such as the space behind a perforated panel or a slotted concrete masonry unit, also called a Helmholz resonator. Friction of the resonating air molecules against the wall of the neck converts sound energy to heat. If there is also insulation within the cavity, additional energy is extracted via the porous absorption mechanism.

ACOUSTICAL MEASUREMENT TERMS

- Apparent Sound Transmission Class (ASTC): Field measurement that covers all sound transfer paths between spaces.
- Articulation index (AI): Measures how materials affect speech intelligibility in offices.
- Average room absorption coefficient (average coefficient of absorption): Total room absorption divided by total room surface area.
- Coefficient of absorption (absorption coefficient): Percent of sound energy absorbed by a material.
- Decibel (dB): Measures sound pressure (perceived as relative loudness).
- Hertz (Hz): Measures frequency (perceived as high or low pitch).
- Impact isolation class (IIC): Measures impact sound transmissions through floor assemblies.
- Noise criteria (NC): Standard spectrum curves used to describe a given measured noise.
- Noise reduction (NR): Measures actual difference in sound pressure levels at any two points along a sound path.
- Sabine unit of sound absorption.
- Sound absorption average (SAA): Average of sound absorption coefficients.
ROOM ACOUSTICS

The sabin is defined as a unit of sound absorption. One square meter of 100% absorbing material has a value of one metric sabin. The unit is named in honor of Wallace Clement Sabine, considered the father of acoustical design.

The total sabins in a room can be determined by adding together the sabins of all the surfaces, which vary as a function of frequency. Because most materials absorb more high-frequency sound than low-frequency ones, it is typical to find more sabins in a room at high frequencies than at low frequencies.

In general, sound energy that is not absorbed will be reflected; thus, surfaces with low coefficients of absorption can be used to encourage sound reflection when appropriate.

PROPERTIES OF SOUND

Distance and time are two defining properties of sound. Outdoors, sound drops off 6 dB each time the distance from a source is doubled (inverse square law). Indoors, the reflecting sound energy in a room reaches a constant level as a function of the sound-absorbing units (sabins) in the room.

Outdoors, sound ceases when the source stops. Indoors, sound energy lingers; this decay is called reverberation. The reverberation time (RT) is defined as the length of time in seconds that it takes for sound to decay by 60 dB. Reverberation time is directly proportional to the volume of a space and inversely proportional to the units of absorption (sabins) in it.

Shorter reverberation times greatly enhance speech intelligibility and are imperative in listening environments for people with hearing impairments and for rooms with live microphones for teleconferencing. Longer reverberation times add richness to concert and liturgical music.

USE OF SOUND-ABSORPTIVE MATERIALS

Sound-absorptive materials (such as acoustical tile, glass fiber, wall paneling, carpet, curtains, etc.) can be added to a room in order to control or reduce noise levels or shorten reverberation time. Noise control is especially helpful when the noise sources are distributed around a room, as in a gymnasium, classroom, or cafeteria.

While sound-absorptive materials can be added to any surface in a room, the greatest area available for coverage is usually the ceiling. Because many soft, porous materials are fragile, they should not be located on surfaces that are susceptible to abuse. For these reasons, sound-absorptive materials are often installed on ceilings. However, limiting absorption to one surface or to two parallel surfaces may not effect as great a change as calculated, because an assumption of the reverberation and noise reduction formulas is that the absorption is rather evenly distributed among the surfaces of the space.

GUIDELINES FOR USE OF SOUND ABSORPTION

<table>
<thead>
<tr>
<th>ROOM TYPE</th>
<th>TREATMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classrooms, corridors and lobbies, patient rooms, laboratories, shops, fountains, libraries, private and open-plan offices, restaurants</td>
<td>Ceiling or equivalent area; add additional wall treatment if room is quite high</td>
</tr>
<tr>
<td>Auditoriums, churches, acoustically sensitive spaces</td>
<td>Special considerations and complex applications</td>
</tr>
</tbody>
</table>

ROOM ACOUSTICS FOR VARIOUS MATERIALS

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>125 Hz</th>
<th>250 Hz</th>
<th>500 Hz</th>
<th>1,000 Hz</th>
<th>2,000 Hz</th>
<th>4,000 Hz</th>
<th>NRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marble</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>Gypsum board, 1/2&quot; (13 mm)</td>
<td>0.29</td>
<td>0.15</td>
<td>0.04</td>
<td>0.04</td>
<td>0.09</td>
<td>0.09</td>
<td>0.05</td>
</tr>
<tr>
<td>Wood, 1&quot; (25 mm) thick, with air space behind</td>
<td>0.19</td>
<td>0.14</td>
<td>0.09</td>
<td>0.06</td>
<td>0.06</td>
<td>0.05</td>
<td>0.10</td>
</tr>
<tr>
<td>Heavy carpet or acoustic</td>
<td>0.02</td>
<td>0.06</td>
<td>0.14</td>
<td>0.17</td>
<td>0.14</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>Acoustical tile, surface mounted</td>
<td>0.34</td>
<td>0.28</td>
<td>0.45</td>
<td>0.66</td>
<td>0.74</td>
<td>0.77</td>
<td>0.55</td>
</tr>
<tr>
<td>Acoustical tile, suspended</td>
<td>0.43</td>
<td>0.38</td>
<td>0.53</td>
<td>0.77</td>
<td>0.87</td>
<td>0.77</td>
<td>0.65</td>
</tr>
<tr>
<td>Acoustical tile, painted (out.)</td>
<td>0.35</td>
<td>0.35</td>
<td>0.45</td>
<td>0.50</td>
<td>0.50</td>
<td>0.45</td>
<td>0.45</td>
</tr>
<tr>
<td>Audience area: empty, hard seats</td>
<td>0.15</td>
<td>0.19</td>
<td>0.22</td>
<td>0.29</td>
<td>0.34</td>
<td>0.30</td>
<td>0.30</td>
</tr>
<tr>
<td>Audience area: occupied, upholstered seats</td>
<td>0.39</td>
<td>0.57</td>
<td>0.80</td>
<td>0.94</td>
<td>0.92</td>
<td>0.87</td>
<td>0.80</td>
</tr>
<tr>
<td>Glass fiber, 1&quot; (25 mm)</td>
<td>0.04</td>
<td>0.21</td>
<td>0.73</td>
<td>0.99</td>
<td>0.99</td>
<td>0.90</td>
<td>0.75</td>
</tr>
<tr>
<td>Glass fiber, 4&quot; (100 mm)</td>
<td>0.77</td>
<td>0.99</td>
<td>0.99</td>
<td>0.99</td>
<td>0.99</td>
<td>0.95</td>
<td>1.00</td>
</tr>
<tr>
<td>Thin fabric, stretched tight to wall</td>
<td>0.03</td>
<td>0.04</td>
<td>0.11</td>
<td>0.17</td>
<td>0.24</td>
<td>0.35</td>
<td>0.15</td>
</tr>
<tr>
<td>Thick fabric, bunched 4&quot; (100 mm) thick wall</td>
<td>0.14</td>
<td>0.35</td>
<td>0.55</td>
<td>0.72</td>
<td>0.70</td>
<td>0.65</td>
<td>0.60</td>
</tr>
</tbody>
</table>
SOUND TRANSMISSION

The property of a material or construction system that blocks the transfer of sound energy from one side to another is sound transmission loss (TL), which is measured in decibels. Specifically, TL is the attenuation of airborne sound transmission through a construction during laboratory testing.

Transmission loss values range from 0 to 70 or higher. A high TL value indicates a better capability to block sound; that is, more sound energy is lost (transformed into heat energy) as the sound wave travels through the material.

Sound transmission class (STC) is a single-number rating system designed to combine TL values from many frequencies. STC values for site-built construction range from 10 (practically no isolation; e.g., an open doorway) to 65 or 70 (such high performance is only achieved with special construction techniques). Average construction might provide noise reduction in the range of STC 30 to 60.

It is very difficult to measure the STC performance of a single wall or door in the field because of the number of flanking paths and nonstandard conditions. Field performance is measured with Advanced Sound Transmission Class (ASTC) ratings, which cover effects from all sound transfer paths between rooms.

TRANSMISSION LOSS

Design of construction and materials for high transmission loss builds on three principles: mass, separation, and absorption.

Mass: Lightweight materials do not block sound. Sound transmission through walls, floors, and ceilings varies with the frequency of sound, the weight (or mass) and stiffness of the construction, and the cavity absorption.

Separation: Improved TL performance without an undue increase in mass can be achieved by separation of materials. A true double wall with separate unconnected elements performs better than the mass law predicts for a single wall of the same weight. Resilient attachment of surface skins to studs or structural surfaces provides a similar benefit, as do separate wythes.

Absorption: Use of soft, resilient, absorptive materials in the cavity between wythes, particularly for lightweight staggered or double-stud construction, increases transmission loss significantly.

If two layers of dense material are separated by an air space (rather than being continuous), they create two independent walls. The improvement in transmission loss depends on the size of the air space and the frequency of the sound.

NOISE REDUCTION

Noise reduction (NR) depends on the properties of a room and is the actual difference in sound pressure level between two spaces. It is the amount of sound blocked by all intervening sound paths between rooms, including the common wall but also the floor, ceiling, outside path, doors, and other flanking paths.

Noise reduction also depends on the relative size of a room. If the noise source is in a small room next to a large receiving room (e.g., an office next to a gymnasium), the noise reduction will be greater than the TL performance of the wall alone because the sound radiating from the common wall between office and gym will be dissipated in such a large space. On the other hand, if the noise source is in a large room next to a small one (as from a gym to an office next door), the noise reduction will be far less than the TL of the wall alone because the common wall, which radiates sound, is such a large part of the surface of the smaller room.

SOUND ISOLATION

One of the most common goals in the design of sound isolation construction is the achievement of acoustical privacy from a neighbor. This privacy is a function of whether the signal from the neighbor is audible and intelligible above the ordinary background noise level in the environment. Noise reduction is measured as a field performance, where it is evaluated and given an STC value. The privacy index is equal to noise reduction plus background noise that masks speech sounds.

Normal privacy, in which you are aware of a neighbor’s activity but not overly distracted by it, can usually be achieved with a privacy index of 68 or higher. Confidential privacy, in which you are unaware of the neighbor, usually requires a privacy index of 75 or higher.

The level of continuous background noise, such as that provided by the heating, ventilating, and air conditioning (HVAC) system or by electronic masking, has a significant impact on the quality of construction selected and must be coordinated with the other design parameters.

SOUND ISOLATION CRITERIA

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>SOURCE ROOM</th>
<th>ADJACENT AREA</th>
<th>BACKGROUND LEVEL IN SOURCE ROOM:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>QUIET</td>
</tr>
<tr>
<td>School buildings</td>
<td>Classrooms</td>
<td>Adjacent classrooms</td>
<td>STC 40</td>
</tr>
<tr>
<td></td>
<td>Dinner areas</td>
<td>STC 40</td>
<td>STC 38</td>
</tr>
<tr>
<td></td>
<td>Kitchen and dining areas</td>
<td>STC 50</td>
<td>STC 47</td>
</tr>
<tr>
<td></td>
<td>Shops</td>
<td>STC 50</td>
<td>STC 47</td>
</tr>
<tr>
<td></td>
<td>Recreation areas</td>
<td>STC 46</td>
<td>STC 42</td>
</tr>
<tr>
<td></td>
<td>Music rooms</td>
<td>STC 50</td>
<td>STC 50</td>
</tr>
<tr>
<td></td>
<td>Mechanical equipment rooms</td>
<td>STC 50</td>
<td>STC 49</td>
</tr>
<tr>
<td></td>
<td>Toilet areas</td>
<td>STC 46</td>
<td>STC 42</td>
</tr>
<tr>
<td></td>
<td>Musical practice rooms</td>
<td>Adjacent practice rooms</td>
<td>STC 50</td>
</tr>
<tr>
<td></td>
<td>Corridor and public areas</td>
<td>STC 46</td>
<td>STC 42</td>
</tr>
<tr>
<td>Executive areas, doctors’ suites, confidential privacy</td>
<td>Office</td>
<td>Adjacent offices</td>
<td>STC 50</td>
</tr>
<tr>
<td></td>
<td>General office areas</td>
<td>STC 46</td>
<td>STC 46</td>
</tr>
<tr>
<td></td>
<td>Corridor or lobby</td>
<td>STC 46</td>
<td>STC 42</td>
</tr>
<tr>
<td></td>
<td>Washrooms and toilet areas</td>
<td>STC 50</td>
<td>STC 47</td>
</tr>
<tr>
<td></td>
<td>Music rooms</td>
<td>STC 50</td>
<td>STC 42</td>
</tr>
<tr>
<td>Normal offices, normal privacy requirements, group meeting rooms</td>
<td>Office</td>
<td>Adjacent offices</td>
<td>STC 40</td>
</tr>
<tr>
<td></td>
<td>Corridor, lobby, exterior</td>
<td>STC 40</td>
<td>STC 38</td>
</tr>
<tr>
<td></td>
<td>Washrooms, kitchen, dining</td>
<td>STC 46</td>
<td>STC 46</td>
</tr>
<tr>
<td>Conference rooms</td>
<td>Other conference rooms</td>
<td>STC 46</td>
<td>STC 42</td>
</tr>
<tr>
<td></td>
<td>Adjacent offices</td>
<td>STC 46</td>
<td>STC 42</td>
</tr>
<tr>
<td></td>
<td>Corridor or lobby</td>
<td>STC 42</td>
<td>STC 40</td>
</tr>
<tr>
<td></td>
<td>Exterior</td>
<td>STC 46</td>
<td>STC 38</td>
</tr>
<tr>
<td></td>
<td>Kitchen and dining areas</td>
<td>STC 46</td>
<td>STC 42</td>
</tr>
<tr>
<td>Large offices, computer work areas, banking floors, etc.</td>
<td>Corridors, lobby, exterior</td>
<td>STC 46</td>
<td>STC 35</td>
</tr>
<tr>
<td></td>
<td>Data processing areas</td>
<td>STC 46</td>
<td>STC 36</td>
</tr>
<tr>
<td></td>
<td>Kitchen and dining areas</td>
<td>STC 46</td>
<td>STC 38</td>
</tr>
<tr>
<td></td>
<td>Bedrooms</td>
<td>Adjacent bedrooms</td>
<td>STC 50</td>
</tr>
<tr>
<td></td>
<td>Adjacent single bathrooms</td>
<td>STC 46</td>
<td>STC 45</td>
</tr>
<tr>
<td></td>
<td>Adjacent living rooms</td>
<td>STC 46</td>
<td>STC 42</td>
</tr>
<tr>
<td></td>
<td>Dining areas</td>
<td>STC 46</td>
<td>STC 42</td>
</tr>
<tr>
<td></td>
<td>Corridor, lobby, or public spaces</td>
<td>STC 46</td>
<td>STC 42</td>
</tr>
</tbody>
</table>

2.9 The ceiling is installed prior to installation of the partition. This detail can be used when improved acoustical qualities are desired and economy of installation is required. It is not as stable as a full-height partition with studs continuous to the structure above. STC rating of 40 to 44.

### ACOUSTICAL PARTITIONS

The reduction of airborne sound transmission, such as normal conversation and other office noise, is identified by STC ratings. The STC does not identify reductions of impact or vibration noise, which are classified by the IIC ratings.

#### RECOMMENDED STC VALUES

<table>
<thead>
<tr>
<th>REceiving Room</th>
<th>Source Room</th>
<th>STC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offices requiring privacy</td>
<td>Lobby or corridor</td>
<td>50</td>
</tr>
<tr>
<td>(doctors, executives)</td>
<td>General office</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Adjacent office</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Toilet room</td>
<td>55</td>
</tr>
<tr>
<td>Other office areas</td>
<td>Lobby or corridor</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Kitchen or dining room</td>
<td>45</td>
</tr>
<tr>
<td>Conference and training rooms</td>
<td>Other conference room</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Adjacent office</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>General office</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Toilet room</td>
<td>55</td>
</tr>
<tr>
<td>Hotel bedrooms</td>
<td>Adjacent bedroom, living room, or bathroom</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>Toilet room</td>
<td>55</td>
</tr>
<tr>
<td>Classrooms (K to 12)</td>
<td>Adjacent classroom</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Laboratory</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Lobby or corridor</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Kitchen or dining room</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Vocational shop</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>Music room</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>Toilet room</td>
<td>55</td>
</tr>
<tr>
<td>All areas</td>
<td>Mechanical room</td>
<td>60</td>
</tr>
</tbody>
</table>

### MODIFIED FULL-HEIGHT PARTITION

- Structure above
- Metal runner channel
- 5/8" (14) gypsum board
- Pack all voids tight with insulation
- Spacers, as required
- Sca ped ceiling
- Casing bead, floated
- Metal runner channel
- Continuous acoustical tape
- Metal studs @ 2" (50) O.C., wax, 5/8" (14) gypsum board each side
- 1-1/2" (38) sound insulation
- Wall base
- Metal runner channel
- Continuous acoustical sealant both sides

### FLOOR/CEILING CONSTRUCTION – CONCRETE

- Finish floor
- Carpet and pad
- Subfloor
- Wood frame
- Batt insulation
- Wood furring
- Two layers gypsum board

### FLOOR/CEILING CONSTRUCTION – WOOD

- Structural floor
- Resilient hanger
- Insulation
- Framing channel
- Two layers gypsum board

### NOTE

2.9 The ceiling is installed prior to installation of the partition. This detail can be used when improved acoustical qualities are desired and economy of installation is required. It is not as stable as a full-height partition with studs continuous to the structure above. STC rating of 40 to 44.