acoustical performance is easy with Sound Design™

sound

- office
- education
- healthcare

Armstrong
Meet Sound.

Sound has a strong personality.

It can impede concentration, healing, and learning, or add drama, vibrance, and energy. Sound protects every whisper and proclaims every announcement.

beautiful design + great acoustics = Sound Design™

When Sound is not considered in design, it can result in distracting and irritating noise.

Sound Design™ is pretty basic once you get to know it.

So, read on!
Featured Products  Formations™ Curves with Ceramaguard® Fissured™ Lay-in panels with Classic Axiom® trim on Prelude™ XL® 15/16” suspension system in White. Formations Squares with MetalWorks™ Vector® Microperforated panels with Classic Axiom trim in Gun Metal Grey on Prelude XL 15/16” suspension system in Gun Metal Grey. Formations Curves with 360º Grid and Classic Axiom trim in Custom RAL 1021 – Valley Center High School, Valley Center, KS
Sound can be useful, inspiring, and helpful. Products with high NRC, or noise reduction coefficient, absorb and minimize unwanted sound.

Sound can also be annoying or distracting. Concentration and comprehension can be difficult. The ability to understand the spoken word is called intelligibility.

Sound can behave erratically. It can bounce around and echo so that it’s not easily understood. That’s called reverberation.

Sound can be made to stay put when you need it to. You can block sound by selecting a product with high CAC, or ceiling attenuation class, a measure of sound blocking.

Sound, and lots of it, is sometimes desired to enliven music venues and night clubs. Sound reflection is when reflective acoustical surfaces add controlled vibrancy to spaces.

But you don’t need to become an acoustics expert — simply go to our recommended products chart on page 12 and find the right solutions for you!
vanilla

Select modest, classic, simple designs for tried and true acoustical solutions.

va-va-voom

Embrace creative, stimulating, eye-catching design for excellent acoustical solutions that make an impact.

Featured Products

1 MetalWorks™ RH200 Custom Ceiling System with Rd 1522 perforation with Custom 4'' trim in White – Foundation Campus, Seattle, WA
2 WoodWorks® Tegular Custom 1’ x 8’ panels in Bamboo Patina with W2 perforation on Prelude® XL™ 15/16” suspension system with 4” Classic Axiom® in Silver Satin; WoodWorks Walls Custom 4’ x 8’ panels in Bamboo Patina – Chandler City Hall, Chandler, AZ

NRC + CAC = Sound Design™
Sound Design™ in today’s workplace addresses both quiet concentration and energetic collaboration. Studies have shown that excessive noise at the office reduces worker effectiveness, raises stress, and lowers employee satisfaction.

An effective choice for open plan environments would have high NRC to decrease reverberant sound and high CAC to block sound from adjoining work stations.

It’s easy to achieve speech privacy and low reverberation time with simple acoustical science.

**Contributors of Noise**

**Open Plan Offices**
- Conversations, benching workstations, speaker phones

**Closed Plan Offices**
- Sound transfer from room to room

**Sound Design**

**Open Plan/Collaboration Areas**
- Requires high NRC and CAC products
- Spot acoustic treatments for noise separation

**Open Plan/Focus Spaces**
- Requires products with high NRC and CAC

**Closed Plan/Privacy Spaces**
- Requires high CAC and NRC products in closed plan areas
peaceful

Calm, sleek, simple design can lead to quiet, clever acoustics.

pow-wow!

Design that is vibrant, stimulating. Dynamic acoustics.

Featured Products

1. TechZone™ Ceiling System Optima® Square
   Regular 4’ x 4’ field panels and 4’ x 6” technical panels on Interlude® 9/16” suspension system – Interventure Capital Group LLC, New York, NY

2. Optima® Plank Custom Ceiling-to-Wall Faceted Transitions on Suprafine® 9/16” suspension system with Axiom®-Vector® and custom trim – Bayer Interventional, Coon Rapids, MN
Acoustical considerations for schools vary by space:

• Classrooms
• Library
• Cafeteria
• Auditorium
• Gym

Students typically hear only 3 out of every 4 words in poorly designed classrooms.

Speech clarity is dependent on architecture.

Background noise interferes with speech intelligibility.

Noise increases vocal fatigue and absenteeism among teachers.

Noise and reverberation combine to reduce speech intelligibility.

Contributors of noise:

• Neighboring classrooms
• Adjacent corridors
• Multipurpose spaces
• HVAC equipment
• Outdoor noise

Sound Design:

• High performing learning environments
• High speech intelligibility

Independent Research Confirms:

• Speech clarity is dependent on architecture.
• Background noise interferes with speech intelligibility.
• Noise increases vocal fatigue and absenteeism among teachers.
• Noise and reverberation combine to reduce speech intelligibility.

Beautiful Design + Great Acoustics = Sound Design™ | armstrong.com/acoustics
making the grade

Economical, do-it-all design can enable crisp acoustics.

ace it

Inspirational design can generate interactive, engaging acoustics.

Featured Products
1 School Zone™ Fine Fissured™ Lay-in, Items 1713 & 1714 – University High School, Morgantown, WV
2 SoundScapes® Shapes in Cranberry, Tangerine, Plum, and Pale Lemon – DJ Montague Elementary School, Williamsburg, VA

NRC + CAC = Sound Design™
Sound in today’s healthcare facilities requires high levels of attention to design to ensure speech privacy (HIPAA) and optimum patient recuperation. When sound becomes excessive in corridors, busy nurses’ stations, and chaotic treatment rooms, it negatively affects patient stress and can create discomfort. It can also affect communication between doctors and nurses.

Studies indicate that on average, hospital noise levels exceed those set by the World Health Organization.

Worldwide, the sound levels inside hospitals average 72 decibels during the day and 60 decibels at night – far exceeding the standard of 40 decibels or less, set by the World Health Organization.*

**Contributors of Noise**

- Hard surfaces
- Walls not built to deck
- Alarms, generators, HVAC equipment
- 24/7 environment

**Sound Design™**

- Requires high CAC and NRC in closed plan areas
- Requires high NRC and CAC in open plan areas

*Source: Hospitals Drowning in Noise, Chicago Tribune
Revitalizing, pick-me-up design can create rejuvenating acoustics.

**Featured Products**

1. Ultima® Create!™ custom image
2. Optima® Radial Custom Ceiling on Suprafine® XL® 9/16” suspension system – West Kendall Baptist Hospital, Miami, FL
<table>
<thead>
<tr>
<th>Setting</th>
<th>Situation</th>
<th>Acoustical Suggestion</th>
<th>Recommended Ceiling Systems</th>
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<tbody>
<tr>
<td><strong>Workplace</strong></td>
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<tr>
<td>Open office</td>
<td>Employees have difficulty focusing on tasks due to noisy office space.</td>
<td>Worker effectiveness can be increased with balanced acoustical design using a combination of high NRC and high CAC products in open plan areas to absorb sound and block noise from adjacent spaces.</td>
<td>TechZone™ Ceiling Systems, Optima®, Lyra™, SoundScapes® products, Soundsoak® Walls</td>
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<tr>
<td></td>
<td>Contributors of distractions include conversations of co-workers in</td>
<td></td>
<td>Ultima® High-NRC, Cirrus® High-NRC, Fine Fissured™ High-NRC, Capz™, Calla™</td>
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<td></td>
<td>collaboration areas, benching workstations, and use of speaker phones.</td>
<td></td>
<td>Ultima, Cirrus, Mesa™, Formations™ Clouds</td>
</tr>
<tr>
<td>Closed office</td>
<td>Concentrating on technical work is difficult when sound can be heard through ceilings, doorways, windows, and HVAC ducts transferring sound from room to room. Employees ranked acoustics the lowest of key attributes in the workplace.</td>
<td>Balanced acoustical design requires high CAC products in closed plan areas to provide privacy from adjoining offices and corridors and NRC to decrease unwanted sound and control reverberation.</td>
<td>Ultima High-CAC, Cirrus High-CAC, WoodWorks®, Soundsoak® Walls</td>
</tr>
<tr>
<td>and Conference</td>
<td></td>
<td></td>
<td>Ultima, Cirrus, Mesa High-CAC</td>
</tr>
<tr>
<td>room</td>
<td></td>
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<td>Dune™, Calla</td>
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<tr>
<td><strong>Education</strong></td>
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<tr>
<td>Classroom</td>
<td>Excessive reverberation inhibits student understanding and increases teacher vocal strain. Studies indicate that students typically hear only 3 out of every 4 words, missing 25% of what is said in the classroom.</td>
<td>Better sound absorption and shorter reverberation time promote higher speech intelligibility.</td>
<td>Ultima, Optima, Calla, Lyra, TechZone Ceiling Systems, Soundsoak® Walls</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>School Zone™ Fine Fissured, Cirrus High-NRC</td>
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<td>Mesa, School Zone, Fine Fissured, Georgian™, Cirrus</td>
</tr>
<tr>
<td>Cafeterium</td>
<td>Open multi-purpose spaces change from cafeterias to auditoriums to gymnasiums requiring different acoustical needs depending on use.</td>
<td>Sound absorption is key and can be accomplished with high NRC products in select areas.</td>
<td>Capz™, MetalWorks™, SoundScapes products</td>
</tr>
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<td></td>
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<td>Calla, Ultima, Formations Clouds</td>
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<td></td>
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<td>School Zone Fine Fissured, Georgian, Mesa</td>
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<td><strong>Healthcare</strong></td>
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<tr>
<td>Patient room</td>
<td>The need to share private medical information between patients, doctors, and other medical staff without worrying about being overheard by others is key in a healthcare environment.</td>
<td>A ceiling with the ability to block noise from intruding into other spaces can help provide a private, secure environment for sharing confidential information and holding discreet conferences.</td>
<td>Ultima High-CAC, Ultima High-NRC, Ultima Health Zone™</td>
</tr>
<tr>
<td>and Treatment</td>
<td></td>
<td></td>
<td>Mesa High-CAC, Fine Fissured High-NRC, Ultima, Ultima Create!™</td>
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<tr>
<td>room</td>
<td></td>
<td></td>
<td>Cirrus, Mesa</td>
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<tr>
<td>Lobby and</td>
<td>Noise caused by hard surfaces, active corridors, busy nurses' stations, alarms, non-private treatment areas, and a 24/7 work environment all help to create sound levels that exceed those recommended by the World Health Organization.</td>
<td>Spot absorption in larger open spaces, and cleanable, scrubbable ceilings that offer noise reduction in spaces with wall to wall ceilings address excessive noise and reverberation.</td>
<td>MetalWorks, TechZone™ Ceiling Systems, Optima Health Zone</td>
</tr>
<tr>
<td>nurses' station</td>
<td></td>
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<td>Optima, Woodworks, Optima Create!, Lyra, Calla</td>
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<td></td>
<td></td>
<td></td>
<td>Ultima, Ultima Health Zone</td>
</tr>
</tbody>
</table>
Reverberation
The persistence of sound in an enclosed space after the source of the sound has stopped. The level of the reverberant sound within a room is dependent on both the volume of the room and the amount of sound absorption installed within the room, such that small hard surfaced rooms are “louder” than large well-treated rooms.

Noise Reduction Coefficient (NRC)
A measure for rating the overall sound absorption of a material when used in an enclosed architectural space where sound is reflected at many angles of incidence.

Articulation Class (AC)
A measure for rating the attenuation of reflected speech passing over the top of wall partitions or furniture into the adjoining work stations.

Sabin
A measure of sound absorption provided by a material when installed within an architectural space. The number of sabin per unit is approximately equal to the total surface area of the unit (in square feet) that is exposed to sound, multiplied by the absorption coefficient of the material.

Ceiling Attenuation Class (CAC)
A measure for rating the performance of a ceiling system as a barrier to airborne sound transmission through a common plenum between adjacent closed spaces, such as offices.

Sound Reflection
Intentional use of non-absorptive surfaces that enhance a lively acoustical sound quality, typically for nightclubs or music venues.

Sound Transmission Class (STC)
A measure for rating the performance of a wall system as a barrier to airborne sound transmission between adjacent closed spaces, such as offices.

Ubiquity
The number of sabin per unit is preferred to characterize the absorption provided by an individual “space absorber,” such as a baffle, blade, cloud, or canopy in:

- Open offices or retail spaces
- Open plenum areas
- Corridors/lobbies

Absorption of sabin is measured according to ASTM C423

Ceiling system with an STC < 35 is considered low performance, whereas one with an STC > 55 is high performance. STC is the wall equivalent of CAC.

STC is important between closed spaces and in many open plan spaces:

- Closed offices, corridors
- Open offices with dividers

STC is measured according to ASTM E90

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take the next step toward Sound Design™

1 877 ARMSTRONG (276-7876)

Name of your Armstrong Representative

TechLine – Technical information, detail drawings, CAD design assistance, installation information, other technical services – 8 a.m. to 5:30 p.m. EST, Monday through Friday. FAX 1-800-572-8324 or email: techline@armstrong.com

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