

# Multipurpose Spaces

## National Clearinghouse for Educational Facilities

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The concept of multipurpose spaces in schools is certainly not new. Especially in elementary schools, the combination of cafeteria and auditorium (and sometimes indoor physical activity space as well) is a well-established approach to maximizing the use of school space and a school district's budget. Nonetheless, there continue to be refinements in technology and design configurations that improve the performance of these facilities. From acoustics and lighting to adaptable seating and efficient use of stage, storage, and food preparation spaces, the design and use of these seemingly simple assembly spaces is actually quite complex.

Education institutions have trouble justifying huge spaces that have only one function and sit empty most of the day. The answer is creating multipurpose spaces that can accommodate a number of functions. (Turnipseed, 2006)

### *The Evolution of a Concept*

Multipurpose spaces have been part of U.S. schools for more than 150 years, as evidenced in *School Architecture*, a book by Henry Barnard published in 1849 that advocated grouping four classrooms around a central hall meant for group activities. By the turn of the century, it was common for New York City elementary schools to include an assembly room that could be subdivided with track-mounted wood partitions. These early attempts at flexibility in configuration and use didn't work well, though. Instead of several different areas, each designed to perform a specific function well, schools had one enclosure that handled multiple uses poorly. As individual classrooms, the spaces were noisy because wooden partitions weren't sound-proof. And as assembly space, the flat floor kept children in the back from seeing or hearing well what was going on at the front. (Morisseau, 1966)

With subsequent development of sound-proofed moveable partitions, stage arrangements, and seating,

from the 1950s to the present day multipurpose spaces have become a popular solution to accommodate large numbers of students economically. The Wake County (N.C.) Board of Education concluded from a study it funded in 2007 that by overlapping partitioned cafeteria and auditorium spaces within its new middle-schools, it would save \$300,000 in building costs and have a net savings of 2,000 square feet per school. Maximizing the use of these facilities also extends beyond school hours for many schools that opt to rent meeting space to qualified outside groups.

### *Key Issues for Multipurpose Spaces*

The wide variety of activities multipurpose space may need to accommodate include dining, plays, films, assemblies, community events, physical education, and large-group instruction. Each activity has its own specific requirements for balancing acoustics, lighting, air conditioning, support and storage space, and moveable or adjustable amenities such as seating, food presentation equipment, and self-serve refreshment areas. In addition, areas adjacent to these spaces deserve consideration as well. Noise transmission to classroom or study areas must be controlled. If spaces are open to the public after school hours, they need to be accessible from the outside while access to the rest of the school is controlled. Following is further discussion on balancing sometimes-conflicting factors for optimal performance across multiple use needs.

**Location.** The multipurpose space should be located next to other public spaces and be acoustically separated from instructional areas. For new multi-story schools, it is important to avoid placing multi-purpose areas above classrooms or other spaces where background noise can be a distraction. For school and community events held during after-school hours, security dictates that the multipurpose spaces be closed off from the rest of the school while still providing direct access to restroom facilities.

**Integrating technology.** The multipurpose space should be able to handle several forms of technology, just like any large lecture hall or classroom. Video, data, and electrical outlets should be spaced along the

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perimeter of the space, as well as at the edge of the stage. A sound system, video projection system, and cable and satellite capability also should be available. Also, operationally, users will need to know how to use the equipment properly.

**Food services.** When used as a cafeteria, a multipurpose space's wall and floor surfaces, furniture, and equipment should be easy to keep clean, which can conflict with other uses. For instance, carpeting for sound dampening in an auditorium application will not be appropriate for cafeteria use. Consideration should also be given to the traffic flow if there will be several food service lines, vending machines, and places for returning trays and silverware.

**Acoustics.** As just indicated, acoustic treatment can be one of the most difficult balancing acts for multipurpose spaces. Depending on the mix of uses, the space may need to accommodate voice, film, and dramatic productions and be capable of handling microphones and the public address system. Walls and ceilings should incorporate proper acoustical treatment. Room configuration is also important, such as a multi-tiered ceiling that can enhance acoustics.

To address sound criteria in schools, the American National Standards Institute (ANSI) published Standard 12.60, *Acoustical Performance Criteria, Design Requirements and Guidelines for Schools* in 2002, which it re-issued with the Acoustical Society of America in 2010. Acoustical issues for schools include background noise from outside and inside sources; reverberation time (i.e., echo) of sound within a room; noise criteria (loudness of background noise, such as air-handling equipment, over a range of frequencies, especially as it affects speech intelligibility); sound transmission through wall and ceiling materials, connections, and penetrations; and impact insulation, such as the tromping of feet, through the floor to the room below.

Cafeteria and gymnasium use are often sources of background noise, which is why it is good to isolate them from quieter areas. Auditoriums and performance spaces, on the other hand, are more the victim of background noise and require additional attention to distracting indoor and outdoor noise sources.

**More on reverberation.** Although some reverberation within a space can help distribute speech, longer reverberation times will degrade speech intelligibility. Variables that affect the reverberation time include the volume of the space and the amount of sound

absorption within the room. If reverberation time is considered in the design phase, the acoustical treatments can be a part of the design rather than an unplanned and likely ill-fitting addition later. (Acoustics.com, 2010)

In the design of a combined cafeteria and auditorium, the cafeteria function typically dominates the planning and layout of the room (e.g., flat versus inclined floors and movable versus fixed seating). Luckily, even though acoustic requirements for a cafeteria are significantly less critical than those for an auditorium function, the amount of sound absorption required for an auditorium is typically also adequate to keep general chatter down during cafeteria use. So, for acoustics, a space should be designed primarily for speech and musical presentations.

During performances, sound must be projected from the stage throughout the space while sound reflected back to the stage needs to be controlled. (Sound slapping back from a flat, acoustically reflective back wall, for instance, can severely affect performers' concentration.) There needs to be freedom from echoes and flutter, and the reverberation time needs to be an appropriate compromise between speech intelligibility (amplified and unamplified) and full, blended instrumental and choral music.

All of this can be optimally achieved by having a sound reflective/diffusive lower ceiling area (or suspended acoustic clouds) in front of and over the stage, highly sound-absorptive material for the rear and sides of the ceiling, reflective/diffusive lower walls and upper walls treated with materials that absorb sound in mid-to-low frequencies and diffuse sound in high frequencies. This allows mid- and low-frequency reverberation time to be controlled without sacrificing the high frequencies that are crucial for speech intelligibility and music clarity. The lower wall areas are often almost entirely occupied with doors, windows, and vending machines, and, therefore, are not typically considered for acoustic treatment. For walls, acoustic treatment is best placed above 10 feet, which also keeps treated areas above the reach of most students. (RPG Diffuser Systems, 2010)

**Lighting.** More than one lighting system may be required in the multipurpose space. In addition to serving meetings and dining events, the lighting system may be required to handle performances and multimedia presentations. Performance lighting might require spotlights, light controls, and a dimmer system. Plus, windows and skylights should have shades so that the

space can be darkened adequately. On the other side of the equation would be large-scale teaching spaces in which work-surface lighting would need to be adequate for taking notes and reading.

**Seating.** Requirements for seating in a cafeteria is drastically different from both performance and lecture-hall uses. Once again, flexibility is provided through innovative equipment selection and configuration. Seating for sports events and dramatic presentations can be handled with built-in bleachers that pull out from alcoves along the walls. Moveable tables and chairs can accommodate cafeteria and large-scale teaching/testing use in that same space, preferably with a podium from which the teacher or rector can be readily seen. And for fixed, tiered seating schemes, fold-up desktops for each seat will provide both a ready work surface and easy ingress and egress from each row of seats. If the multipurpose space will be used as both a theater and a cafeteria, allow 10-14 square feet per person for dining and 7.5 square feet per person for performance seating. Plan also for adequate chair and table storage.

**Ventilation.** For all uses, clean air and circulation of outside air are vital elements of a healthful indoor environment. For cafeteria use, fresh air controls the buildup of any unpleasant odors. For gymnasium use, humidity and temperature control are both important considerations. And, again, for auditorium use, noise from air handling equipment for such a large space can easily become obtrusive.

**Outdoor space.** An adjacent outdoor area for dining as well as large-group gatherings can expand the capacity of multipurpose spaces. Lights and an overhead covering for these outdoor spaces will extend their usability in rainy weather and at night.

**Use of a stage.** The stage should be as similar as possible to one in a traditional auditorium and allow easy movement of materials and large equipment. It should have access to a loading dock and any related spaces such as a gymnasium or outdoor area. It also should have storage and a fly space, where curtains and scenery can be hung and stored. Raised stages must be accessible, via a ramp or other means, in accordance with federal accessibility requirements. Despite the tendency for schools to use permanent stages for storage, the multipurpose aspects often make sightlines a problem. (Turnipseed, 2006)

## *Design Principles for Multipurpose Spaces*

All too often, the multipurpose space can have the feel of a vast and sterile room. Designers should therefore consider:

- **The multipurpose space as school symbol.** Schools lacking a dedicated auditorium must rely on the multipurpose space for holding large group functions. Parents, community members, and local officials may often see the multipurpose space before, or instead of, the rest of the school. The aesthetic and symbolic nature of the space should therefore convey the spirit and emphasis of the school (Duke, 1998). The space may be thought of as a Great Room, in the sense of a gathering place (Brubaker, 1998), with distinctive architectural features, colorful designs, and comfortable furniture.
- **Creative adjacencies.** In many situations, spaces designed specifically for one use can be rearranged with moveable partitions to accommodate an additional use while provide adequate sight lines between audience and presenters or performers. In its simplest form, this might entail a cafeteria with some seats situated up on a raised floor. A simple curtain will convert the space into an auditorium with a stage. Or an entire cafeteria floor can be raised above an adjacent gymnasium containing retractable seating, with the two spaces separated by moveable partitions. Opening the partition and pulling out the auditorium seats turns the cafeteria into a stage with abundant extra space for curtain-enclosed backstage areas and additional in the round audience seating. This can also be done with raised-floor music classrooms adjacent to gymnasium/cafeteria spaces where the retraction of movable soundproof partitions creates a combined space for musical performers and an audience. These planning of adjacencies (including mezzanines that become balconies) are also valuable strategies for further maximizing space use in school facilities that accommodate separate populations—such as both middle and high school students—who already share various support spaces. (Turnipseed, 2006)

## Conclusion

The multipurpose space should be able to handle a wide range of functions. As noted, it should be designed with several lighting systems, have acoustically treated walls and ceilings, and be technologically integrated and easily maintained. A good multipurpose space should be able to satisfy the needs of its assigned functions—whether they be multimedia presentations, stage and musical productions, physical education, or dining services—at reasonably high levels of performance.

## Additional Information

Acoustics.com, a design professional's resource.  
<http://www.acoustics.com/default.asp>

See the NCEF resource list *Multipurpose Spaces*, online at [http://www.ncef.org/rl/multipurpose\\_spaces.cfm](http://www.ncef.org/rl/multipurpose_spaces.cfm)

## References

ANSI/ASA S12.60-2010/Part 1 American National Standard Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, Part 1: Permanent Schools, Commentary-1.1.1, p. 30.  
<http://asastore.aip.org/shop.do?plD=594>

Brubaker, C.W. 1998. *Planning and Designing Schools*. New York: McGraw-Hill.

Duke, Daniel L. 1998. *Does It Matter Where Our Children Learn?* Charlottesville, Va.: Thomas Jefferson Center for Educational Design.

Morisseau, James J. 1961. *Divisible Auditoriums*. Educational Facility Laboratories: New York City, p. 4.  
[http://archone.tamu.edu/CRS/engine/archive\\_files/EFL/6000.0805.pdf](http://archone.tamu.edu/CRS/engine/archive_files/EFL/6000.0805.pdf)

Raywid, Mary Ann. 1998. "Small Schools: A Reform That Works." *Educational Leadership* (January), pp. 34-39.

RPG Diffuser Systems Inc., Upper Marlboro, Md.  
[http://www.rpginc.com/commercial/design\\_assistance/pdfs/Auditeria-Cafetorium.pdf](http://www.rpginc.com/commercial/design_assistance/pdfs/Auditeria-Cafetorium.pdf)

Southwest Educational Development Laboratory (SEDL). 1998. "Constructing Knowledge by Design."  
<http://www.sedl.org/pubs/sedletter/v10n04/>

Turnipseed, Steven P. 2006. Quick Change. *American School and University*; v79 n3 , pp. 324-325

Wadsworth, Raymond H. 1975. "Divisible Auditoriums." *American School & University* (October), pp. 60-68.  
Wake County Board of Education report, 2006.  
[http://www.wcps.net/news/2007\\_oct9\\_auditorium/](http://www.wcps.net/news/2007_oct9_auditorium/)

Building Blueprints: Multipurpose/Common Areas, Mesa, Tony, School Planning and Management; v47 n7 , p38,39 ; Jul 2008  
Building Blueprints: Cafeterias That Perform., Tyler, Charles; Cradler, Allen, School Planning and Management; v46 n3 , p52,53 ; Mar 2007

## Publication Notes

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