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Madison Parks Division
Administrative Office
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P.O. Box 2987
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Attn: Mr. Thomas J. Maglio
Landscape Architect

Subject: John Wall Family Pavilion in Tenney Park

Dear Mr. Maglio:

We visited the John Wall Family Pavilion in Tenney Park on Wednesday, March 25, 2015 to examine reported complaints of excessive reverberant crowd noise and poor speech intelligibility. Here is a summary of our observations, measurements, and recommendations.

Observations

The pavilion is a one-story slab-on-grade building. The floor area of the main hall is approximately 2,000 square feet. The volume is approximately 33,000 cubic feet. The floor is sealed concrete and the ceiling is drywall. The walls are painted concrete block with expansive windows.

At the time of our site visit, the room was completely empty and bare. Skating season had ended, so the floor mats were gone. Seasonal furnishings were not present.

Measurements

We conducted reverberation time measurements in the main hall using an Ivie IE-45 audio analysis computer and a JBL Eon powered loudspeaker. The important result is the mid-frequency reverberation time of 3.2 seconds. The mid-frequencies contain the sound energy in the speech range that is significant to reverberant crowd noise and speech intelligibility.

Discussion

The following discussion is intended to be mercifully succinct, and not a dissertation. Therefore, we will simplify some of the analysis, because it is permissible in this particular situation.

Reverberation time is the length of time, expressed in seconds, that sound lingers in the room after the noise source is shut off. The more reverberant the room, the longer the reverb time. Hence, the noisier the room, with the direct sound combining with the reverberant sound energy.

The mid-frequency reverberation time measured in the empty main hall was 3.2 seconds. In this relatively small space, a reverb time of 1 second would be much more appropriate. That is our nominal design goal.

Reverberation time can be shortened, and reverberation reduced, by the addition of sound absorptive materials. The absorptive characteristics of a material can be quantified by its absorption coefficient. If a material absorbed 100% of the sound incident upon it, the absorption coefficient would be 1.0. If a material reflected, instead of absorbed, all of the incident sound energy, the absorption coefficient would be 0. The coefficient would be 0.50 if the material was 50% absorptive. Sound absorption is usually dependent on frequency, but we are going to gloss over that issue by invoking the NRC (noise reduction coefficient), which is germane to mid-frequency speech sounds.

A brief word is in order regarding units of sound absorption. One square foot of perfectly absorptive material (NRC = 1.00) would constitute one sabin of absorption. (Wallace Clement Sabine was a physicist acoustician, rest his soul.) One square foot of material with NRC = 0.50 would be one-half sabin. Two square feet of that material would equal one sabin.

In order to reduce the mid-frequency reverberation time in the Pavilion main hall from 3.2 seconds to approximately 1 second, approximately 1,000 sabins of sound absorptive material should be added. For maximum effect, this material should be distributed over the length and width of the hall, and not concentrated at one end or in one corner.

The sealed concrete floor is not treatable. The ceiling is the other large surface, and it is substantially treatable. Most of the wall area is not treatable, but some portion of the upper painted concrete block walls might be usable if ceiling treatment alone is not sufficient.

Let us turn our attention to ceiling treatment options.

Fabric Faced Fiberglass Acoustical Panels

The first option one always considers for retrofit ceiling (or wall) mounted sound absorption is fabric faced fiberglass acoustical panels, one inch thick. They are acoustically effective, with an NRC ≥ 0.80. They may be easily attached to a ceiling or wall using standard concealed hardware. The facing is attractive Guilford FR701 fabric. A variety of edge shapes is usually available; square, radius, bevel, or half bevel. Fabric panels are really just a commodity. In stock sizes, they can often be purchased at a unit cost of $5 per square foot.

Rectangular panels may be viewed at sites including www.conweddesignscape.com. (There are also many other manufacturers.)

Panels in a variety of shapes may be viewed at www.primacoustic.com. (There are additional manufacturers.)

BASWAphon

BASWAphon is the deluxe or high-end acoustical ceiling treatment. Visually, it is as smooth and clean as a very good painted plaster surface, and better than even a very good painted drywall surface. It consists of a mineral fiber substrate with a troweled scratch coat and finish coat of a special plaster-like material. In a 1-9/16" thickness, it provides NRC = 0.85 absorption.

BASWAphon is expensive. Fifteen dollars per square foot is not unusual. In a retrofit installation, details must be developed for edges, light fixtures, sprinkler heads, return air grilles, and so forth.

Water damage and impact damage to BASWAphon can be repaired, but the same degree of skill as original installation is required. Therefore, it is only typically used on ceilings.

BASWAphon may be viewed at www.baswaphon.com.

There is a knock-off version of BASWAphon called Fellert. However, we do not yet have any experience with it, so we are not able to recommend it.

Sprays & Tectum

Acoustical sprayed plaster is probably not realistic in this situation. The required preparation, masking, and detailing effort would be monumental, so the cost would probably exceed BASWAphon. Even in a full three-quarter-inch finish thickness, spray is not as absorptive as BASWAphon, and even the smoothest sprays still have a visible texture, like oatmeal.

The venerable Tectum is cementitious wood fiber, like a biscuit of shredded wheat. Rugged panels suitable for use in gymnasiums are available. Recently, Tectum introduced some very clever wall and ceiling appliques in a variety of shapes. In all candor, they are "pretty cool." The problem is, the NRC value is only 0.40, so a huge area of panels would be necessary. We doubt they would be appropriate in the Pavilion.

Wall Treatment

We see the treatable portions of the painted block walls, up above reach height and out of harm's way, as just a fallback position, in case sufficient ceiling area cannot be treated.

Recommendations

We recommend that an area of not less than 1,100 square feet of ceiling be treated with BASWAphon, 1-9/16" thick (40 mm thick). This is probably a $20,000 solution, but it would be highly effective and have no visual effect on the existing space.

If BASWAphon is not feasible, we recommend that an aesthetically acceptable scheme be developed to add at least 1,250 square feet of fabric faced fiberglass acoustical panels, one inch thick, to the ceiling and perhaps the upper walls. This solution could probably be accomplished for $13,000, but will have an aesthetic impact on the Pavilion. (For better, or for worse.)

We hope these remarks prove useful. Please do not hesitate to contact us if questions arise or additional information is required.

Sincerely,

James F. Yerges