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Session 3pAAb: Balancing Risk and Innovation in Acoustical Consulting

3pAAb1. Risk & innovation -- following on from the 2012 Knudsen Lecture, recent experience with calculated risk for the purpose of creating remarkable spaces is reviewed
Scott Pfeiffer*

*Corresponding author's address: Threshold Acoustics LLC, 53 West Jackson Boulevard, Chicago, Illinois 60604, spfeiffer@thresholdacoustics.com

Owner expectations, architectural vision, and creation of the intended aural environment often come together at a critical point in the design process. Frequently the answer that satisfies all of the requirements stretches the comfort level of all parties. When balanced properly, this element of risk frees the entire project team and reaches unexpected, but welcome, outcomes. The author will illustrate these critical decision points in several project examples, outlining the calculation in the calculated risk, and the opportunity to deepen the confidence in the consulting process through further research.

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RISK & INNOVATION – STAGE RESPONSE

A project does not have to be large or even terribly ambitious to raise questions of “Risk & Innovation”. A renovation at the University of Chicago’s Mandel Hall was instigated by the need to add fire protection, and acoustic improvements were included mostly as a way of addressing the architectural impediment created by the reflectors inserted during an earlier renovation.

It was clear why the reflectors had been included. Mandel Hall serves many users, and the renovation sought to provide a large stage for symphonic performance by placing the orchestra fully forward of the proscenium on stage lifts. The lifts then serve the proscenium uses of the stage as audience seating and orchestra pit. The orchestra is therefore under the high ceiling, and in a part of the room where the pro-proscenium side walls flare sharply to connect the narrow proscenium to the full width of the house.

None of these surfaces provides support to the ensemble on stage, making a reflector array a natural choice to obscure the path to the high ceiling, and provide early reflections to the musicians on stage. The reflector array performed these functions, but did so in an architectural vocabulary that announced itself as anachronistic, and fell short of addressing other acoustical problems in the room.

The reflector array was deployed at 26’ above the stage, hung flat. They did not serve the audience beyond the first few rows, and they limited the stage sound that energized the room modes in the upper volume of the room, resulting in a low reverberation time, and a weak and uneven presence of sections on stage.

**FIGURE 1.** The coverage of the original reflector array from a prior renovation.

The Risk

Based on experiences with the London Symphony Orchestra’s rehearsal facility at Old St. Luke’s Church in London, and other similar spaces where orchestras play happily under a high ceiling, we determined that we could eliminate the reflector array if we could sufficiently close the proscenium with an operable upstage wall, and reshape the stage side walls to provide greater infill for the musicians onstage so that the high ceiling reflection would follow other supportive reflections for a balanced stage response.
FIGURE 2. Overlay of Old St. Luke’s and the Mandel Hall stage

The elimination of the reflectors would have allowed the upper volume to be more effectively energized, allows the ceiling to serve the audience, and provides side wall infill for audience where the ceiling is too high to do so.

FIGURE 3. New sidewalls and upstage shell walls without a reflector array.

The risk comes in creating a stage environment that is much more open, for an advanced ensemble of non-majors and community musicians that have played comfortably under the low ceiling for years. The reflector array is
clearly the safe choice, though one that must respond architecturally and must allow for better support of the ensemble to the audience.

Ultimately, the tight schedule for the construction window, and the storage required for the upstage wall in a land-locked, already-too-small stage house did not allow for the elimination of a reflector array. We designed a new array that: 1) serves the stage and audience, 2) is deployed higher to allow greater access to the upper sidewalls for stage sound to energize the upper volume, 3) is better coordinated with theatre lighting requirements, 4) is better integrated with the historic architecture through color and form.

**FIGURE 4.** The coverage of the final reflector design is illustrated above for a downstage source.

**FIGURE 5.** The plan of 107 musicians on stage with a reflected ceiling plan of the reflector.
The Potential Innovation

These decisions were made in the best interest of the client and the project, and the University of Chicago has no use for reassurance regarding the potential for future elimination of the reflector array. We however, would benefit our future projects to understand more directly the balance of stage response required for good hearing conditions on stage. The issues of perception have been studied in many ways, though the five conditions described in this process would bracket future decisions about stage enclosure design for unamplified performance.

The conditions for comparison via modeling or measurements would be key on-stage and stage to house source-receiver pairs for: 1) the original Mandel Hall stage which we can be relatively assured were challenging to lead to the first renovation, 2) the early renovated Mandel Hall stage with the low, horizontal and more sparse reflector array, 3) the newly renovated higher reflector array, 4) the reflectorless stage solution, and finally, 5) the same set of source-receiver pairs for Old St. Luke’s (or other similar venue).

This type of targeted study of performer hearing conditions benefits from the range of available examples that exist in the built environment, and could be parsed into a substantially narrower and more controlled exploration of stage acoustics, building on available research in this area.

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