

# Crowell Concert Hall

WESLEYAN UNIVERSITY

RENOVATION COMPLETED 1997

Acoustics Consultant:

Project Architect:

Owner:

Canopy Design & Construction

Acoustic Diffusion Panels

Stage Enclosure Construction:

Sound & Communications:

Lighting Design:

Structural Engineer:

Construction Cost:

Brooks Acoustics Corporation - Vernon, CT

Allan Dehar Associates - New Haven, CT

Wesleyan University - Middletown, CT

Wenger Corporation - Owatonna, MN

RPG Diffusor Systems - Upper Marlboro, MD

Bergan Architecture Woodworking - Middletown, CT

North American Theatrix - Oxford, CT

System Design Associates - New Haven, CT

Michael Horton - Hamden, CT

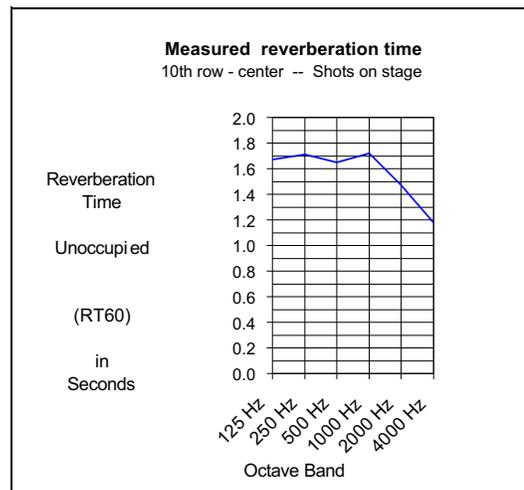
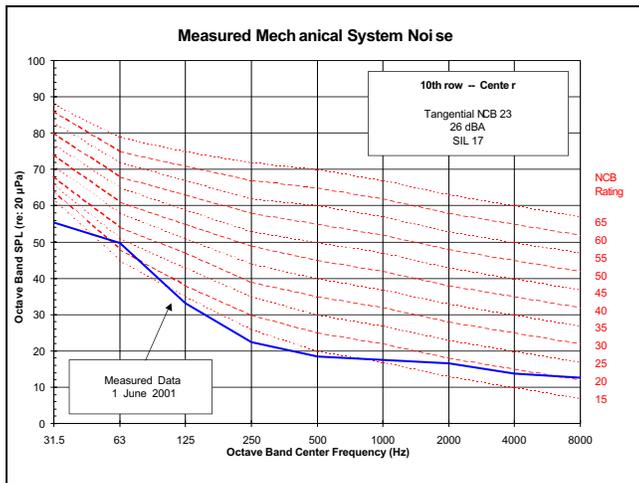
\$1.5 Million

**Crowell Concert Hall** is the main musical performance venue of the Center for the Arts at Wesleyan University, in Middletown, Connecticut, a school known for its excellent music program. The 414 seat hall, dating to the early 1970s, needed acoustical renovation to correct long standing problems with its sound. For 25 years Crowell was notorious among faculty for its poor acoustics. Several attempts to solve the problems had been made over time, but failed to produce satisfactory results. Specific **acoustical problems** in the hall included poor on-stage communication, as well as poor clarity, intimacy and envelopment in the house, numerous echo anomalies, and high background noise levels. A priority list was developed to address these problems, in close coordination with Wesleyan music faculty. Since Wesleyan is a teaching institution, and because performing on the stage was regarded as difficult, the problem assigned the highest priority was that of **stage communication**, or the ability of performers to hear one another. Next in priority were the hall acoustics and the background noise level.

The **conceptual design solutions** proposed to address these problems included a stage shell and enclosure, reflective and absorptive surfaces in the house, and noise reduction measures for a variety of noise sources in the hall. In addition to the typical constraints of a tight schedule and budget, the implementation of a solution was complicated by the minimal disturbance to the building and its structure, hardware to be fixed in space, new lighting to be integrated into the design, and sensitivity to the original architectural concept be maintained. The noise problem was addressed using standard acoustical engineering techniques to identify and eliminate successive noise sources, primarily in the building's mechanical services. For the problems of poor stage and house acoustics at Crowell, the application of new and **innovative techniques** were employed, including computer modeling of the space with **ray tracing** calculation of acoustic parameters and the **auralization** of the design space.

The original hall was modeled using the CATT-Acoustics computer aided design system. Excellent agreement was found between objective acoustical measurements and model predictions. Also, the subjective quality of the auralized model was judged to be an accurate representation of the hall by music faculty. Renovation design goals for the stage were: improve early reflection density, reduce/eliminate disturbing late reflections from the ceiling, back wall, eliminate on-stage flutter, retain more energy on-stage to improve dispersion/diffusion. Design goals for the house were: improve projection from stage, improve early reflection density, improve lateral reflection energy, eliminate flutter and other echo anomalies, enhance sense of intimacy/envelopment, and with side and rear reflections. The new hall design included a stage enclosure and canopy, as well as house canopies over the audience seating area. Stage shells and audience canopies have been used before in music halls. However, this may be the first instance where the stage and hall canopy designs were integrated for the purpose of eliminating acoustic reflections which interfere with on-stage communication, while also improving house acoustics.

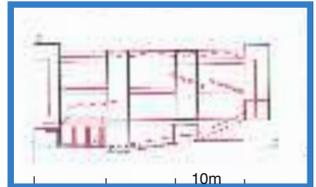
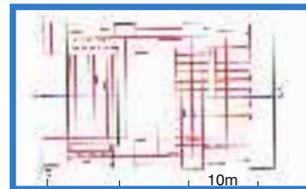
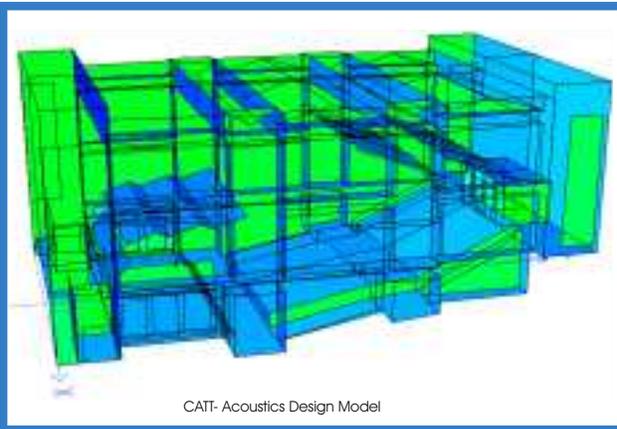
The final design was largely realized. The renovated hall has been universally well received. Performers at Crowell now **consistently praise** the finely articulated sound on stage. Many comment on the warmth of the stage design and the focus it brings to a performance. The renovated hall plays an important role in an improved quality of learning for Wesleyan students, a new feeling of satisfaction for faculty members and concert performers, and an improved environment for the audience. This project received the 1999 Engineering Excellence Award from the American Council of Engineering Companies of Connecticut.



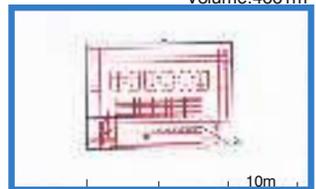
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WESLEYAN UNIVERSITY

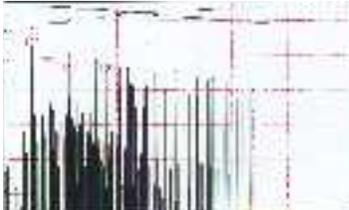
RENOVATION COMPLETED 1997



Volume: 4661m<sup>3</sup>



Mid-Hall Reflection Diagram Before Renovation



Mid-Hall Reflection Diagram After Renovation

