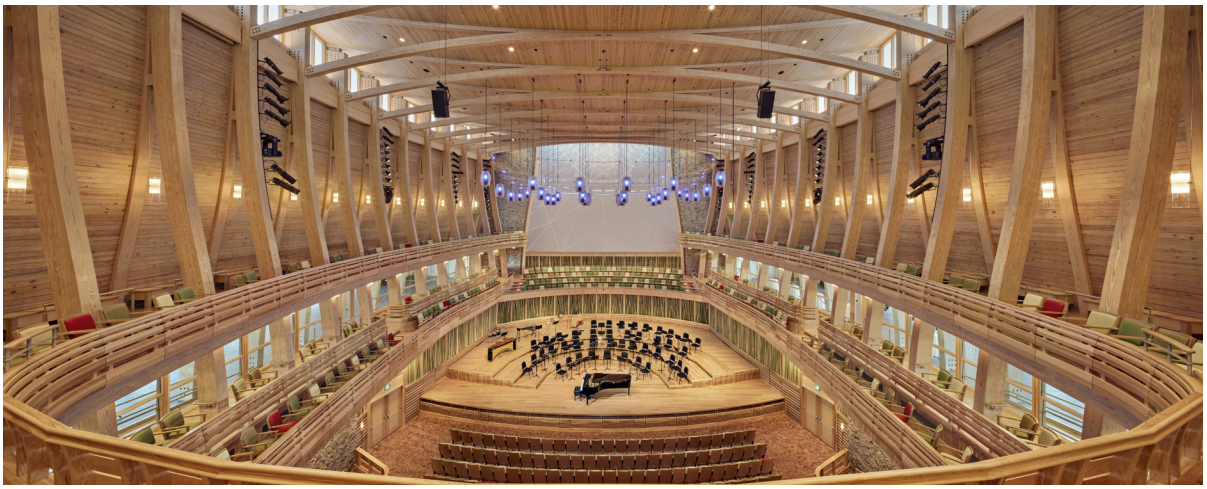

CAPTURING THE ESSENCE OF THE CONCERT HALL: 'TUNING FORK' COLUMNS HARMONIZING WITH HYBRID TRUSSES AND A CONVEX TIMBER DECKING CEILING DESIGN

Source: Architect: Epstein Joslin + Picardy Architects, Inc.
Credit: Photo courtesy of Robert Benson Photography

CASE STUDY: GROTON HILL MUSIC CENTER

A STRUCTURE THAT RESONATES: GROTON'S INNOVATIVE MASS TIMBER CONCERT HALL

PROJECT OWNER: GROTON HILL MUSIC CENTER

PROJECT LOCATION: 122 OLD AYER RD, GROTON, MA, 01450

COMPLETION DATE: DECEMBER 3, 2022

ARCHITECT/DESIGNER: EPSTEIN JOSLIN + PICARDY ARCHITECTS

MASS TIMBER ENGINEER/MANUFACTURER: UNALAM

GENERAL CONTRACTOR: GOGUEN CONSTRUCTION

STRUCTURAL ENGINEER: ODEH ENGINEERS

MECHANICAL, ELECTRICAL, AND PLUMBING: BR+A CONSULTING ENGINEERS

OTHER CONTRACTORS: THRESHOLD ACOUSTICS WITH LKACOUSTICS DESIGN STUDIO IN CONCEPT DESIGN (ACOUSTIC/AV CONSULTANT), THEATRE CONSULTANTS COLLABORATIVE (THEATER CONSULTANT)

GROTON HILL MUSIC Center in eastern Massachusetts seamlessly integrates structural engineering and mass timber elements in a 126,000-square-foot music education and performance facility. The not-for-profit organization was founded in 1985 to create a world-class venue that blends acoustics, structure, and aesthetics in a rural setting.

From the early design stages on, the project's distinctive feature is its commitment to exposed mass timber. Unlike conventional structures that isolate the performance space from the acoustic, Groton Hill Music Center aims to let concertgoers "listen to the structure." The architect's vision, expressed in early concept design sketches, sought to use mass timber to unite acoustics, structure, and finishes, creating a building that resonates with its surroundings.

EIGHT STRUCTURAL 'BRANCHES' SPRING FROM THE LOBBY TO SUPPORT THE ORCHARD ROOF ABOVE.

Source: Architect: Epstein Joslin + Picardy Architects, Inc.
Credit: Photo courtesy of Robert Benson Photography

Inspired by the local landscape, Epstein Joslin + Picardy Architects envisioned abstract timber frames resembling barns and orchards. Mass timber, chosen for its warmth, ambiance, and sustainability, became the focal point. Collaborating with structural engineers, acoustic consultants, timber fabricators, and builders, the team engineered abstract forms to meet acoustic, aesthetic, and functional goals.

The superstructure, a hybrid of curved and straight lines supported by steel and glulam framing, includes repeatable elements like "tree" and "tuning fork" columns. Southern Yellow Pine (SYP), selected for its structural and aesthetic qualities, was used in collaboration with fabricator Unalam. Odeh Engineers played a crucial role in designing the entire superstructure, including the connections detailed to meet architectural and acoustic requirements.

To ensure lateral stability, cast-in-place concrete shear walls and reinforced shotcrete shear walls were employed, serving as integral components of the acoustic strategy. The use of mass timber challenged conventional approaches, offering a modern solution that balances amplified and orchestral sound while taking into account embodied carbon concerns.

The acoustical analysis involved large- and small-scale studies using ODEON software for room shaping and MATLAB for diffusion evaluations. Departing from the traditional rectangular concert hall shape, the design embraces curvature, creating an intimate environment. The team navigated acoustical challenges, using the curvature to avoid the pitfalls of acoustic focusing.

Despite a reduction in mass compared to traditional concert halls, the structural design compensated through the laminated curved columns' inherent stiffness and the strategic use of shotcrete. The result is a set of acoustically versatile rooms that cater to various musical genres.

Groton Hill Music Center's success is evident in the positive responses from audiences and performers. The impact extends beyond architectural prowess to thriving music school enrollments and full houses.

In the serene Nashoba Valley countryside, Groton Hill Music Center stands as a testament to mass timber's viability in performance spaces. It showcases explorations in material efficiency and alternative forms. It is also a wooden symphony, both seen and heard, enfolding audiences in a structural masterpiece at the intersection of engineering, aesthetics, and acoustics.