Arch 464
ECS
Spring 2009 **Name**_____

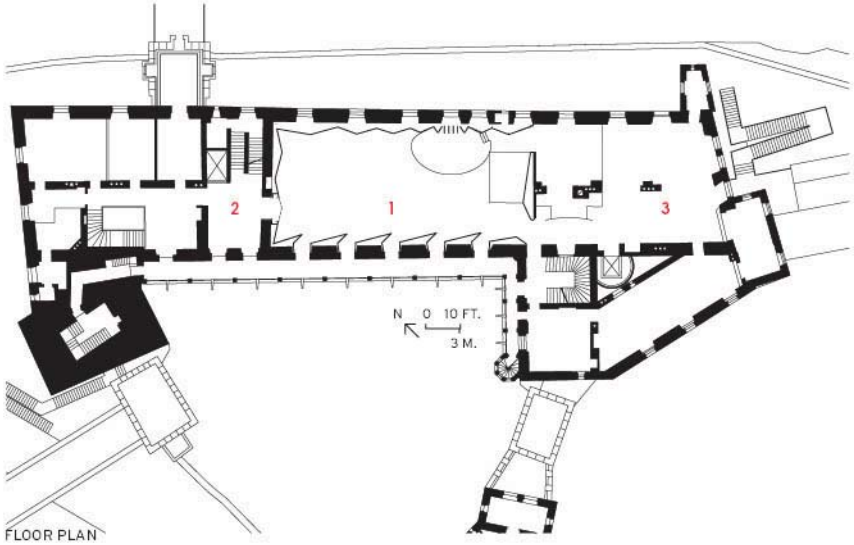
Quiz #4

"Hard Surfaces, Soft Music"

Read and look at everything before you write!

For this problem you are an acoustics scholar who is curious how architect Hans Hollein was able to break acoustic stereotypes, yet create an acoustically appropriate space for the performances and lectures that occur within. The room is a transluscent glass box placed within a two-story masonry shell, a configuration that should be acoustically equivalent to a shower stall. The stage is set-up assymetrically, defying the typical pattern for performance space. How can this space work to the local violinist's satisfaction?

The Crystal Room, in concert configuration, viewed from the small balcony in its western corner. The digital projection screen is shown on the East wall.



FLOOR PLAN

1. *Crystal Room*
2. *Foyer*
3. *Museum*

The walls and ceiling of the Crystal Room are composed almost entirely of translucent glass panels. Spot lighting is suspended from a band of aluminum panels diagonally above the stage

Illustrations and text from Architectural Record 02:09.

CRYSTAL ROOM

Waidhofen, Austria

Hans Hollein carves out a diamond in the rough with a crystalline performance space inside a medieval fortress.

As a general rule, hard, flat surfaces produce lousy acoustics. Hans Hollein however, has been writing his own rules for decades. In his very first built performance space, the Pritzker Prize–winning architect insisted on using glass. "I've always wanted to prove that you can create exceptional acoustics in a space made entirely of glass or stone," says Hollein. He finally got his chance when designing the Crystal Room (*Kristallsaal*) inside Rothschildschloss, a medieval castle in the picturesque town of Waidhofen an der Ybbs, a 2-hour drive west of Hollein's Vienna office.

The performance space is tucked inside a former Rothschild family castle.

Program

Hollein made several interventions to the castle – most notably, a 20-foot-tall glass box atop the main tower – which recently opened to the public. Though a museum occupies most of the restored structure, the town also required a performance space for annual music festivals and a yearlong program of classical and jazz concerts.

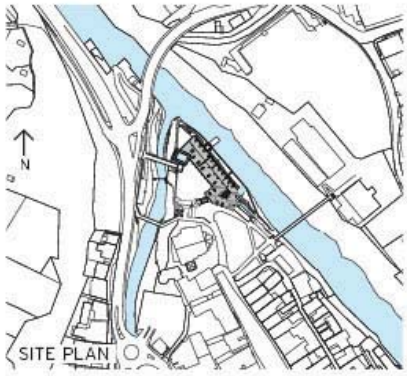
Solution

Nestled within the upper floors of the castle, the double-height volume, clad almost entirely in translucent glass, is an unexpected sight given its context and function.

Pieced together like a puzzle, glass panels of varying size and shape fan out across the room like the bellows of an accordion. Hollein's design of the folds was intuitive, confirmed later by an acoustician.

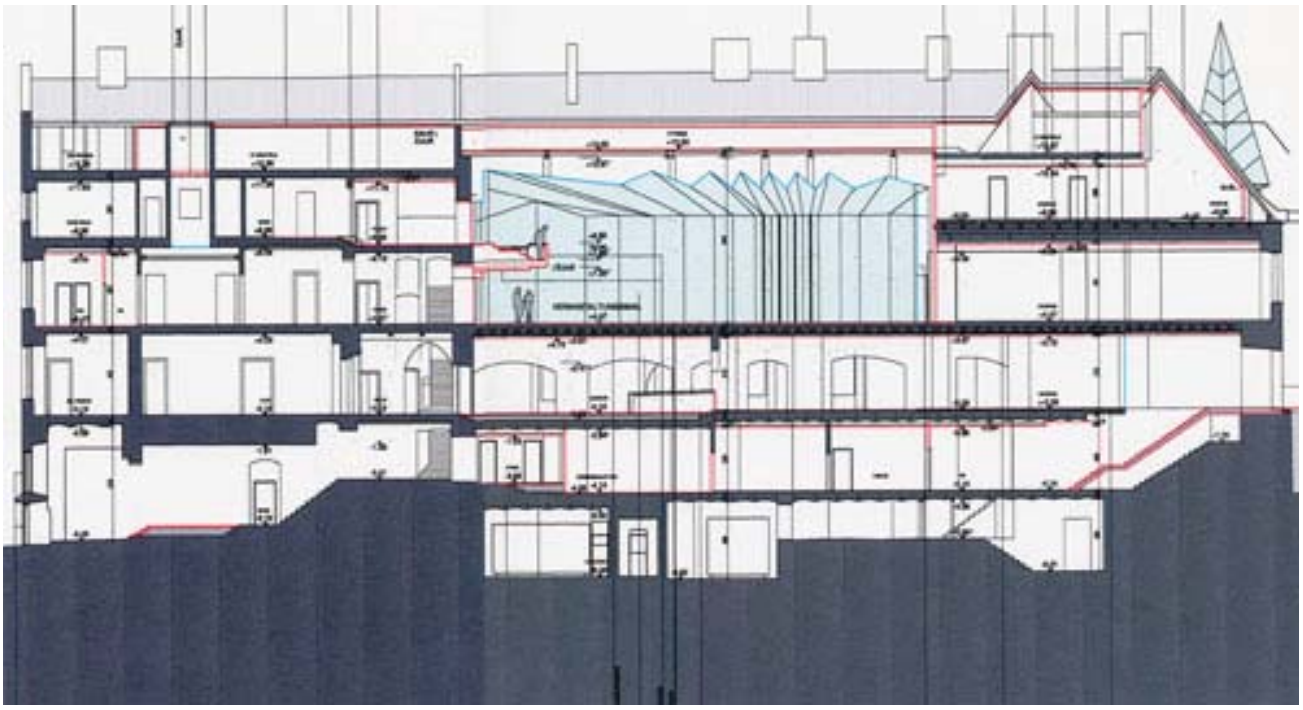
Ceiling panels hang from newly installed steel rafters, tilting upward to a zigzagging band of wood-backed, perforated aluminum panels that absorb sound. Wall panels – many of which are not completely vertical – conceal existing windows, but allow for some daylight to pass through. (Neon tubes along the floor behind the walls are switched on during performances, giving the room a cool, blue glow.) Circular fasteners, which affix the panels to their supports, create a visual rhythm. Gaps between ceiling panels were left open, but sealed between wall panels to address aesthetic, not acoustic, concerns.

The glass is laminated to meet fire-code requirements and to temper its sound-reflecting qualities. For musical performances, seating radiates around an elevated stage, which can be removed to accommodate a straight seating pattern for lectures, readings, films (shown on a flat screen integrated into the back wall), and meetings. A small balcony offers additional seating, for a total of 200.



Commentary

Hollein hits a high note; his intimate, cloudlike concert space is the perfect place to get swept away by music. Reviews for its acoustics have also been favorable. A resounding stamp of approval came from a local violinist, who used it as a recording studio. ■

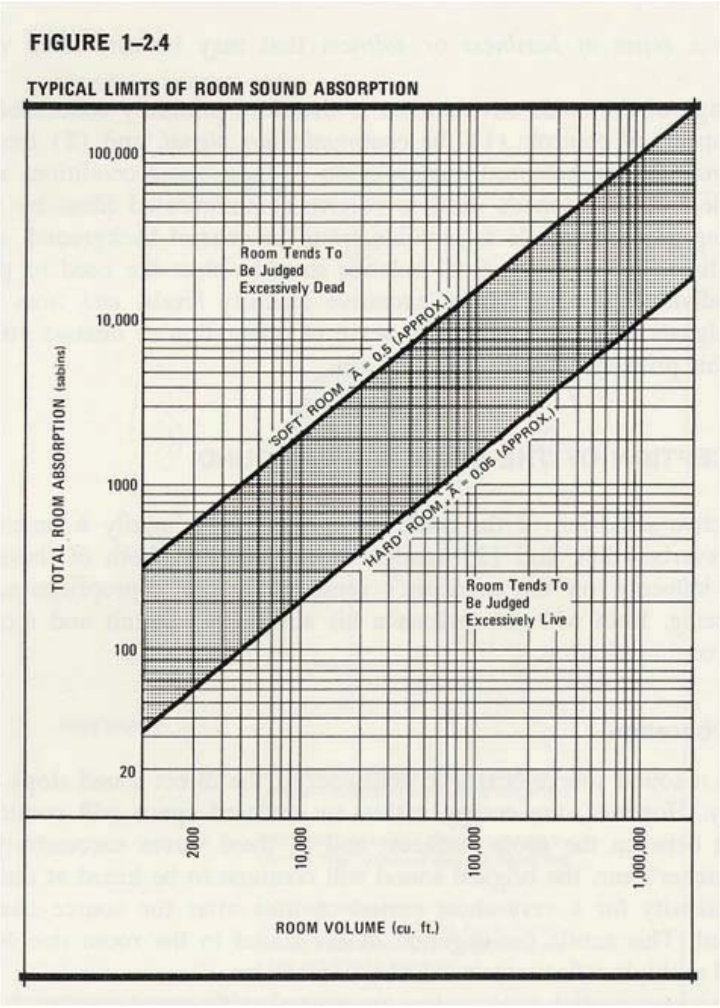


At the top of the page a west-east section of the building shows the Crystal Room and its balcony. In mid-page is a construction image of the large space in which the Crystal Room resides and a view of the space above the room's glass shell. At the bottom of the page are ceiling hanger details and the architect's study model of the space, looking west.

Analysis

4 points

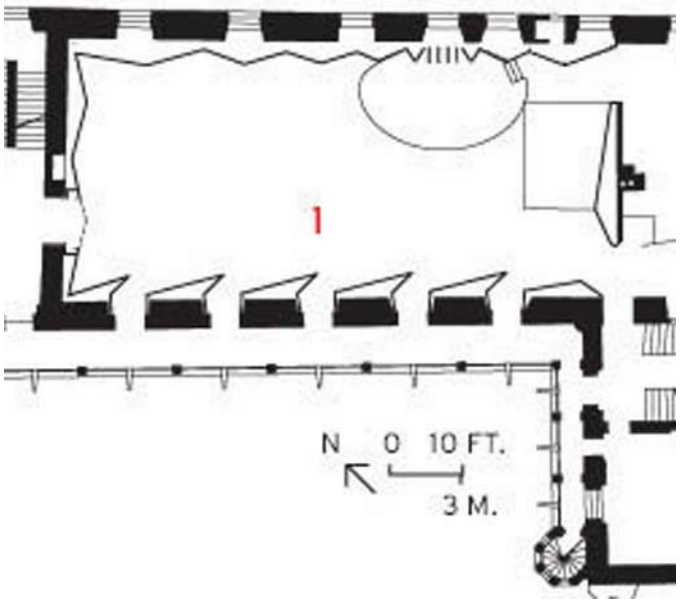
1. **Estimate** the reverberation time (T_R) of the glass room, given the wooden floor absorbency = 0.20; and the glass ceiling and walls' absorbency = 0.01. The two absorptive features, 420 sqft of perforated aluminium panels (α = 0.70) and 200 sqft of voids in the ceiling (α = 1.00), complement the absorbancy of the audience (α = 0.65) covering 70% of the floor). The room is 2,560 sqft (72 ft x 35.5 ft) with a 22 ft average ceiling height. **Comment** on the relative deadness or liveliness of the room and its acoustic suitability for concert and lecture activities.



Concert Configuration

3 points

2. What is the **acoustic goal** for the room set-up shown? Suggest **two** different activities that are compatible with both the room set-up and its acoustic quality. Fully **explain** each of your suggestions. Use sketches and diagrams to make your intentions clear. **Identify** where the best seat (acoustically) in the glass room is for these activities and **explain why**.



Lecture Configuration

3 points

3. The lecture set-up without the chairs and lectern is shown. What is the **acoustic goal** for the room as a lecture hall? **Suggest** audience deployment and lectern placement in the space for the best audio and visual performance. Fully **explain** your suggestion using sketches and diagrams to make your intentions clear. **Identify** where the best and worst seats (acoustically) in the glass room are for lectures and explain **why**.