

Acoustic assessment of A Multi - Purpose Hall

Physical properties:

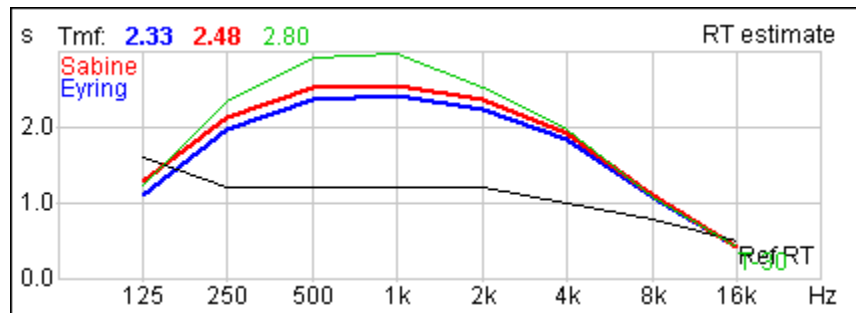
Volume: approximately 3900 m³, Surface area: approximately 3480 m², Composition: concrete, plasterboard, light curtains, fabric covered shallow cavities, A/C ducts, stage, windows and doors, tables and chairs.

Use:

The hall is intended to be “multi-purpose” and should be suitable for

- ◆ speaking – unamplified and amplified
- ◆ playing unamplified and amplified music
- ◆ group meetings and discussions
- ◆ presentation of audio-visual material

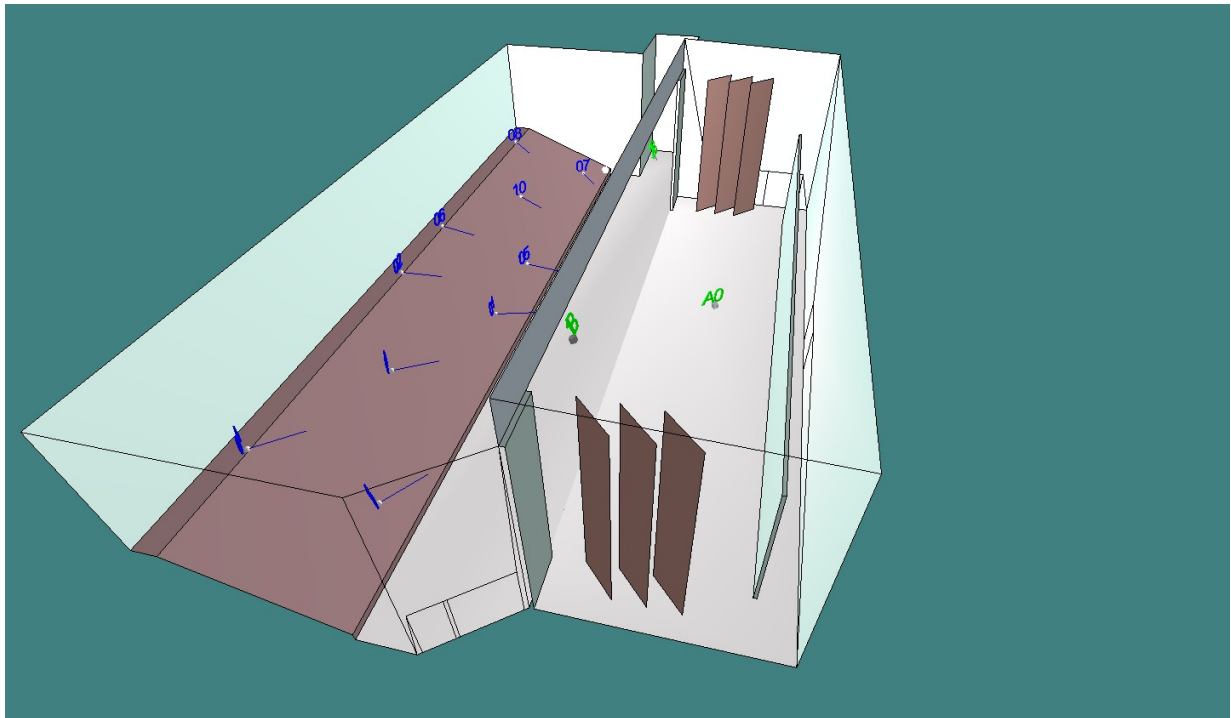
Calculated primary acoustic conditions:



- ◆ This reverberation time is not acceptable. It does not meet the requirements of AS/NZS 2107:2000 Acoustics – Recommended design sound levels and reverberation times for building interiors. The reverberation time of this hall is well above the recommended reverberation time for “assembly halls for more than 280 people”. The recommended reverberation time is approximately 0.95 seconds.
- ◆ Speech Intelligibility is fair.
- ◆ Clarity has negative values in some frequency bands.

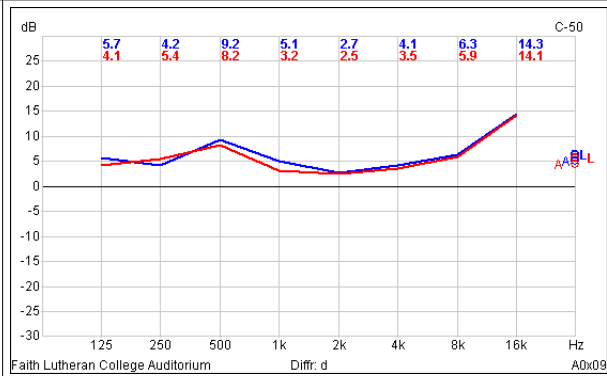
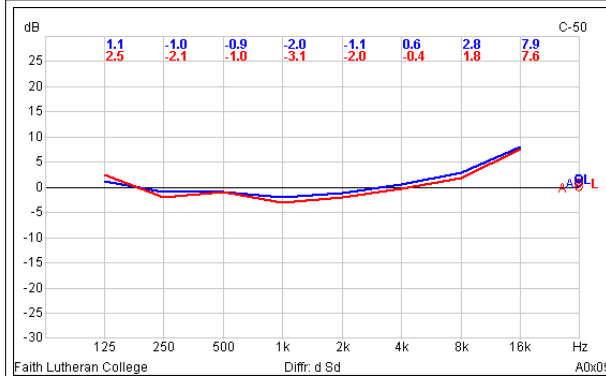
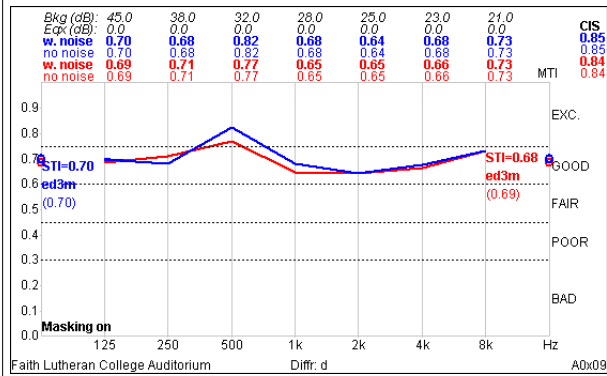
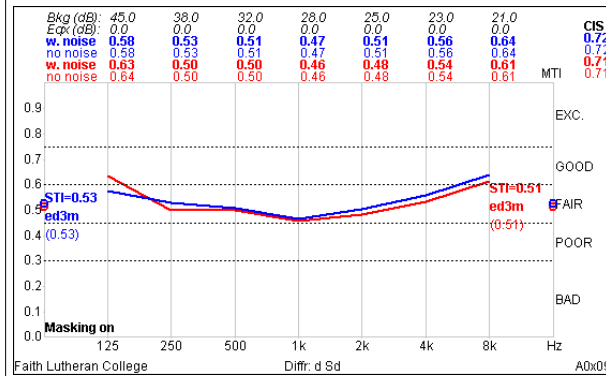
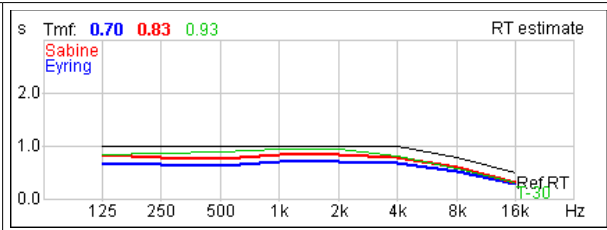
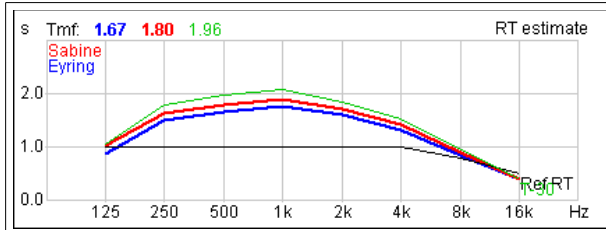
Simulation:

The results above were determined by modelling the room and its components as described in CATT Acoustic. Below is a view of the basic model.



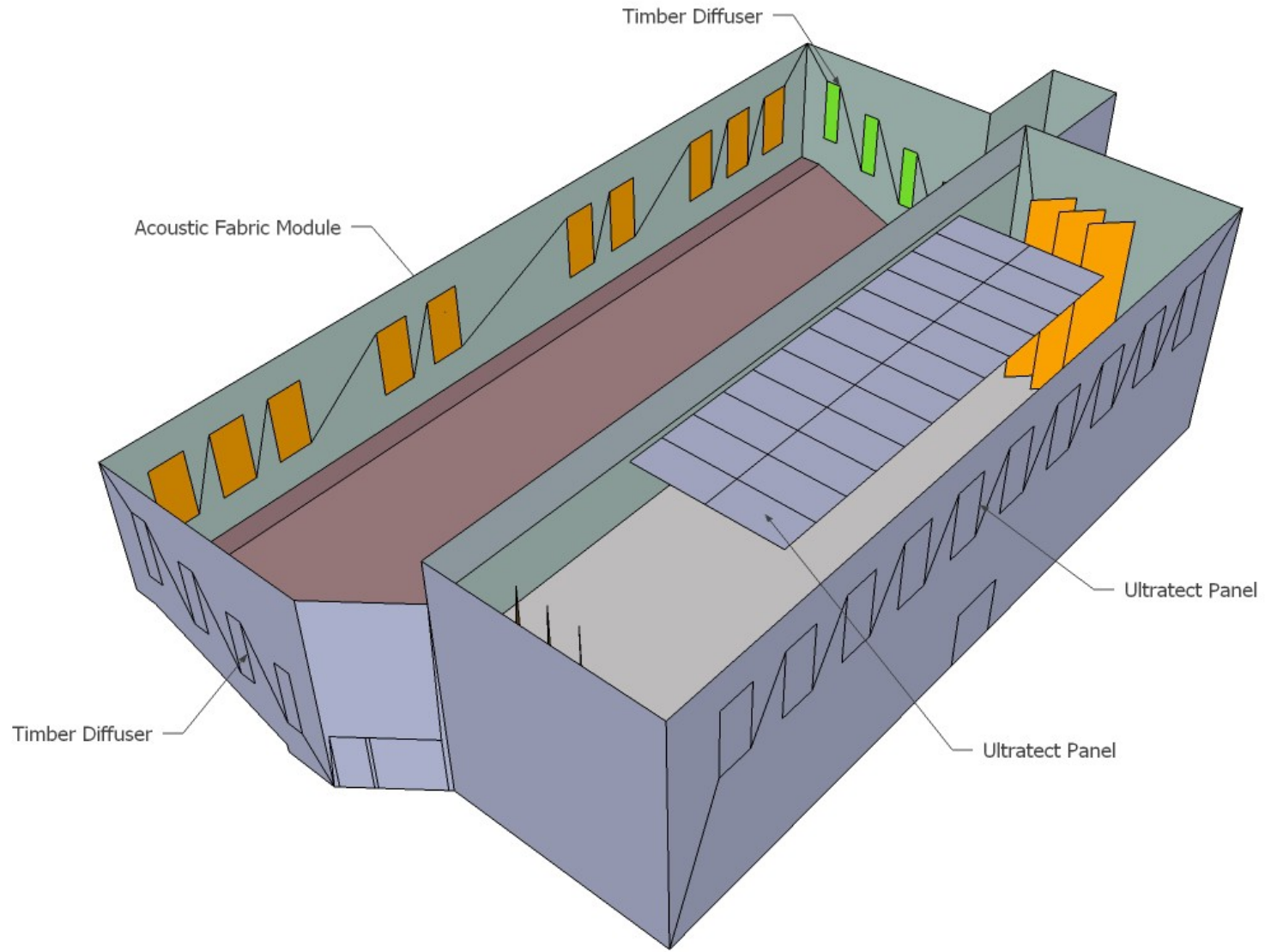
Modeled solution:

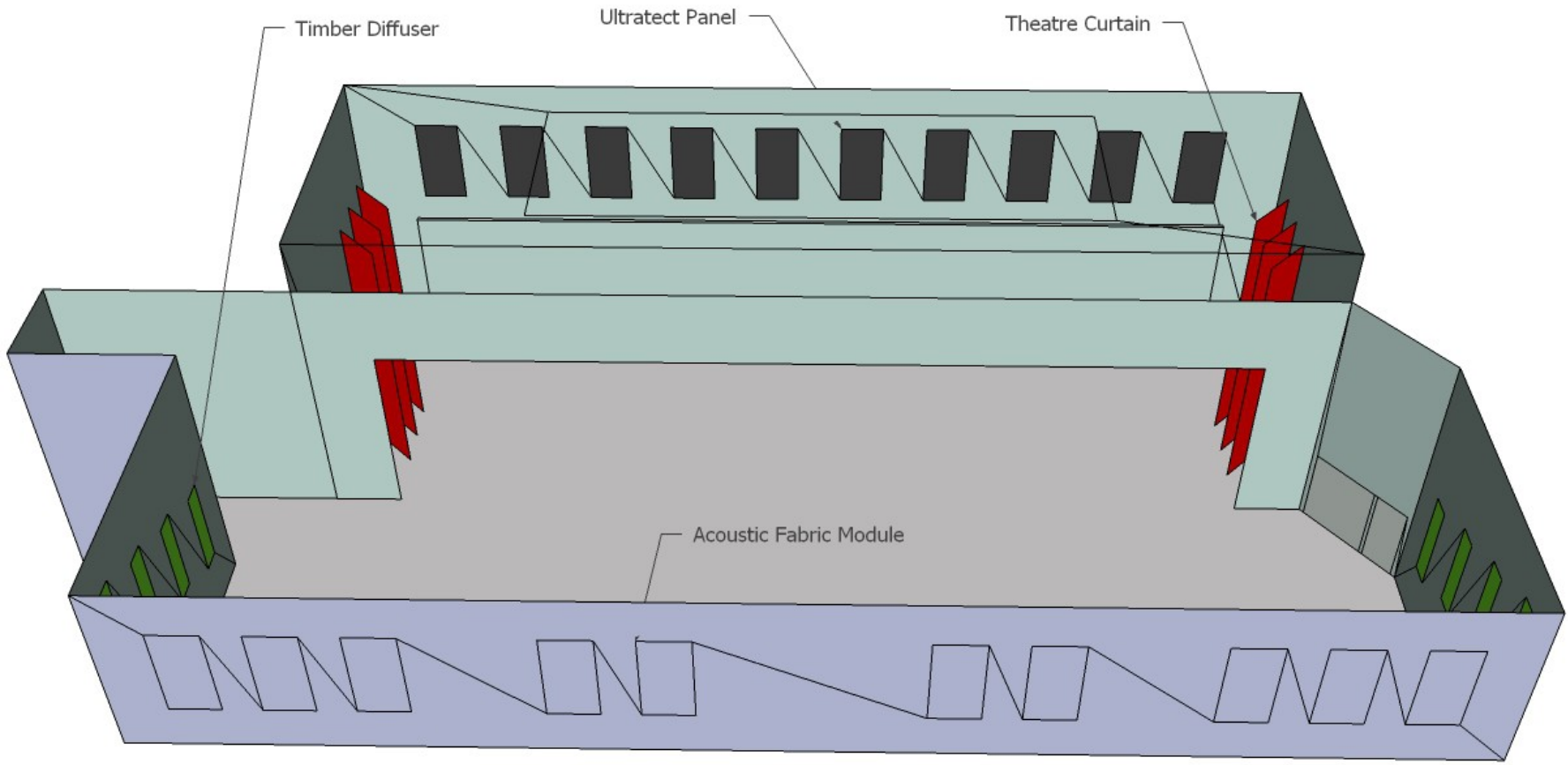
- ◆ The reverberation time (RT60), speech intelligibility (STI) and clarity (C80) of the hall can be modified to be suitable with the use of acoustic absorption and diffusion. Absorption and diffusion to cover the low/mid to high frequency range is required. The type, quantity and position of absorption and diffusion used in the calculations is shown in the attached drawings
- ◆ The modelled RT60, STI and C80 of the untreated and treated cases are shown below.

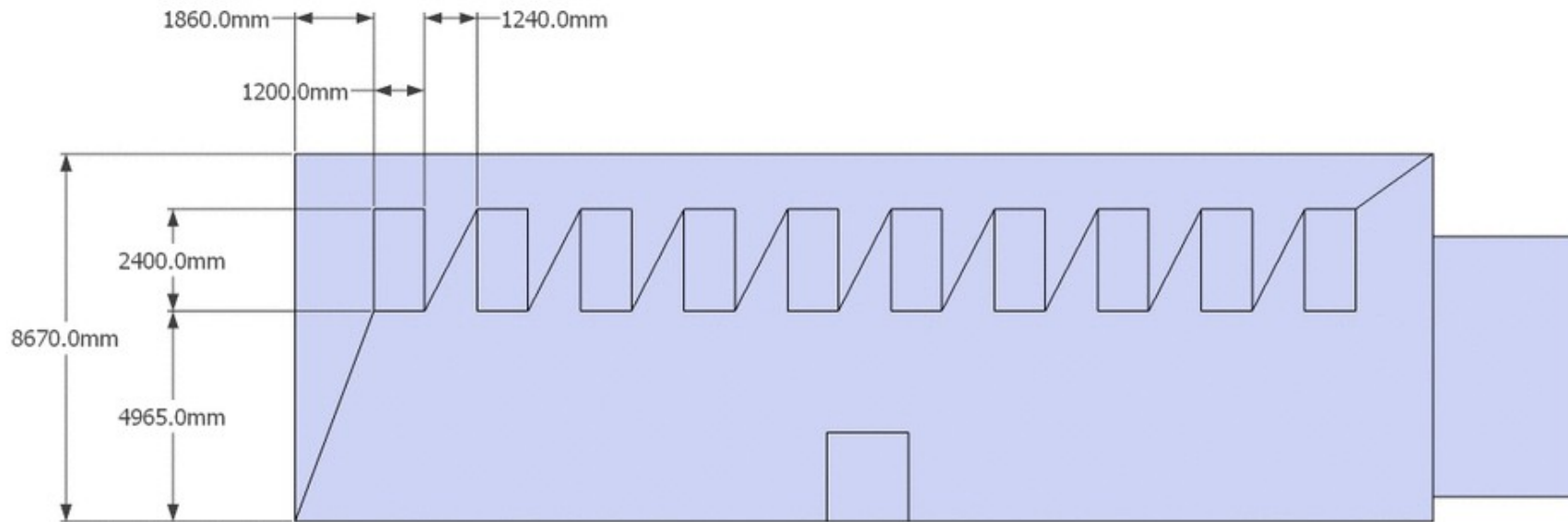


The improvements are achieved by;

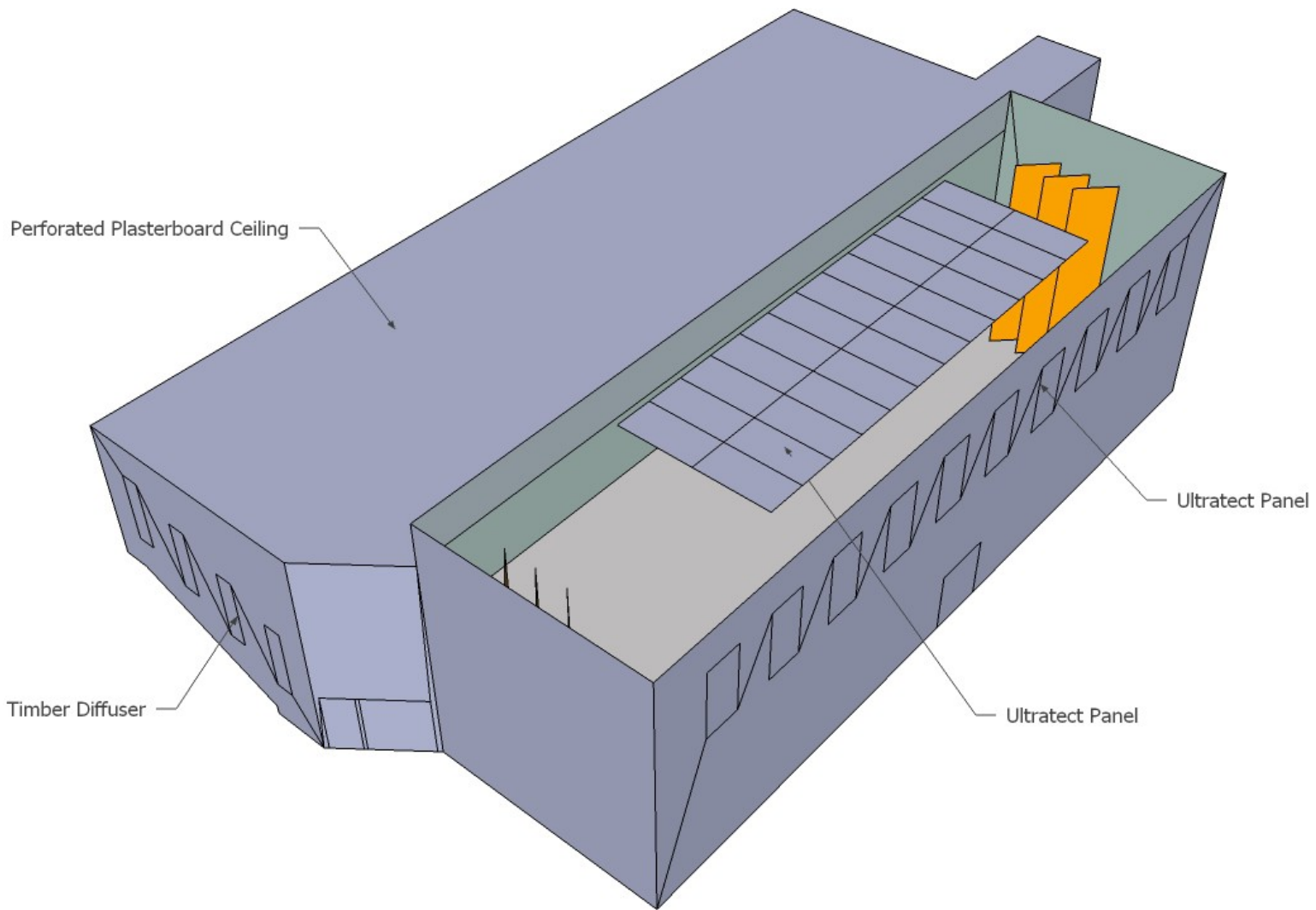
- Adding absorbers as shown in gold (self construct – drawing attached)
- Adding diffusers as shown in green (self construct – drawing attached)
- Adding absorbers as shown in dark grey (Based on Ultratect 50mm thick melamine resin absorber or equivalent NRC 0.9)
- Using a perforated plasterboard ceiling in the audience area Knauf square pattern [C10 NO.8] 16% open area NRC 0.85 on 100mm air space with 75mm glasswool 10 x 10mm holes







Behind Stage Ultratect Panel Placement

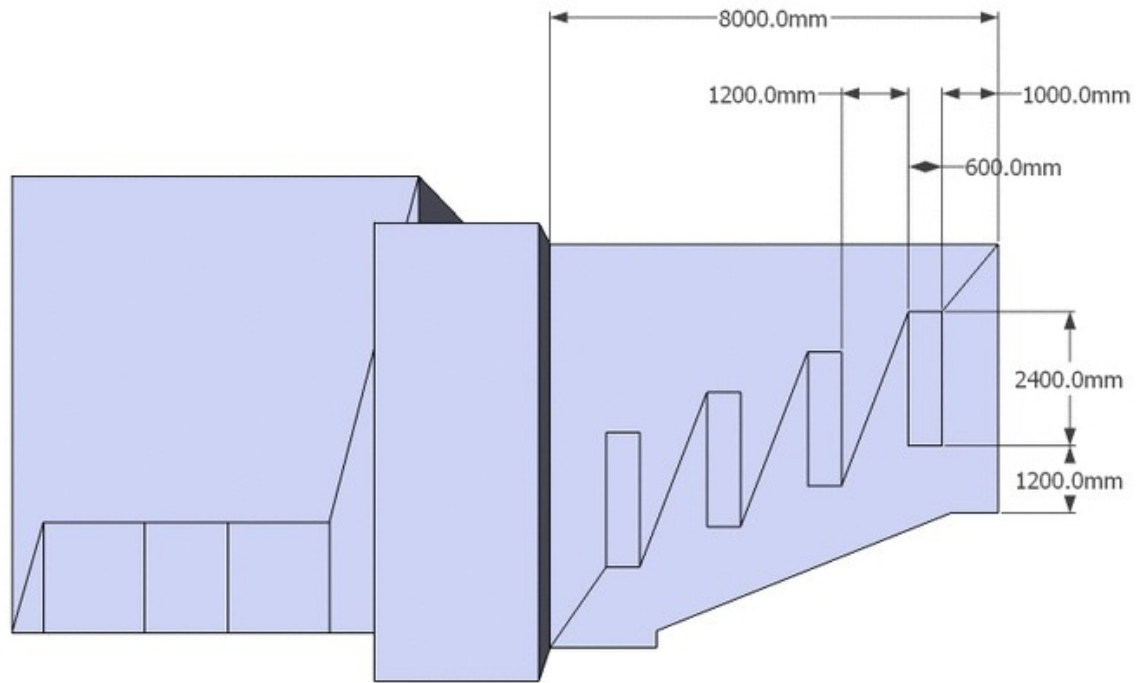


Perforated Plasterboard Ceiling

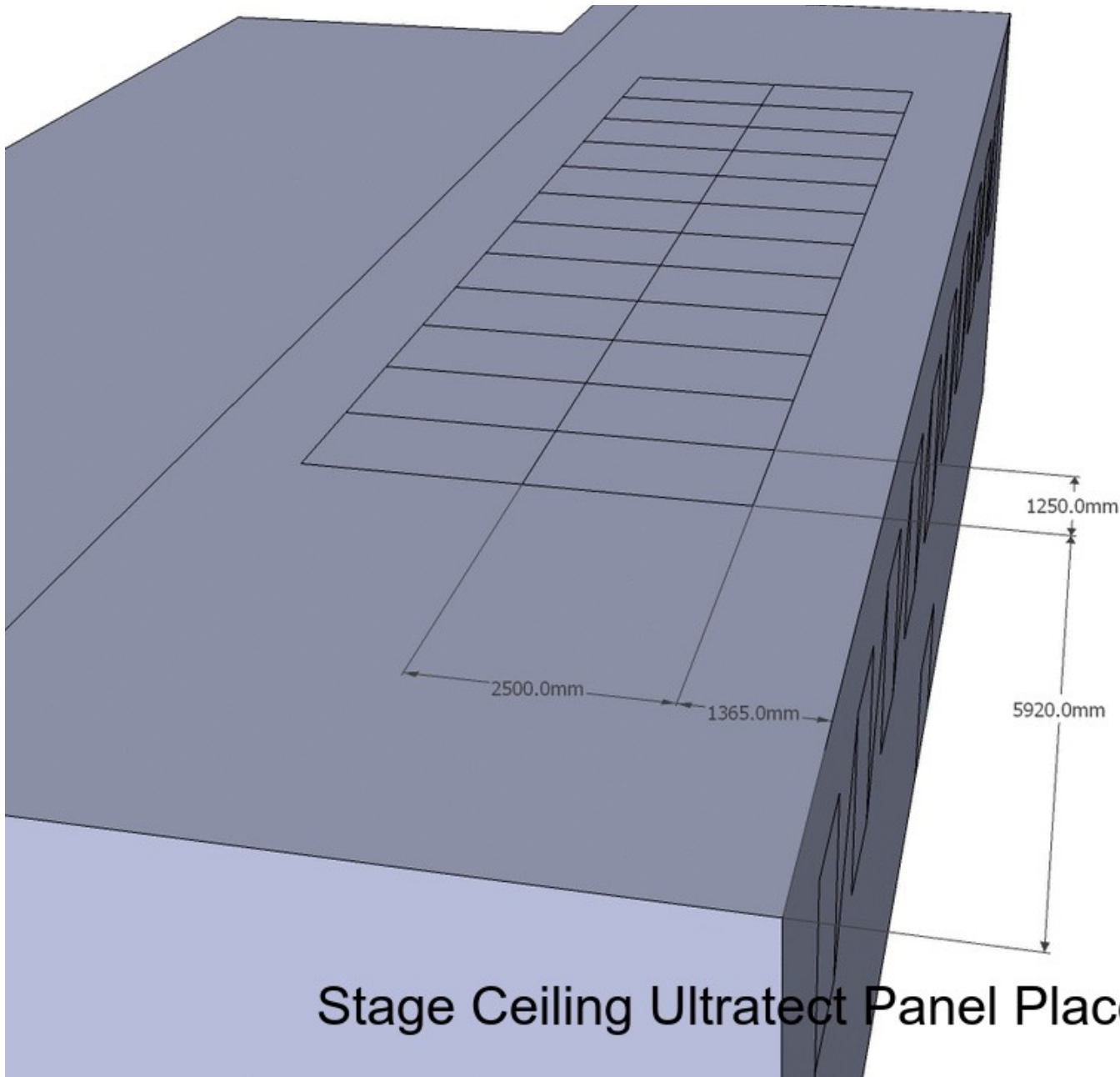
Timber Diffuser

Ultratect Panel

Ultratect Panel



Timber Diffuser Placement



Stage Ceiling Ultratect Panel Placement

Recommendations

An orchestra or small ensemble may have difficulty playing on the stage because it is wide and does not offer acoustic support to the members of the ensemble. To be able to play effectively in a group, musicians need some local feedback provided by early reflections, so that they can hear the other musicians and the ensemble as a whole. Reflected sound from the available surfaces will arrive too late to provide such acoustic support. The graphs below show strength “G” for a musician in an ensemble with and without an orchestra shell. The following two graphs show Clarity (C80) measured at the audience for an orchestra playing with and without a shell.

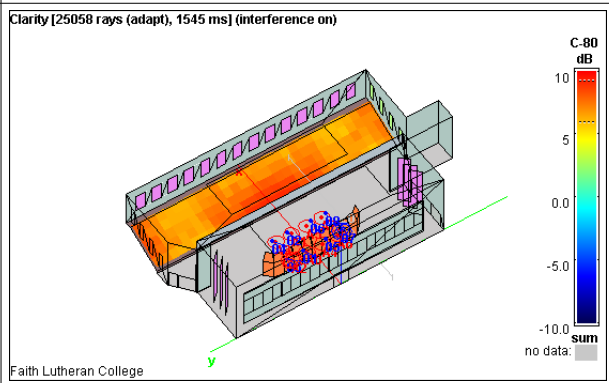
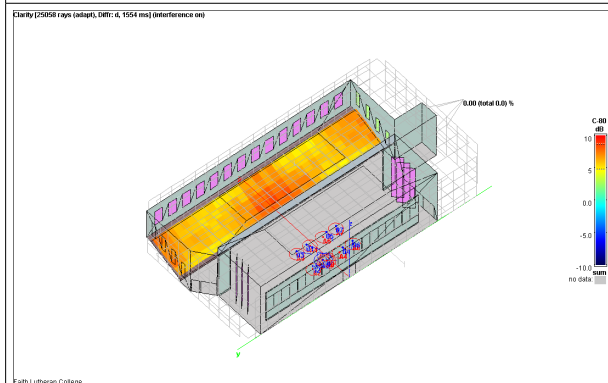
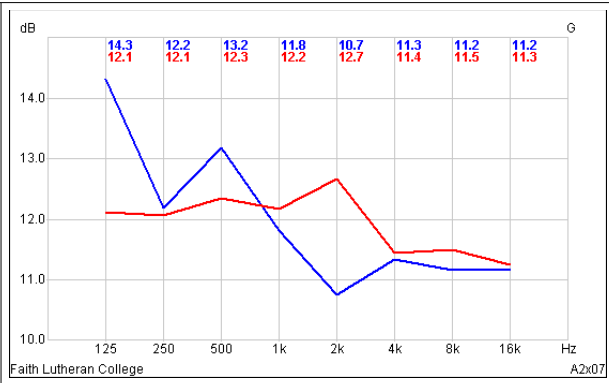
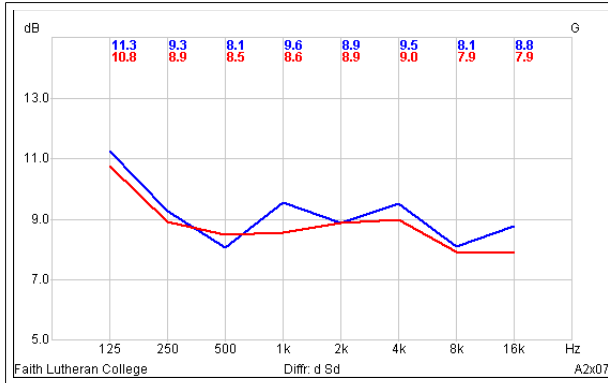
For these reasons, an orchestra shell is recommended.

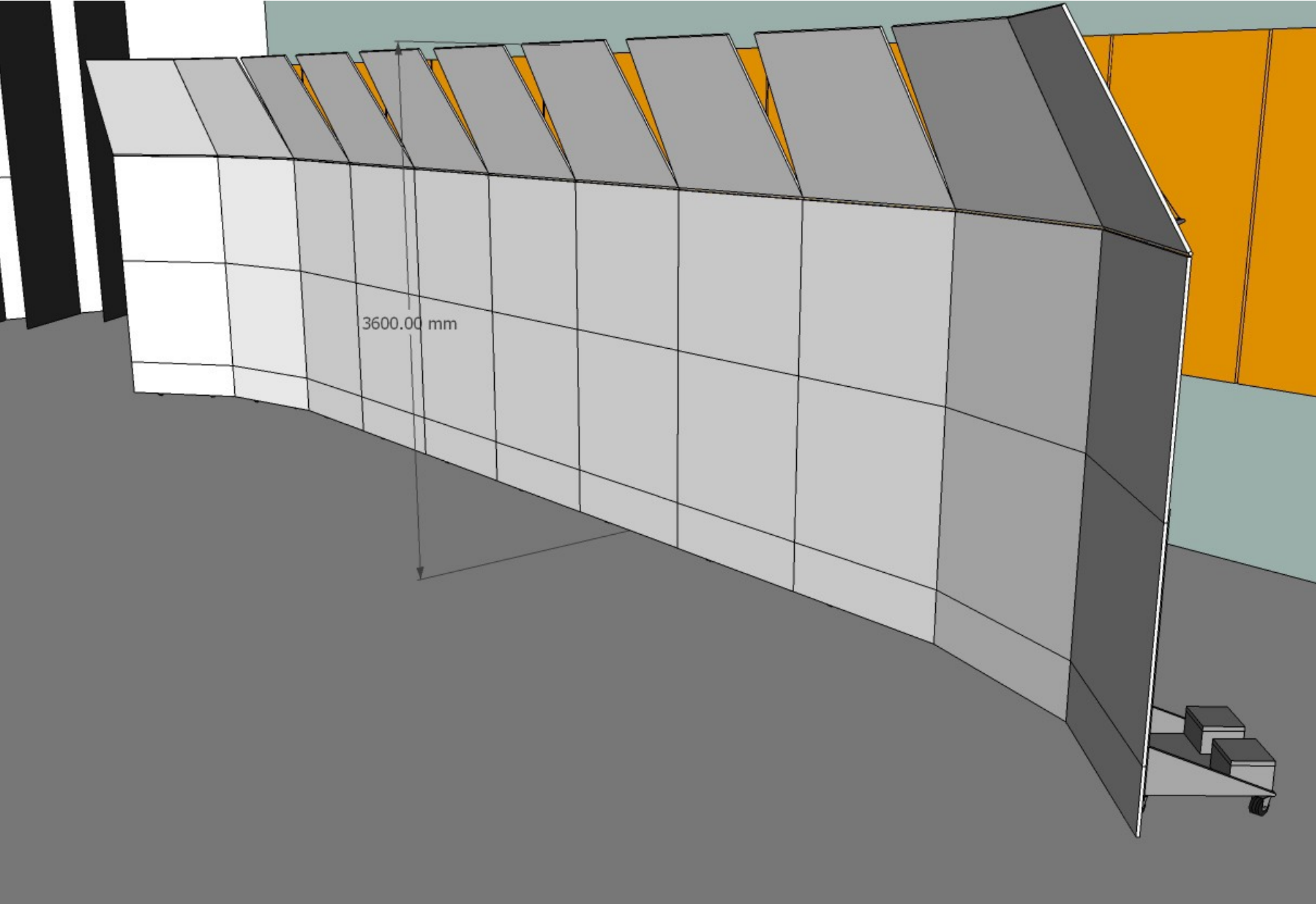
Examples of commercial orchestra shells;

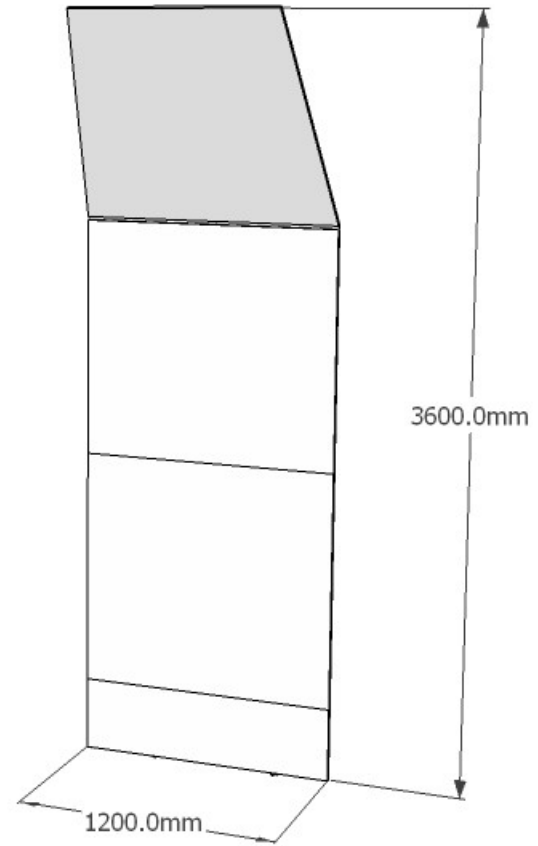
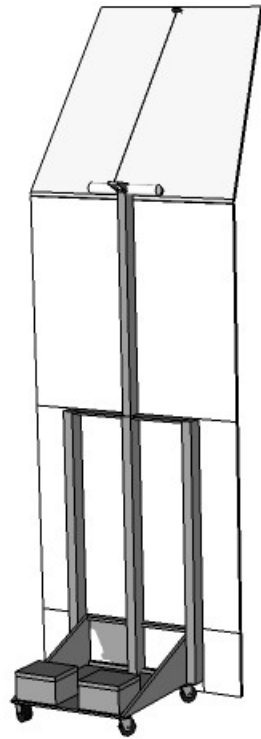
<http://www.wengercorp.com/acoustics/index.php>

http://www.stageright.com/view_product~pid~51~section~drawings.asp

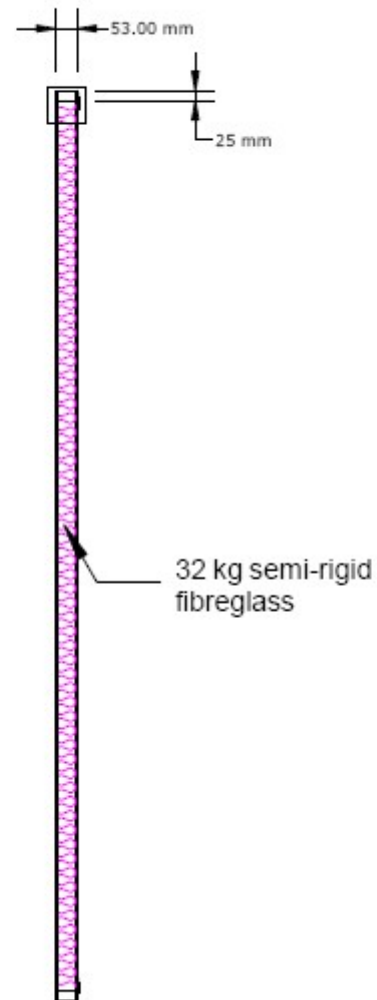
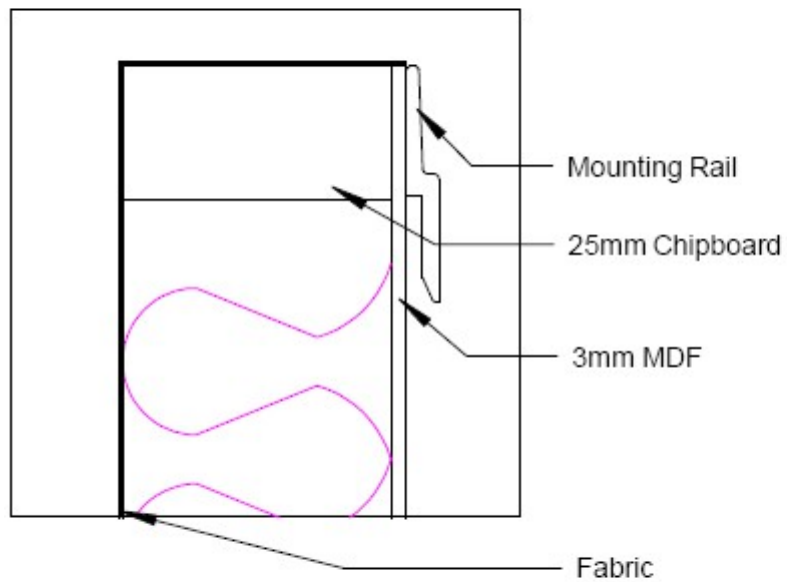
<http://www.customaudiodesigns.co.uk/acoustic-stage-shells.htm>







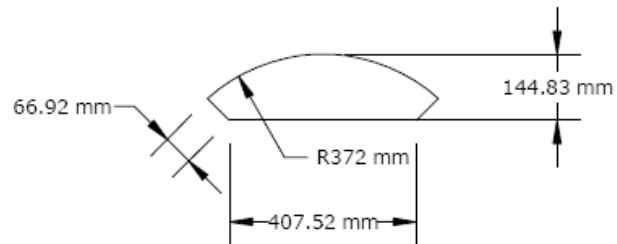
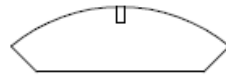
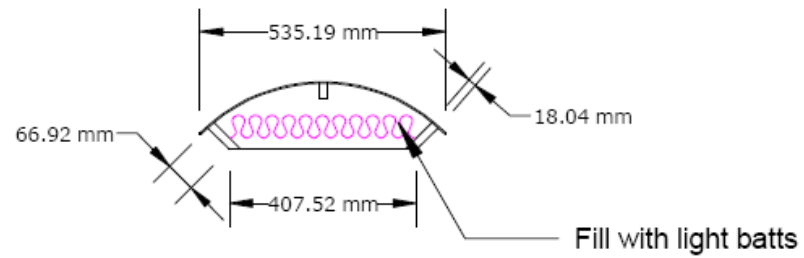
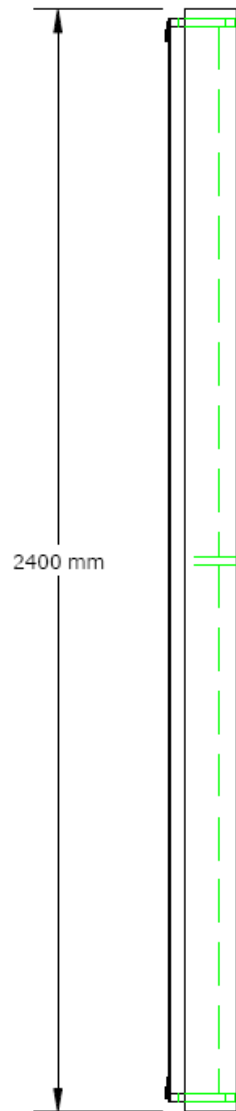
Construction Drawings



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END CAP

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Diffuser

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