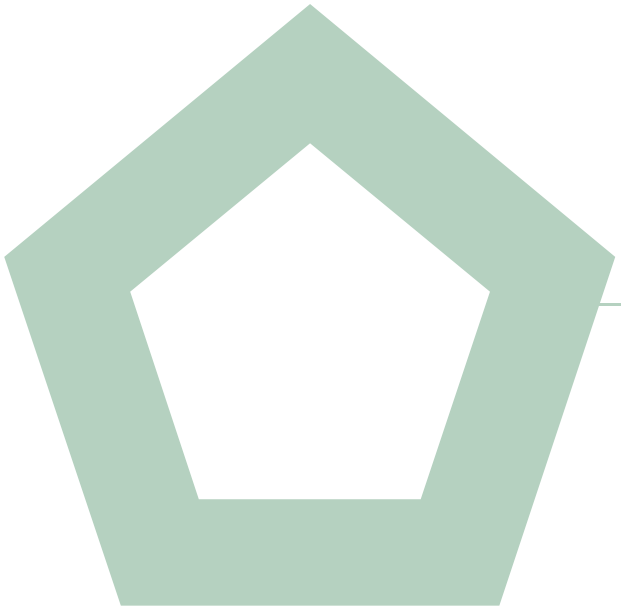
HOARE LEA

Goole Market Hall.
Goole.
East Riding of Yorkshire Council.

ACOUSTICS
STAGE 3 REPORT –

REVISION 1 – 23 OCTOBER 2023



STAGE 3

Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
0	12/10/23	Initial Stage 3 report	MW	PM	PM
1	23/10/23	With additional finishes and substation comments	MW	AP	AP

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1. Introduction.

This report provides the key acoustic design advice at RIBA Stage 3 for the proposed fit-out works of the Goole Market Hall.

The report considers the development uses and summarises the key acoustic design considerations regarding:

- Control of noise egress and specification of music egress limits
- Control of building services noise egress
- Control of reverberation time

General comments on the key acoustic issues and considerations are first provided, followed by the proposed acoustic design criteria and comment on the strategies at Stage 3 to meet the requirements.

2. Acoustic design standards.

The main requirement for this project will be to ensure that noise egress from activities in the Market Hall comply with the planning requirements at the nearest residential premises.

The Environmental Health Officer has advised that the events will need to comply with the guidance set out in Code of Practice on Environmental Noise Control at Concerts (Noise Council):1995, and events should finish before 23:00 hours.

Plant noise egress will need to be assessed in accordance with BS 4142:2014 + A1:2019.

The reverberation time in the Hall should ideally be controlled to provide reasonable levels of speech intelligibility, to support music playback, and help control reverberant sound build-up in the Hall so that voices do not become too cacophonous. As there are no formal standards to address this, our advice is based on our experience of designing similar spaces.

3. Design proposals.

The current Stage 3 proposals show a range of potential options for space uses in the Market Hall; these include:

- A flexible events space in the centre of the Hall to accommodate, amplified music performance, open mic sessions, cinema or theatre type performances
- Street food units, market stalls and a microbrewery / bar to the periphery
- External garden/ bar area

As stated previously, for this scheme, there are two key acoustic attributes that need to be considered, namely:

- The control of sound break-out to the environment from event use internally and the external garden area to nearby residences
- The control of reverberation in the hall to provide suitable acoustic conditions for amplified music performance, spoken address and potential cinema screenings. This will also help reduce reverberant noise build-up.

The current arrangement proposals can be seen in Figure 1.

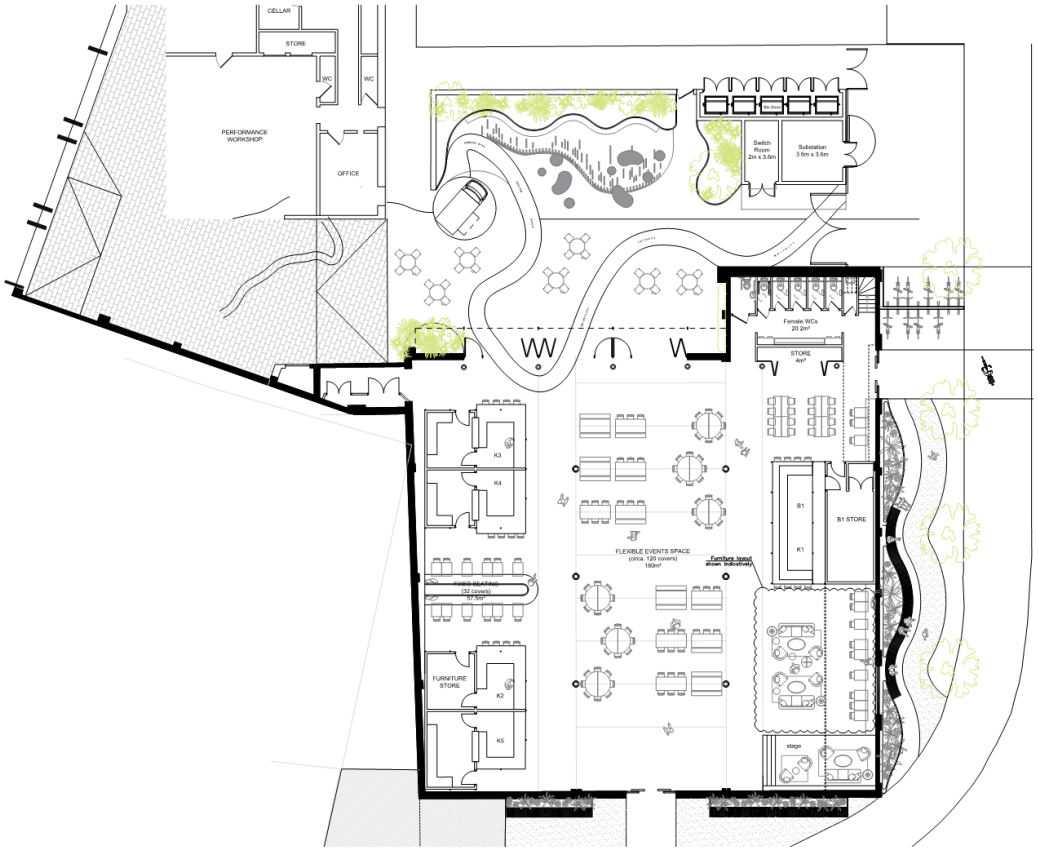


Figure 1 - Current development proposals

4. Control of noise egress.

4.1 Survey overview.

An environmental noise survey has been carried out on site over 7 days commencing on Wednesday 23 August 2023. The aim of the survey was to determine the existing noise levels around the site, with the purpose of establishing the prevalent ambient and representative background noise levels at the nearest residences to set maximum noise egress limits for plant associated with the development.

From the analysis carried out, the representative background sound levels measured during the survey as experienced at the closest residential facade were determined to be 44 dB $L_{A90,15min}$ during the daytime period, and 40 dB $L_{A90,15min}$ during the night-time period.

4.2 Plant noise egress limit criteria.

Based on the BS4142 and the survey results, the cumulative maximum sound pressure levels for fixed plant, equipment associated with the development shall not exceed the levels presented in Table 1 at 1 m from the nearest noise sensitive premises.

Table 1 - Maximum permissible sound pressure levels at 1m from the nearest noise sensitive premises

Time of day	Maximum sound pressure level at 1 m from the nearest noise sensitive premises ($L_{Ar,T}$, dB) *
07:00 to 23:00 hours	44
23:00 to 07:00 hours	40

*If plant noise contains any tonal or impulsive characteristics, a further correction shall be applied to the levels set out above in accordance with BS 4142:2014.

All noise generating plant and equipment associated with the development will be designed to ensure that the noise egress limits specified above are achieved.

Current proposals include the installation of 2no. atmosphere side duct attenuators to each kitchen extract fan serving the food outlets within the Market Hall.

The Mechanical engineer should also verify that air flow through the ductwork does not cause excessive turbulence with weather coverings at its termination, such that additional noise is introduced post attenuation.

It is also noted that a substation is proposed at the edge of the garden area adjacent to Estcourt Terrace. As noise from these can be tonal and hence quite noticeable, especially when background noise levels reduce during the night time, an appropriate noise enclosure will be required to ensure that the rating level of noise from the substation complies with the planning requirements whilst maintaining the ventilation requirements for the safe operation of the substation.

4.3 Entertainment noise limit criteria.

In accordance with the local planning guidance, the proposed Music Noise Level (MNL) limits for the various event types (up to 23:00 hours) are set out below.

Table 2 - Maximum permissible sound pressure levels at 1m from the nearest noise sensitive premises up to 23:00

Event Type and frequency	Limit criteria
Amplified music – up to 3 times per year	The MNL should not exceed LAeq 65dB over a 15 minute period at 1m from residential facade

Cinema/ Theatre type - up to 12 times per year (up to 9 if the 3 amplified music events above have been held)	The MNL should not exceed the background LA90 by more than 15dB over a 15 minute period at 1m from residential façade (i.e. $L_{Aeq,15min}$ 59dB)
Other events up to once per week	The MNL should not exceed the background LA90 by more than 5dB over a 15 minute period at 1m from residential façade (i.e. $L_{Aeq,15min}$ 49dB)

4.4 Calculation of guidance music playback limits in Hall.

Models of the surrounding building massing were created in the industry standard noise mapping software, CadnaA, with area sources introduced to define noise egress through the open doors to the north façade (Figure 2) and through the high level stack ventilation louvres along the roof (Figure 3).

Figure 2 - Drawing showing doors to north facade that are to be opened for large events

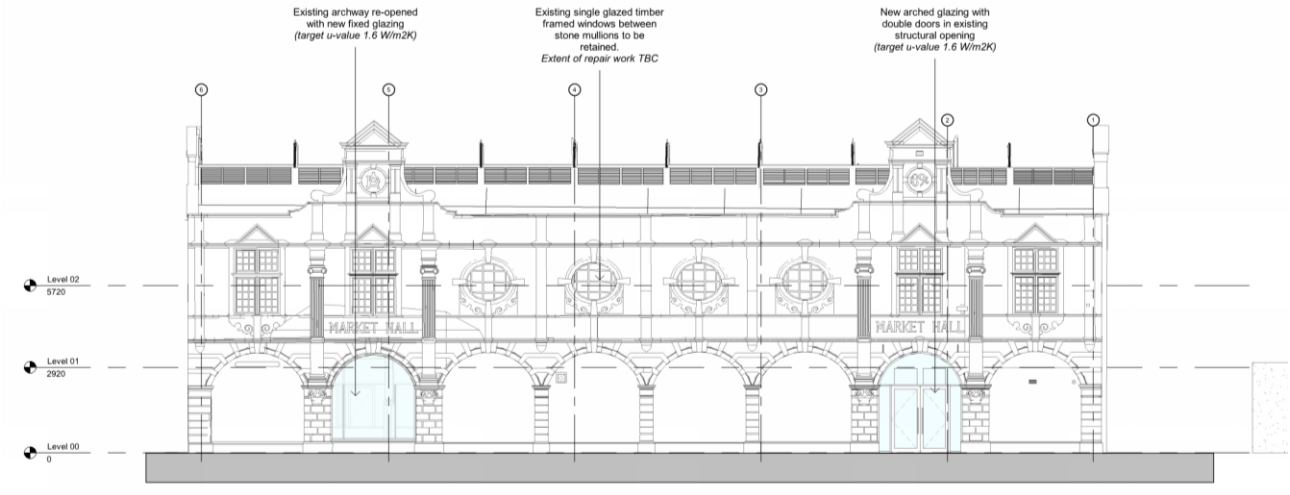


Figure 3 - Drawing showing high level louvres that are open for natural stack ventilation

It is worth noting that this is a 'worst case scenario' as it is likely that sound from the PA system in the hall will be directed towards the audience area and away from the open doors, reducing music egress levels.

Sound level egress plots showing the CadnaA noise map calculations can be seen in the following figures.

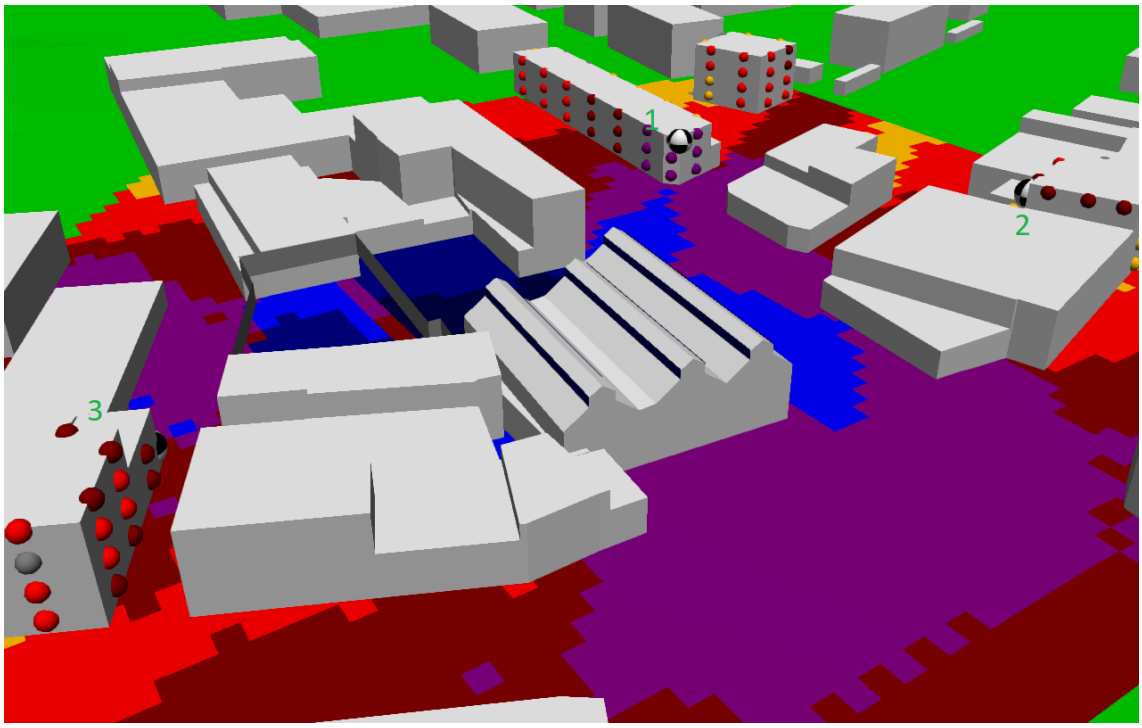


Figure 4 - CadnaA noise map of predicted music level egress through open doors to north façade and high level louvres

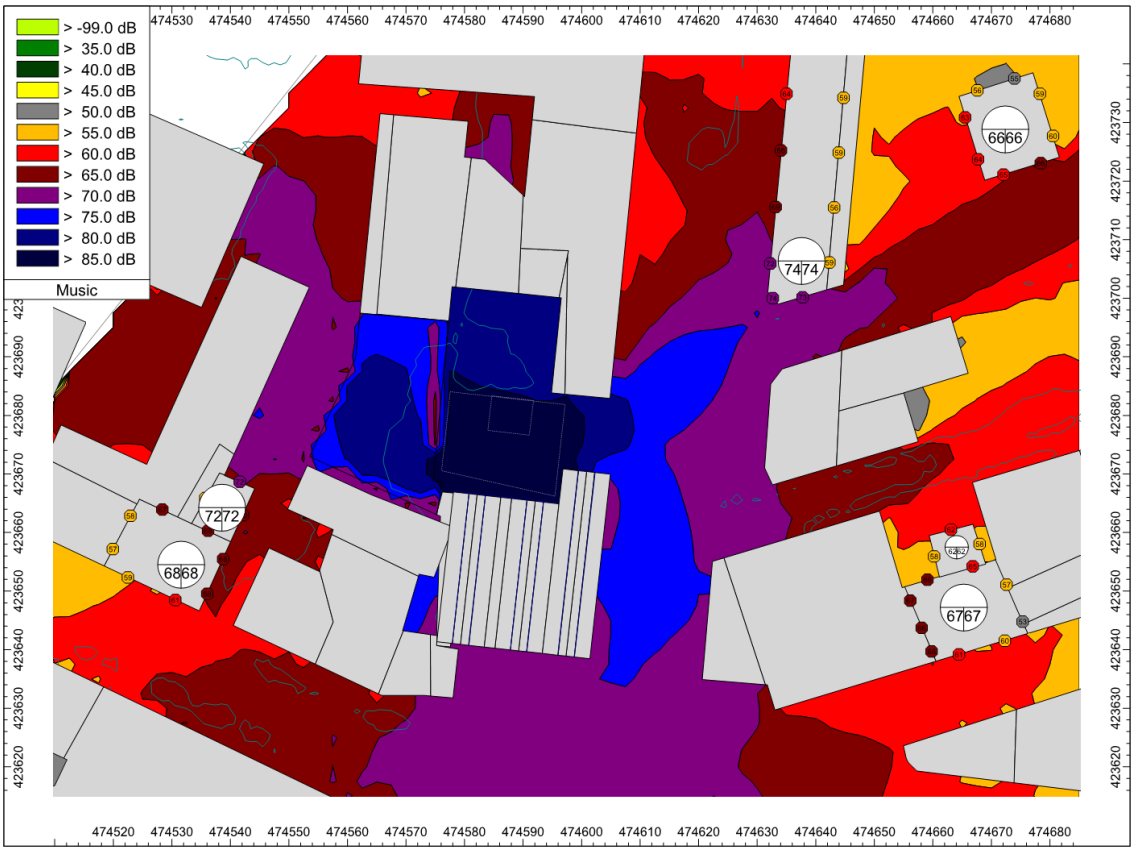


Figure 5 - CadnaA noise map of predicted music levels and closest residential facades

4.5 Guidance limit criteria for noise sources in Goole Market Hall.

Based on the CadnaA model calculations, indicative octave band and A-weighted amplified music and Cinema/ Theatre type events music playback level limits inside the Market Hall are set out below.

Table 3 - Guidance maximum music playback levels

Guidance playback levels	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	A
Amplified music (up to 3 events /year)	95	95	90	90	85	85	80	80	92
Cinema/ Theatre (up to 12 events/ year)	90	90	85	85	80	77	77	77	87

NOTE: The actual music level limits within the Market Hall will need to be set during sound checks to ensure that the planning limit criteria set out in section 4.3 are complied with.

4.6 Sound from activities in the Courtyard.

Th current design proposals will help mitigate sound transfer from activities in the garden area as the switch room and substation massing will help act as a solid barrier to block sound transfer to the nearest residential dwellings. The proposed distribution of foliage around the garden area will also help absorb sound from activities at source.

In addition, the recommended minimum acoustic ratings for new doorsets and glazing are marked in the figure below.

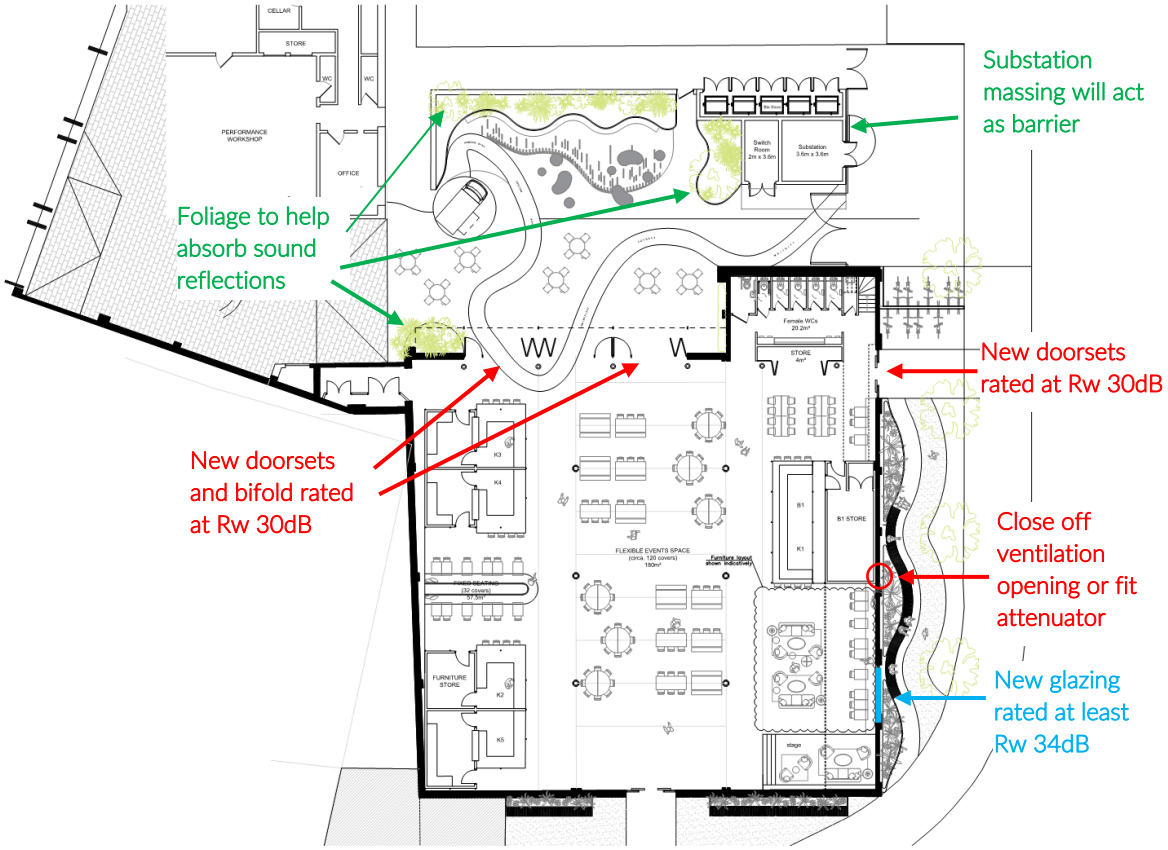
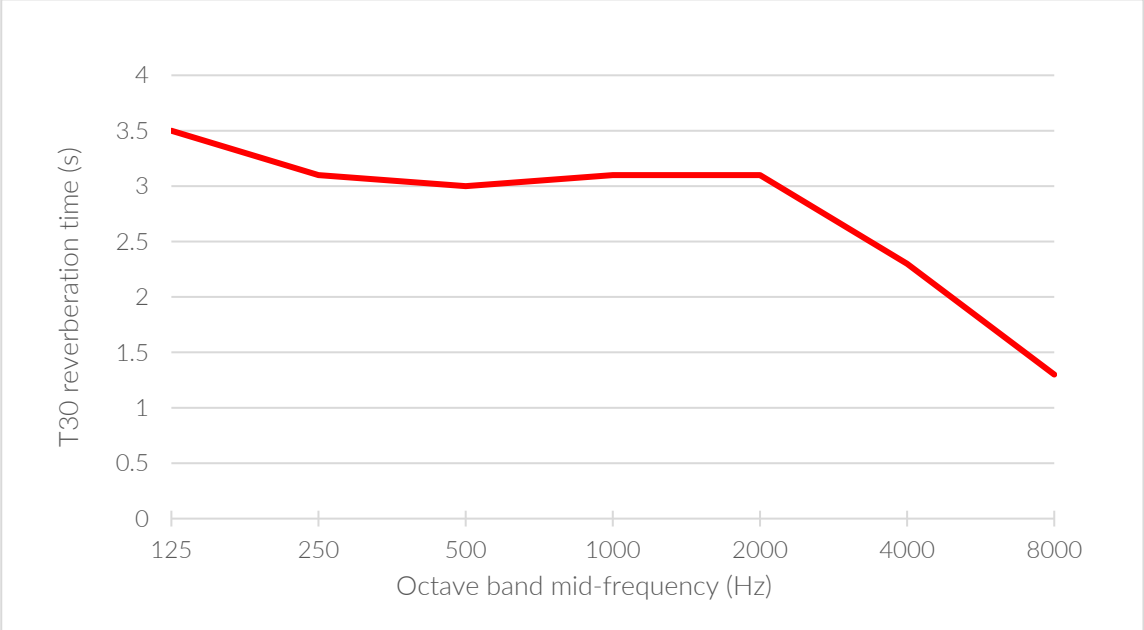


Figure 6 – Recommended noise control measures to the Market Hall and Garden area

5. Control of reverberation.

5.1 Baseline measurements.

A series of reverberation time measurements were made in the unfurnished Market Hall. The mean spectrum is shown in the graph below, indicating a mean mid-frequency reverberation time in the order of 3.1 seconds.



5.2 Main entertainment zone

For the proposed entertainment uses, a furnished and occupied mid-frequency reverberation time of in the order of 1.5 seconds in the central entertainment zone would be appropriate for the provision of reasonable levels of speech intelligibility, clarity of music and control of reverberant sound build-up.

Based on ODEON room acoustic model calculations and the baseline reverberation time measurements conducted in the unoccupied and unfurnished Market Hall, it is recommended to introduce approximately 232m^2 of Class A sound absorptive treatment in the hall.

Treatments such as 50mm thick fabric wrapped panels including 50mm thick mineral fibre can be cost effective, light weight and easy to install for this purpose. They are also available in a range of colours, or the cover fabric can be printed with images to suite the interior design scheme.

From the model analysis, effective locations for the treatment include:

- A 2.4m high band to the internal west façade wall
- A 2.4m high band to the internal south façade wall
- 2 x 18m high band to each side of the middle section of the roof below the glazing

For clarity, these locations are marked in red in Figure 7.

Other wall areas may also be effective as long as they are located on at least two non-parallel walls. It is worth noting that if the wall panels were fixed in front of the building services pipework around the hall perimeter, they would not only provide the benefit of concealing the pipes, but as they are set away from the wall, the void between the rear of the panels and the walls would improve the efficiency of the absorption at low frequency which would be especially beneficial for music uses of the hall.

In addition, the panels are lightweight and so could easily be designed to be removable to allow for maintenance access where required.

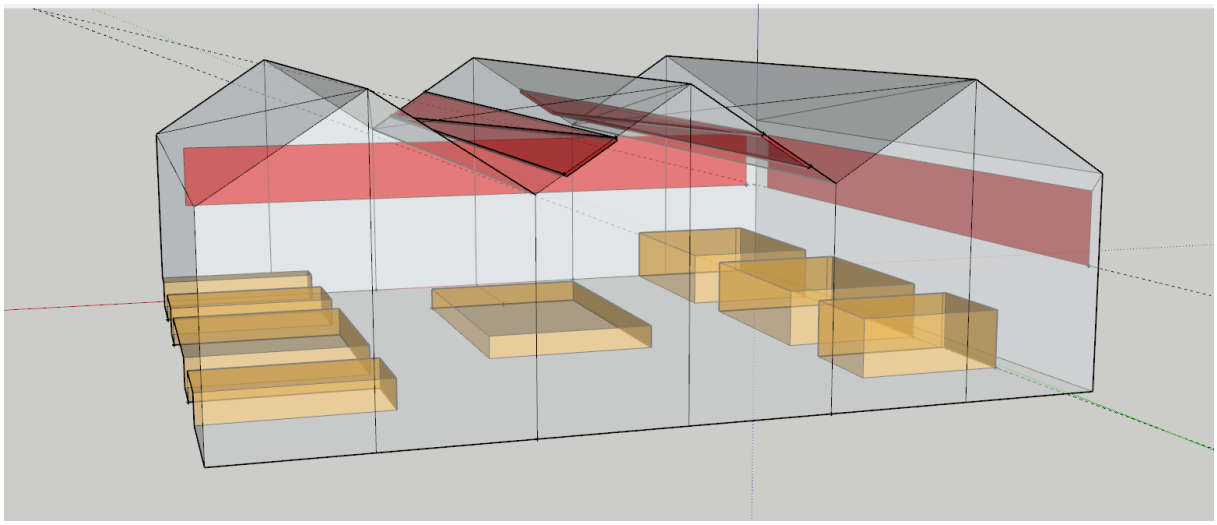


Figure 7 - Recommended locations of Class A sound absorptive panels to the Market Hall

5.3 Creation of relaxation zones.

A preference has been expressed for the creation of more relaxed zones to the periphery of the Hall.

These could be achieved with the combination of options including the introduction of soft furnishings, sound absorptive treatment to bar/ servery /stall fronts (such as slatted timber with 50% open area with 50mm thick sound absorptive mineral fibre behind with black tissue facing), Class A sound absorptive rafts suspended over the seating areas, and localised heavy fabric curtains (wool serge with mass at least 500g/m^2).

These types of measures are indicatively marked in the figure below.

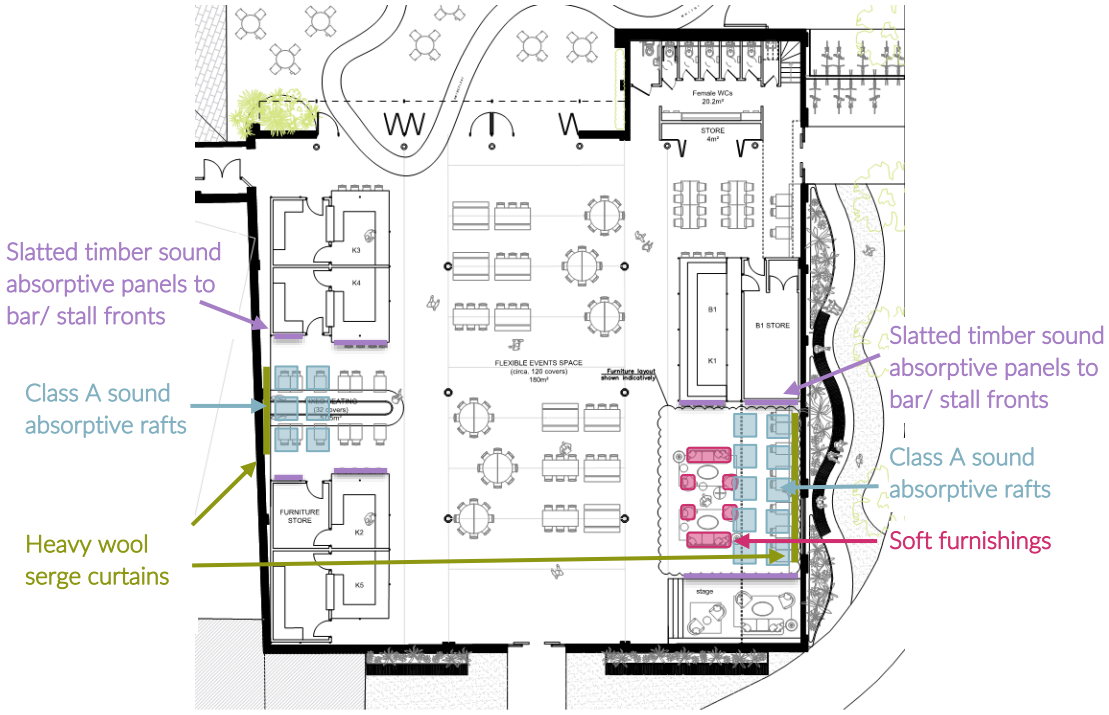


Figure 8 – Indicative locations for optional sound absorptive treatment to create relaxation 'zones'

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