Appendix 12

Theatre Plan - Theatre Consultant

CAMBRIDGE CORN EXCHANGE

DRAFT STAGE 2 - AUDITORIUM LAYOUT OPTIONS

REVISION P3, 31/10/2024

THEATRE

EXISTING CHALLENGES

The existing auditorium seats up to 1409. For standing events, the overall capacity increases to around 1550 (N.B. this figure includes the standing stalls audience plus the seated balcony audience). The space has a number of challenges. There is extremely limited headroom to the rear of the stalls (to the extent that patrons can hit their heads on the underside of the balcony). 84 of the seats in this rear stalls zone are sold as having 'no view of the stage'. The control booth is very small and the upward sightline for the operator is hampered by the deep overhang of the balcony above.

The retractable seating unit to the rear of the stalls is split into modules to 'wrap around' the substantial existing columns which support the balcony. Due to the modular nature of the seating units and the need to deploy and retract them sequentially, the turnaround time between seating and standing formats is longer than it would be with a single retractable unit.

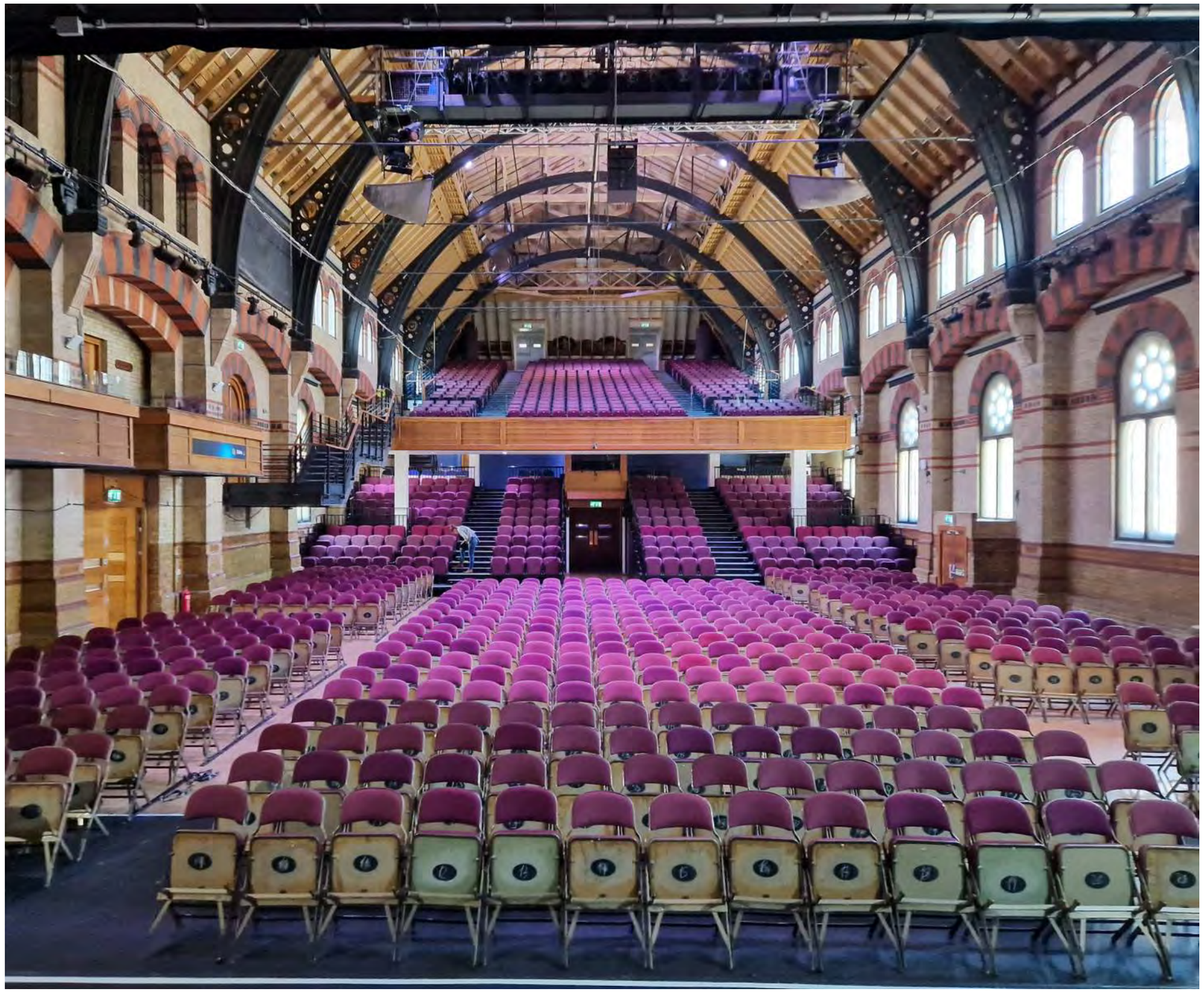
The inset gangways at stalls level (combined with the central vomitory entrance) mean that prime central zones are wasted on circulation rather than seats, whilst the seats are pushed to the sides of the room where sightlines aren't as good. The seats throughout the auditorium have reached the end of their useable life.

The venue's balcony is extremely deep. In addition to the 'letterbox' view that this creates for audience members at the rear of the stalls, it means that the seats towards the back of the balcony feel very remote from the stage. The rake of the balcony is very shallow and the seats are not staggered, meaning that the sightlines from virtually all of the balcony seats are poor. Furthermore, as at stalls level, head height is very limited at the rear of the balcony – due in this case to the eaves of the roof.

Part of the current escape strategy for the balcony is an unsightly stair which crosses in front of the ornate arched windows. An associated crossover row in front of Row A creates a 'gulf' between the seating and the balcony front. Subject to agreement with the fire consultant and building control, the ideal scenario would be to eliminate both this staircase and the widened row.

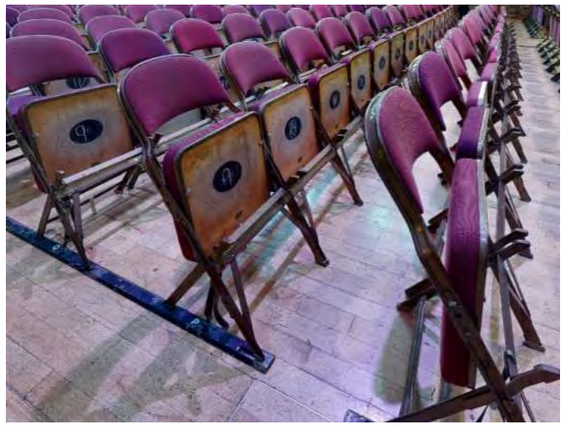
The balcony has an uncomfortable relationship with the period windows. The balcony insertion has not been sensitively carried out and as such it goes through the middle of the windows rather than working around them.

Wheelchair provision in the existing auditorium is limited. Wheelchair positions are located within the 2 side boxes and on the flat floor. There are no wheelchair positions on the main balcony. For an auditorium of this capacity, the number of wheelchair positions should equal 1% of the seating capacity - i.e. 14 positions (though these do not have to be permanent). The wheelchair spaces should be distributed throughout the auditorium to offer a choice of vantage point.

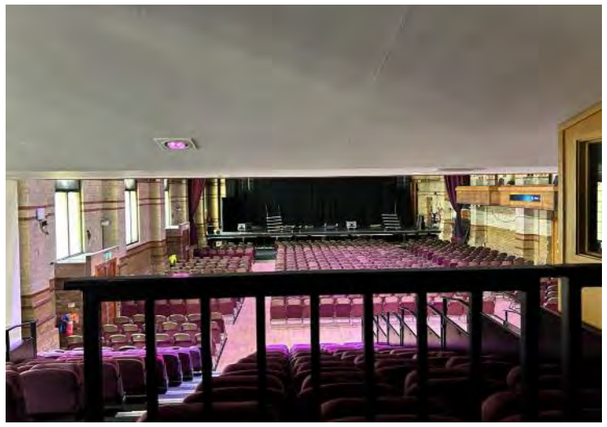


The existing auditorium looking from the stage.

EXISTING CHALLENGES



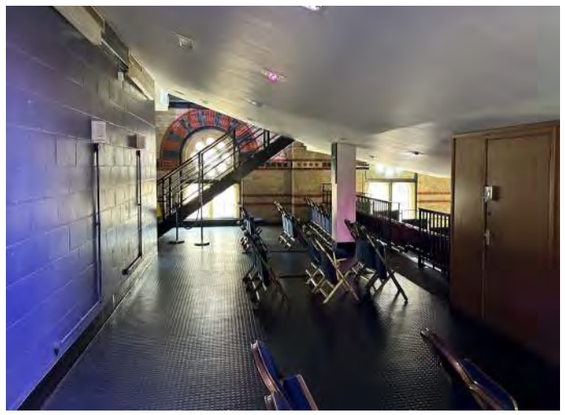
Seats are narrow with constrained legroom. They don't provide the comfort levels modern audiences expect and they are looking tired.



'Letterbox' view at the rear of the stalls due to the deep overhang. 84 seats at the rear of the stalls are sold as having no view of the stage.

With its convoluted arrangement wrapping around the columns, the retractable unit is more complex to operate, extending turnaround times.

Inset gangways occupy prime, optimum sightline positions where there should be seats (whilst the seats are pushed to the perimeter).



Audience members can bang their heads on the underside of the balcony - a major safety hazard. This zone feels claustrophobic.

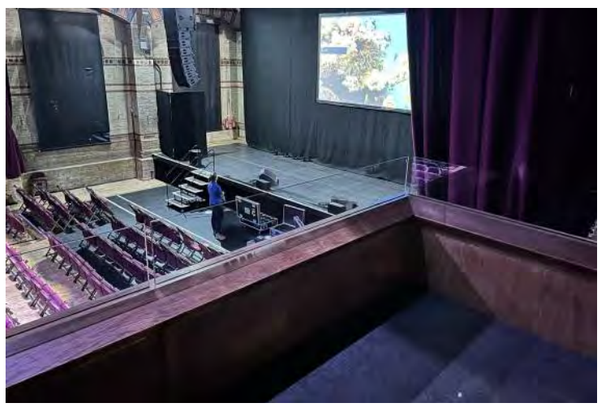
Escape stair is visually obtrusive within the space.

Shallow balcony rake means a reliance upon looking through a glass rail (rather than looking over a solid rail). This creates distracting reflections.

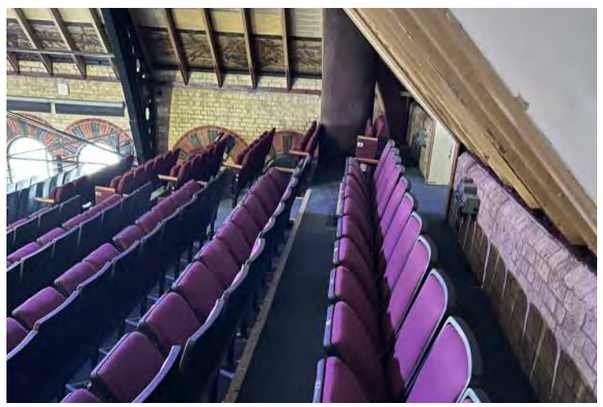
Balcony level sightlines are very poor as the rake is not steep enough and the seats are not staggered.

The balcony has not been sensitively inserted in relation to the period windows. The photo above also shows the mismatched seats.

The back of the Balcony feels very remote from the stage.



Under-provision of wheelchair spaces. For the existing seating capacity, 14 wheelchair positions should be provided in a variety of locations.



Head height is very constrained to the back row of the balcony as this sits right underneath the eaves.

ROW SPACINGS AND SEAT WIDTHS

Row spacings

The guidance in the *Technical Standards for Places of Entertainment* ('Yellow Book') is that, depending upon the design of the seat, 'good practice' row spacing is between 850mm and 900mm back-to-back. The current retractable seating unit has row spacings of approximately 840mm. The current fixed seating at balcony level is generally at around 815mm back-to-back.

In the proposed options:

- Option A has more compact row spacings than the other options. The flat floor seating and rear stalls seating is at 850mm back-to back. The retractable unit row spacings are 875mm. At balcony level, the row spacings remain as existing (i.e. below 'good practice' guidelines) since there is no re-raking in this option.
- Option B, C and D have 900mm row spacings at both stalls and balcony level.

Seat widths

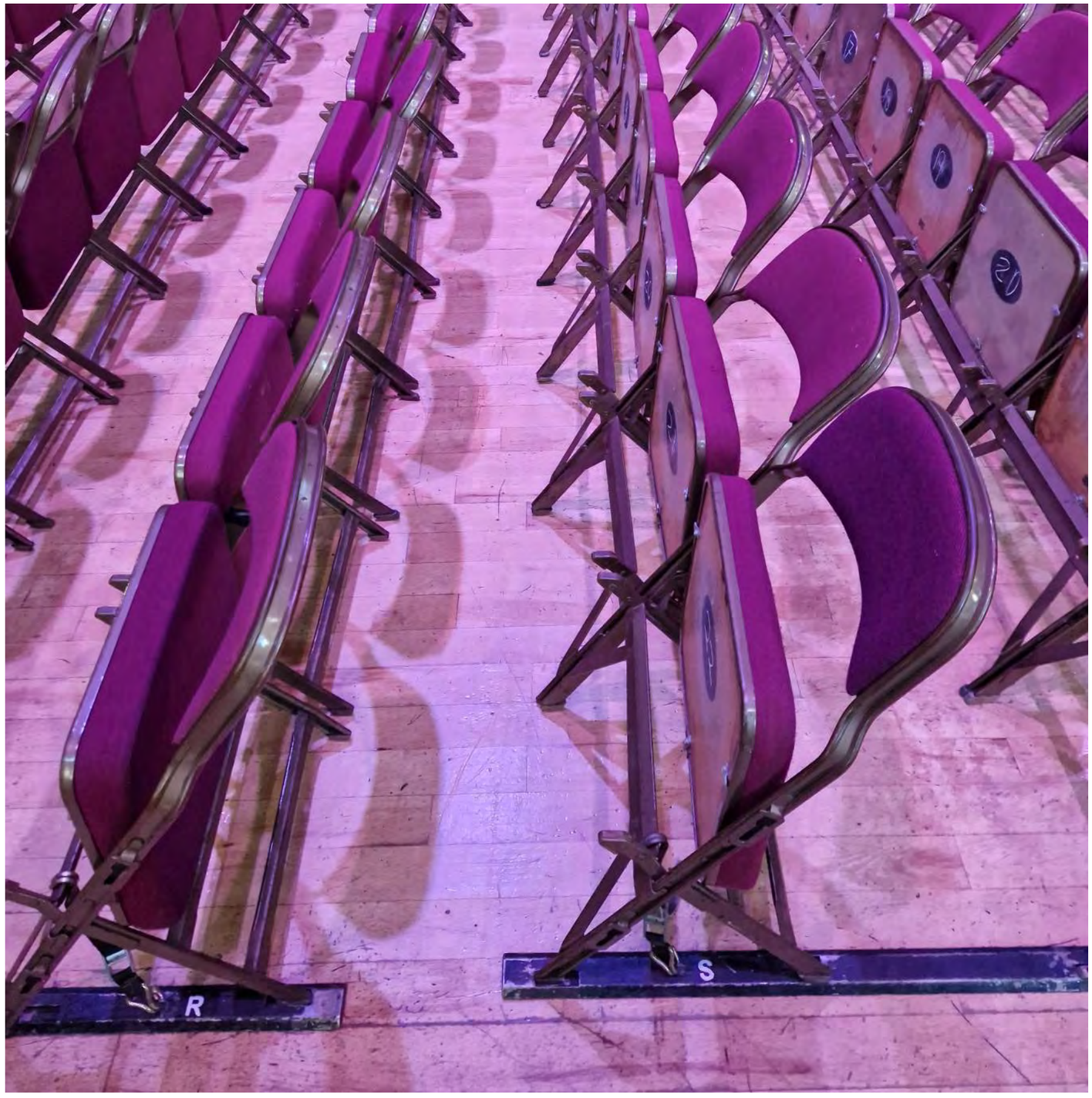
The guidance in the *Technical Standards for Places of Entertainment* is that for seats with armrests, the minimum width requirement is 500mm - but 'good practice' is at least 525mm-550mm. For seats without armrests, 450mm is the minimum, but the good practice recommendation is at least 500mm.

The existing folding seats in the stalls are at 460mm centres (no armrests) and the retractable unit seats are at 475-480mm centres (no armrests). At balcony level, the seats with armrests are generally at 500-510mm centres and the seats without armrests are at approximately 450mm centres.

In the options proposals on the following pages, we have kept seat widths narrower than we would ordinarily recommend so as to try and limit the loss in capacity (given the narrow existing seat widths). In the proposed options, seat widths are generally 500mm, with a small number of 525mm and 550mm seats to give a straight edge to gangways.

In Option A, the more compact row spacings mean that flip-up armrests or no armrests would be required to achieve the required stalls seatway dimension. To reinstate the existing seat count at balcony level in Option A, some seats would need to remain less than 500mm wide. To bring all seats up to min. 500mm in Option A would mean losing 8 balcony seats.

The armrests vs. no armrests issue can be discussed in further detail at the next design stage. It would make sense to adopt a consistent approach throughout the auditorium.



The existing stalls seating.

FLAT FLOOR SEATING

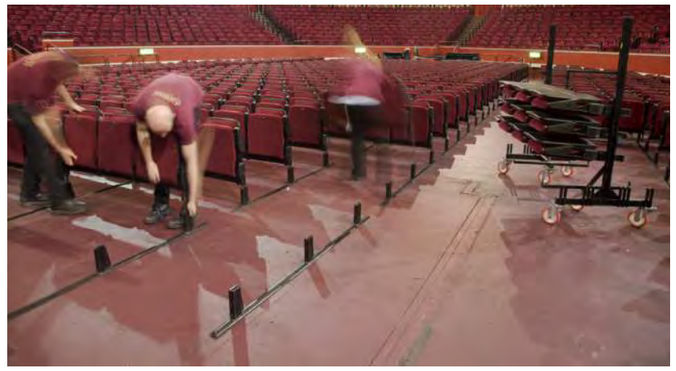
A number of layout options have been explored for the auditorium. Each has both pros and cons and some involve more drastic (and therefore more costly) remodelling of the space than others. For instance, the options which re-rake the balcony dramatically improve the sightlines and legroom at this level, provide a much better control room view, and offer the opportunity to create additional wheelchair positions (at the rear). However, this comes at the expense of losing a large number of seats. Similarly, the options which provide the largest area of increased foyer space at first floor level reduce the number of seating rows within the auditorium.

Stalls flat floor seating
Although the exact amount varies between the different options, a large portion of the stalls seating will inevitably need to remain on the flat floor so that the seating can be removed for a standing audience. The exact nature of this flat floor stalls seating will be explored in more detail at the next design stage. Several systems could be considered:

Flat floor seating - Option 1
The 'baseline' option from a cost perspective would be something like the Hussey Logix system or the Audience Systems Matrix system. These fixing free systems use removable floor bars and theatre-style seats with a flip-up seat pan. They are the 'default' option for venues of this type where large numbers of seats are required on the flat floor. The floor bars keep the row spacings consistent and prevent the rows from 'snaking'. The self-tipping seats allow for closer row spacings than would be possible with stacking chairs. With these systems there is the option to configure the seating in different layouts if, for instance, the venue decided to build a thrust or catwalk style stage or hold a performance in the round. The seats and floor bars stack on trolleys. The trolleys are designed to suit the specific project. Ideally, the trolley dimensions would be tailored around at least some of the seats being stored underneath the stage. A detailed storage study will be developed with the seating manufacturer at the next stage of design. Early discussions with seating manufacturers suggest that motorised trolleys may be the best option in order to make use of the full depth of the under-stage zone. The biggest drawback of Option 1 is the fact that the seating is quite time-consuming and labour intensive to set out (particularly where there is some variation in seat width to allow for a stagger whilst achieving neat row ends).

Flat floor seating - Option 2
The more 'involved' option would be to use a product such as the Figueras Mutarail system, where the deployment of the seats is automated (with the seats running within recessed floor guides). Operationally, this system offers considerable time savings as the space can switch between seated and standing mode at the touch of a button. The number of technicians required to reconfigure the space is minimal and there is no manual labour. However, storage of the seats underneath the stage does not seem viable as the existing stage is relatively low and so there isn't sufficient space to accommodate the sort of very deep beam which would be required along the leading edge of the stage to provide an uninterrupted span. Once the span is divided by columns, it becomes difficult to make such a system work efficiently without losing seats (particularly when the rows are staggered). To make the Mutarail system work, the best approach would probably be to make the 2 pit lifts into double decker lifts, where the seats can be stored on the lower deck. With their existing footprint, the pit lifts would accommodate approximately 20-21 of the stored seating rows – so they would need to be enlarged in order to store the remaining 6-7 rows. The depth of the existing pit would likely need to be increased to accommodate the double decker lifts (although this will not be known until a measured survey of the pit is carried out at the next work stage). The cost of the excavation and modifications to the pit envelope, the new double decker lifts and the seating system itself would therefore make the Mutarail a significantly more expensive option. The Mutarail system relies upon a fixed, end stage layout. It does not give the option to do thrust stage / in the round configurations etc.

Flat floor seating - Option 3
The final option falls somewhere between the Logix/Matrix systems and the Mutarail system. This is products such as the Figueras Mutawheel system and the Kotobuki K-Roll system. Such systems consist of groups of 6-7 seats on wheels. The doubling up of armrests between each group means that the seating capacity would be slightly reduced using this system (compared to the currently drawn layouts). The smaller seat groupings could potentially open up the possibility of dividing up the stage edge span with more supporting columns than the Mutarail system allows (with a view to storing seats underneath the stage). However, given that there is less than 150mm depth to play with for the leading edge of the stage (to achieve the required clearance height for storing seating underneath), this would still be very challenging – even with the span broken up by columns. A detailed design exercise would be required (working with the structural engineer and the seating manufacturer) to determine whether storage underneath the stage is feasible or not. Furthermore, if storage underneath the stage does prove viable, it is unlikely that all of the seats could be accommodated here - so some would still need to stored elsewhere (or a similar double decker lift option could be considered as in Option 2). As this is a manual system, operators would need to crawl underneath the stage to retrieve the seats stored towards the back (or seats would have to be hooked out in some way using a pole or similar) – which is less than ideal. Cost-wise, this option would fall somewhere between Option 1 and Option 2.



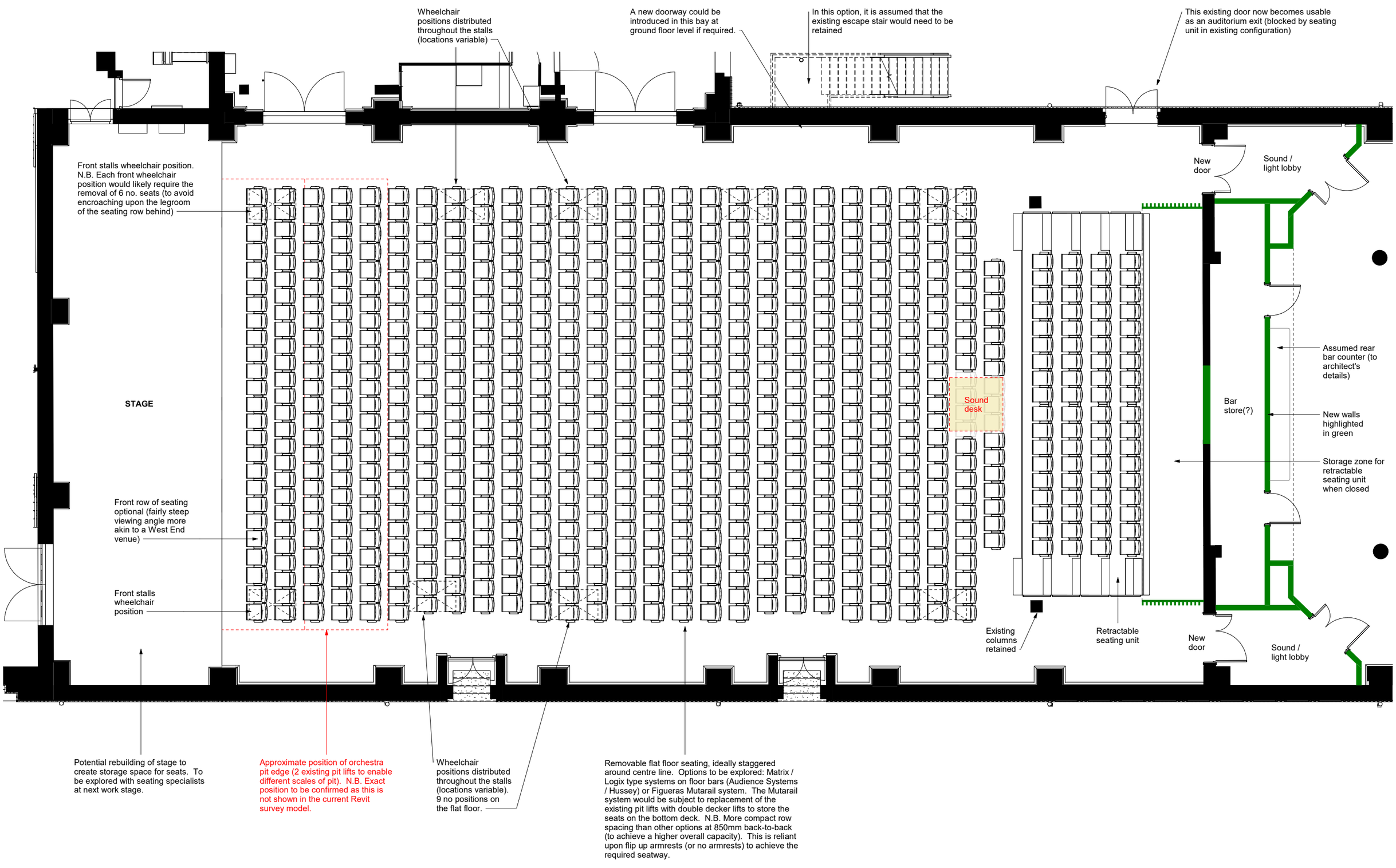
Top 2 images: Option 1 (in this case the Audience Systems Matrix system, though the Hussey Logix system is very similar)

3rd image: Option 2 (Figueras Mutarail system)

Bottom image: Option 3 (in this case the Figueras Mutawheel system, but the Kotobuki K-Roll system is very similar)

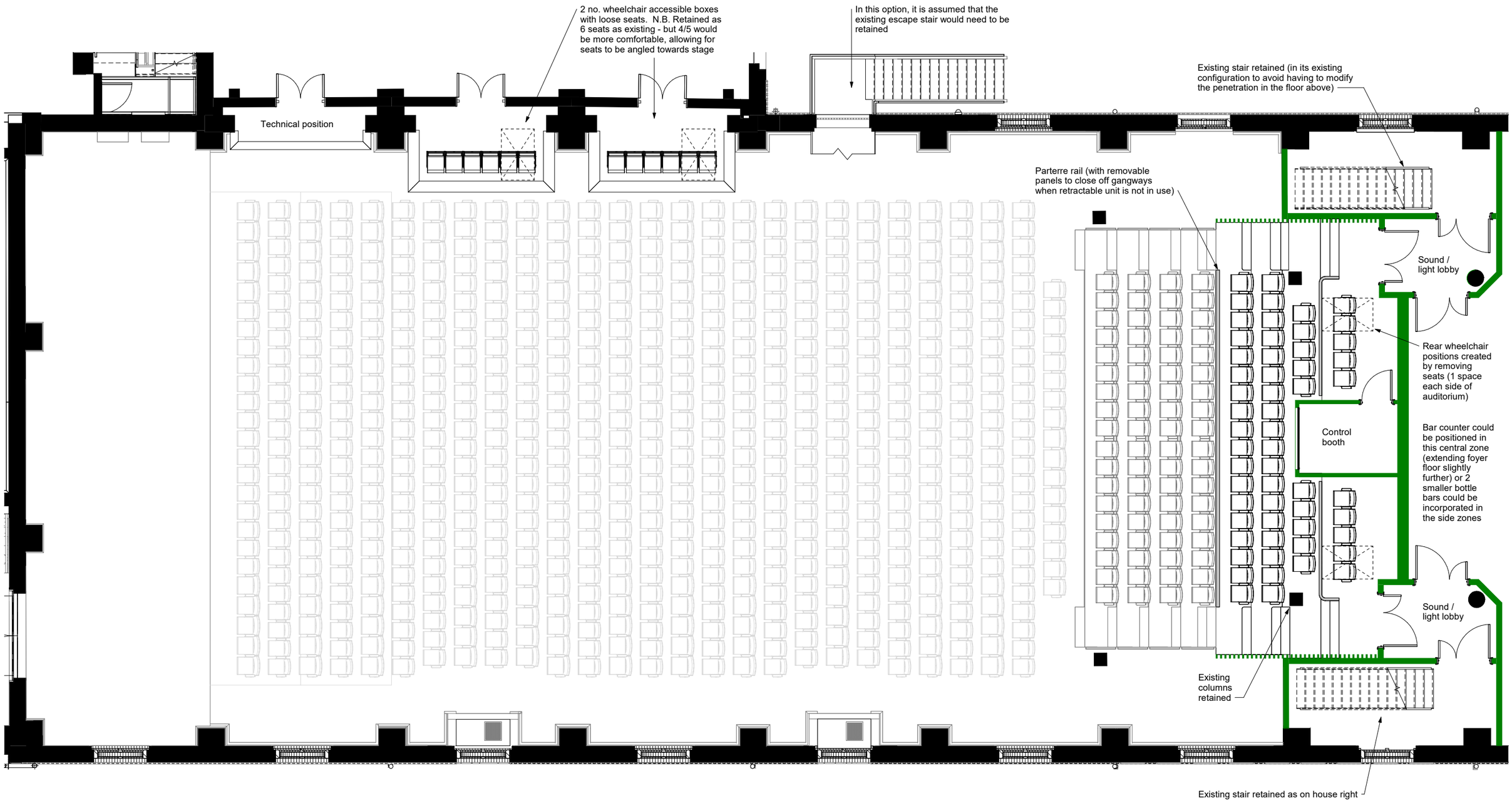
STALLS OPTION A1 (& A2)

Ground floor plan



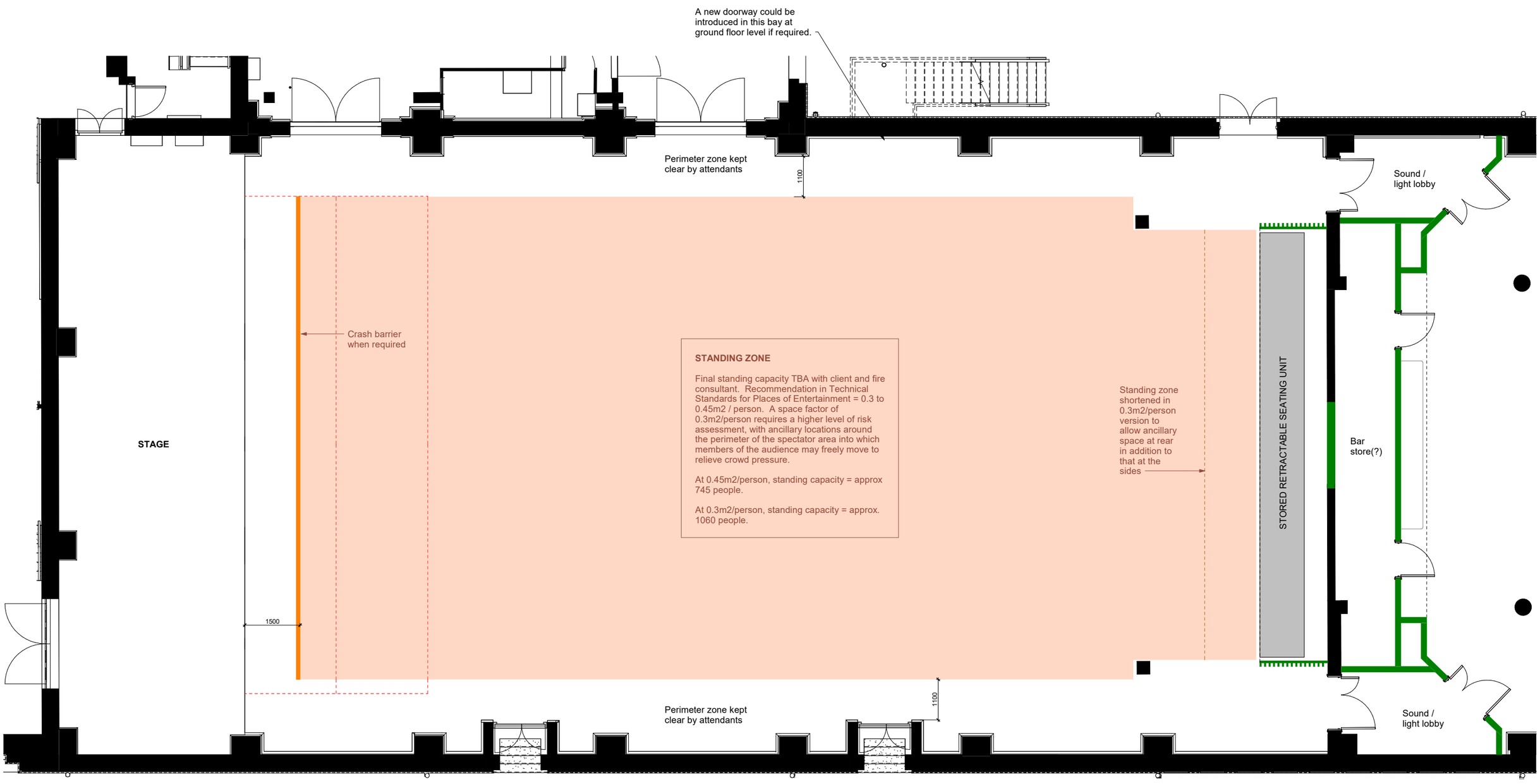
STALLS OPTION A1

First floor plan



STALLS OPTION A1

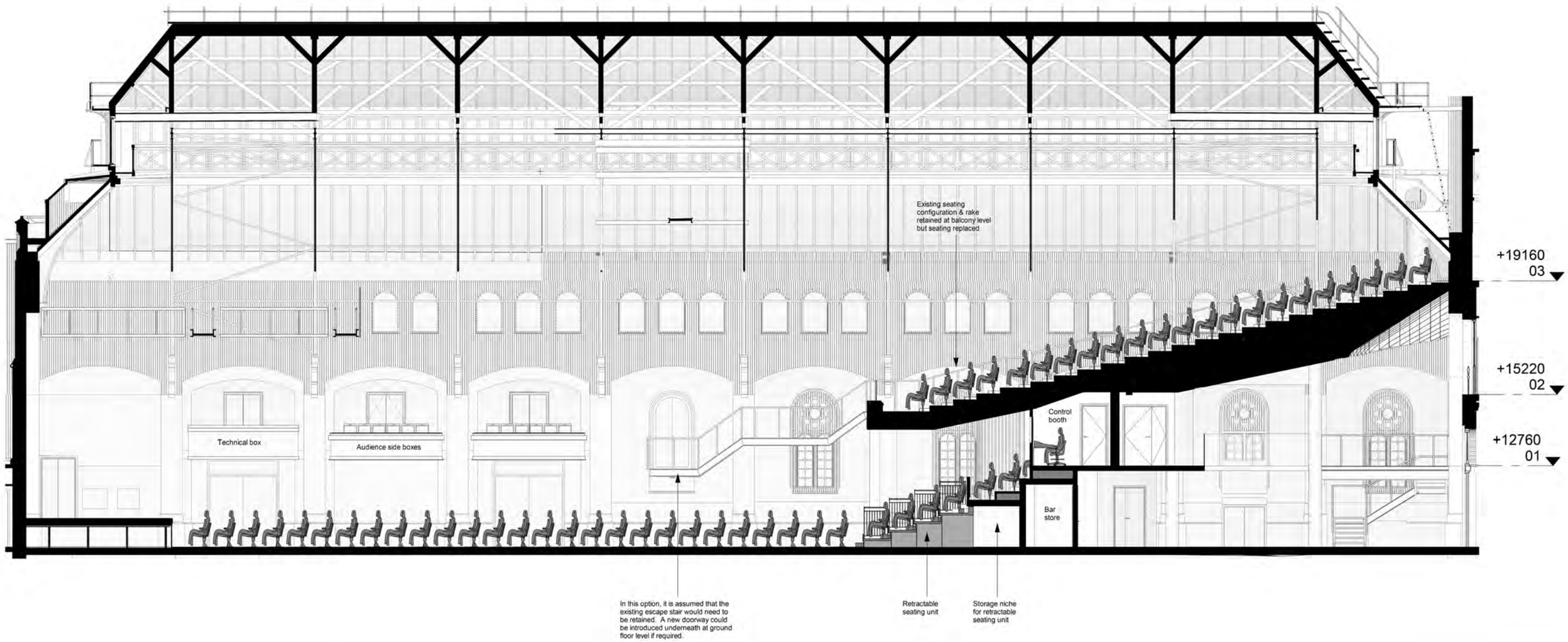
Ground floor plan - Standing Event



N.B. This standing layout also applies to Option A2

STALLS OPTION A1

Long section



Seating Capacities (without extended stage or orchestra pit)

Stalls capacity (allowing for sound desk)
798 seats (or 754 with 11 wheelchair positions)

Balcony capacity (including boxes)
496 seats (or 492 seats with 2 wheelchair positions)*

TOTAL = **1294** (or 1246 with 13 wheelchair positions)
**N.B. This figure assumes that the existing balcony layout is re-instated, but with a minimum seat width of 500mm – i.e. 6 less seats than in the existing layout.*
If possible, we would recommend omitting a further 18 seats - those in Row YY (where head height is very constrained) and a couple of seats from the side boxes (to create more space here). If these seats were omitted, it would bring the overall auditorium capacity to 1276.

Standing events (without extended stage or orchestra pit)

Stalls standing capacity *(N.B. This may be slightly reduced by up to approx. 35 people where travelling bands set up their own control booth in the flat floor zone - booth size varies)*
745 (if allowing 0.45m2/person) or 1060 (if allowing 0.3m2/person)

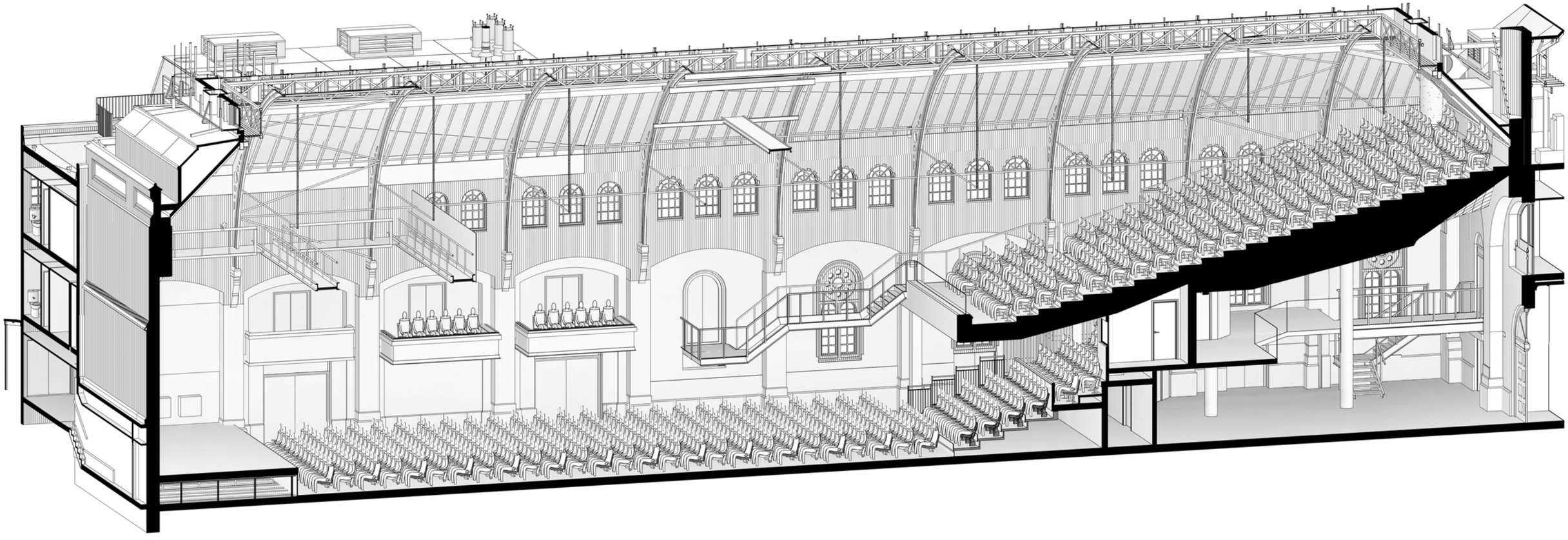
Rear stalls seated capacity
56 seats (or 52 seats with 2 wheelchair positions)

Balcony capacity (including boxes)
496 seats (or 492 seats with 2 wheelchair positions)*

TOTAL (at 0.45m2/person) = **1297 (or 1289 with 4 wheelchair positions)**
TOTAL (at 0.3m2/person) = **1612 (or 1604 with 4 wheelchair positions)**
**See left hand note regarding balcony capacity*

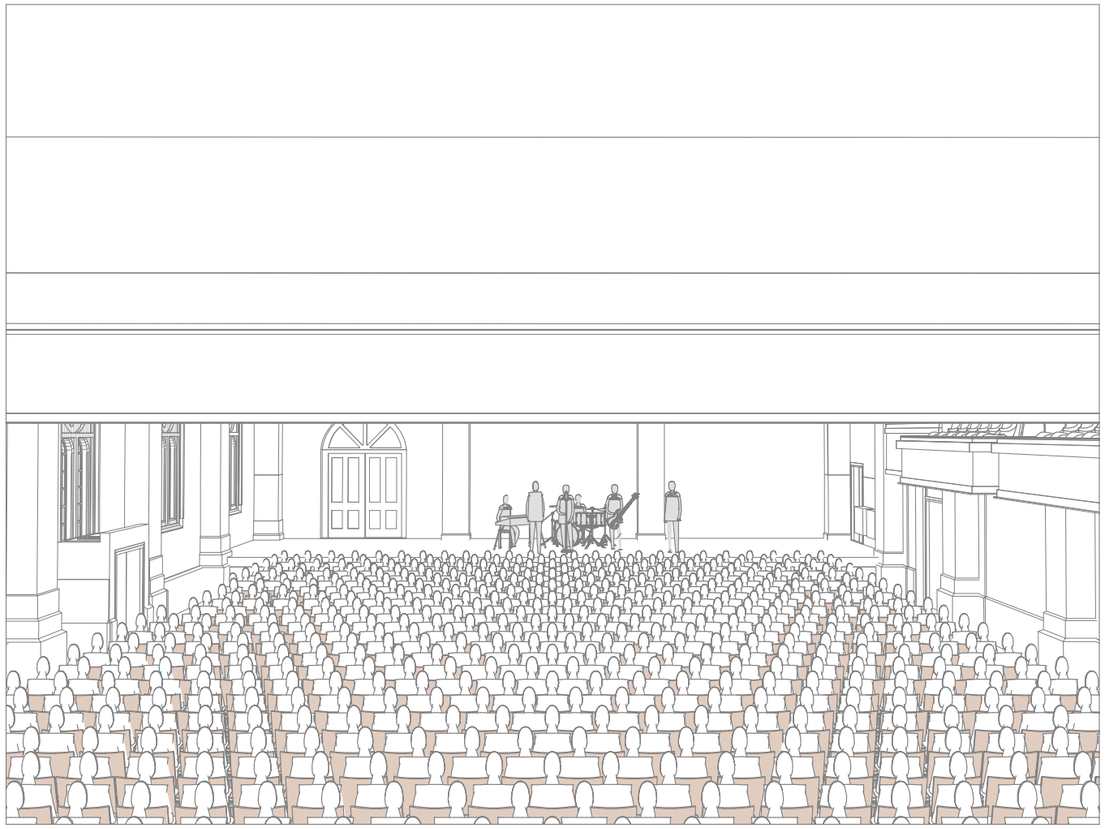
STALLS OPTION A1

Perspective section



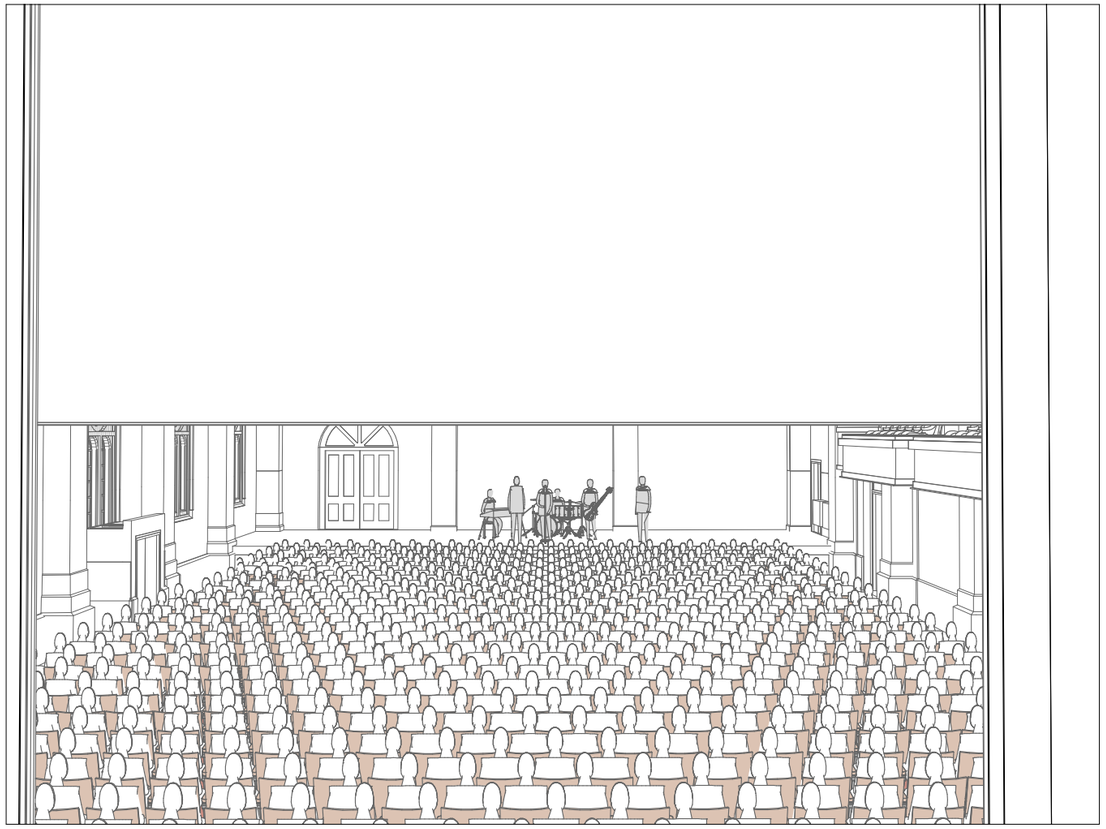
STALLS OPTION A1

Control room sightline



Existing control room sightline

The existing control room sightline is not particularly good due to the deep balcony overhang, which creates a 'letterbox' view for the operator. Their upward sightline is compromised.



Proposed control room sightline - Option A

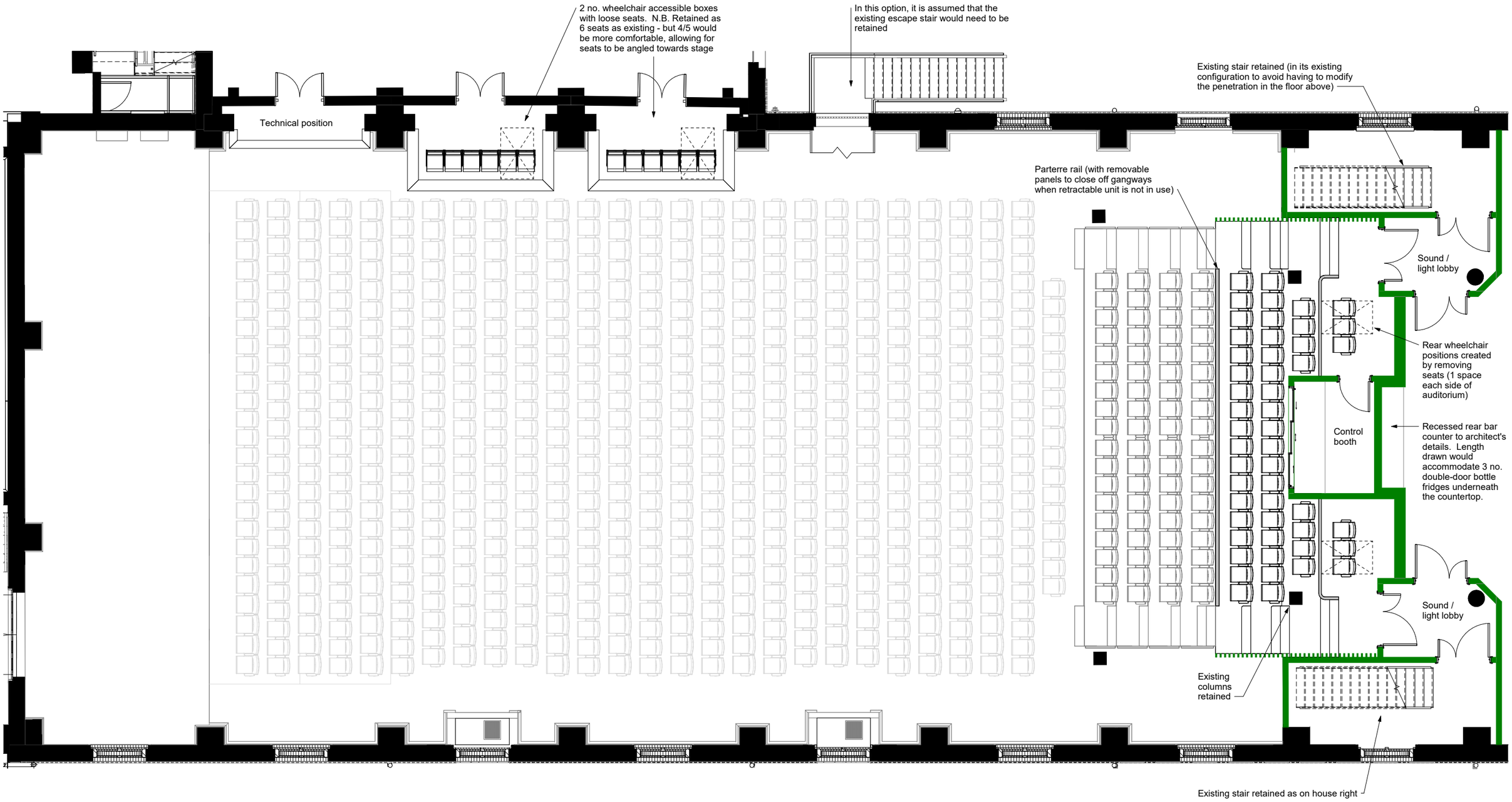
Option A is the only option which keeps the control room at stalls level. The other options relocate it to balcony level to improve the operator's view. In Option A, the control booth is shifted back slightly in order to improve the rear stalls seating layout. This technically makes the operator's sightline slightly worse than it is at the moment, although as the image above shows, this difference is barely discernible. The 'less than ideal' control room sightline in Option A is one of the trade-offs against the benefit of the higher seat count.

Sound is not controlled from this booth - it is controlled from a sound desk on the flat floor (so that it is not distorted by the balcony overhang). Only lighting is operated from the enclosed booth.

STALLS OPTION A2

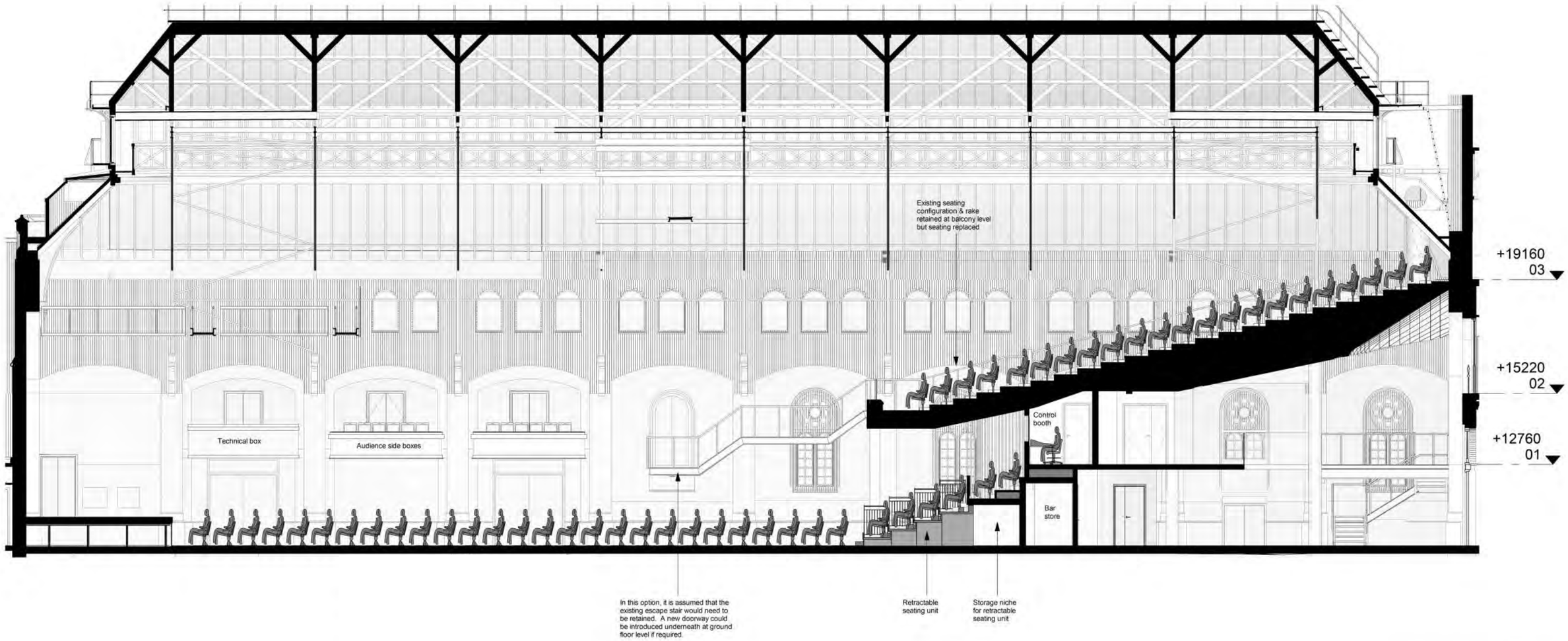
First floor plan (Ground floor plan is as per Option A1)

N.B. This is the option that forms the basis of the Stage 2 plans.



STALLS OPTION A2

Long section



Seating Capacities (without extended stage or orchestra pit)

Stalls capacity (allowing for sound desk)
792 seats (or 748 with 11 wheelchair positions)

Balcony capacity (including boxes)
496 seats (or 492 seats with 2 wheelchair positions)*

TOTAL = **1288** (or 1240 with 13 wheelchair positions)
**N.B. This figure assumes that the existing balcony layout is re-instated, but with a minimum seat width of 500mm – i.e. 6 less seats than in the existing layout.*
If possible, we would recommend omitting a further 18 seats - those in Row YY (where head height is very constrained) and a couple of seats from the side boxes (to create more space here). If these seats were omitted, it would bring the overall auditorium capacity to 1270.

Standing events (without extended stage or orchestra pit)

Stalls standing capacity *(N.B. This may be slightly reduced by up to approx. 35 people where travelling bands set up their own control booth in the flat floor zone - booth size varies)*
745 (if allowing 0.45m2/person) or 1060 (if allowing 0.3m2/person)

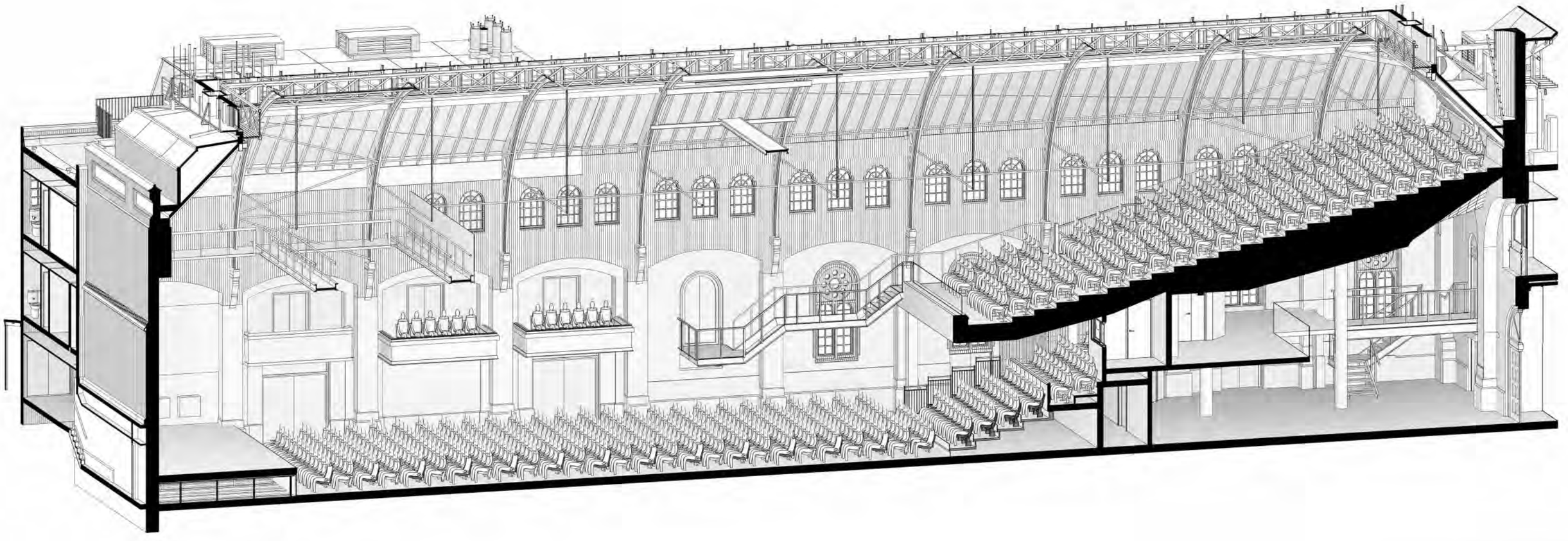
Rear stalls seated capacity
50 seats (or 46 seats with 2 wheelchair positions)

Balcony capacity (including boxes)
496 seats (or 492 seats with 2 wheelchair positions)*

TOTAL (at 0.45m2/person) = **1291** **(or 1283 with 4 wheelchair positions)**
TOTAL (at 0.3m2/person) = **1606** **(or 1598 with 4 wheelchair positions)**
**See left hand note regarding balcony capacity*

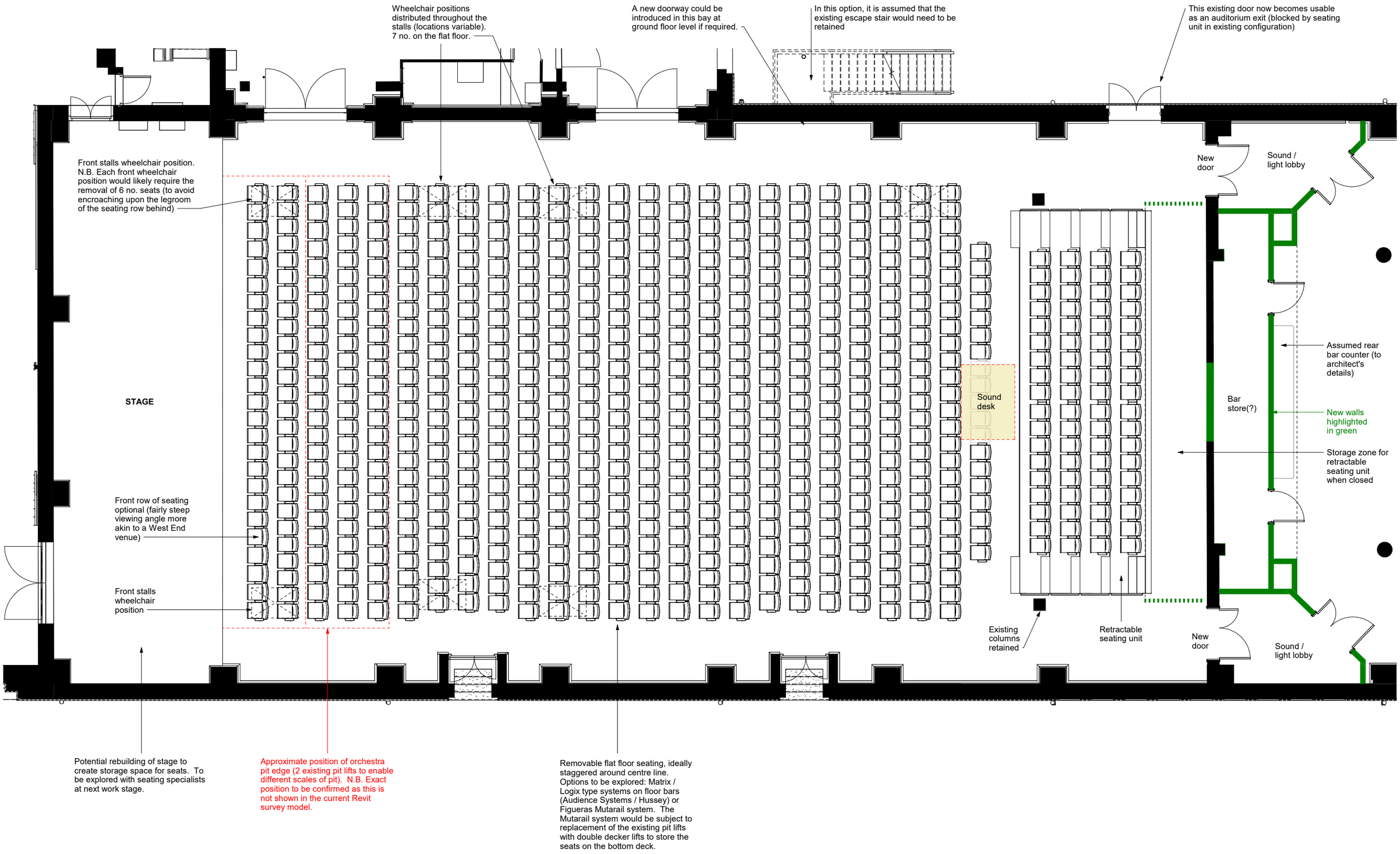
STALLS OPTION A2

Perspective section



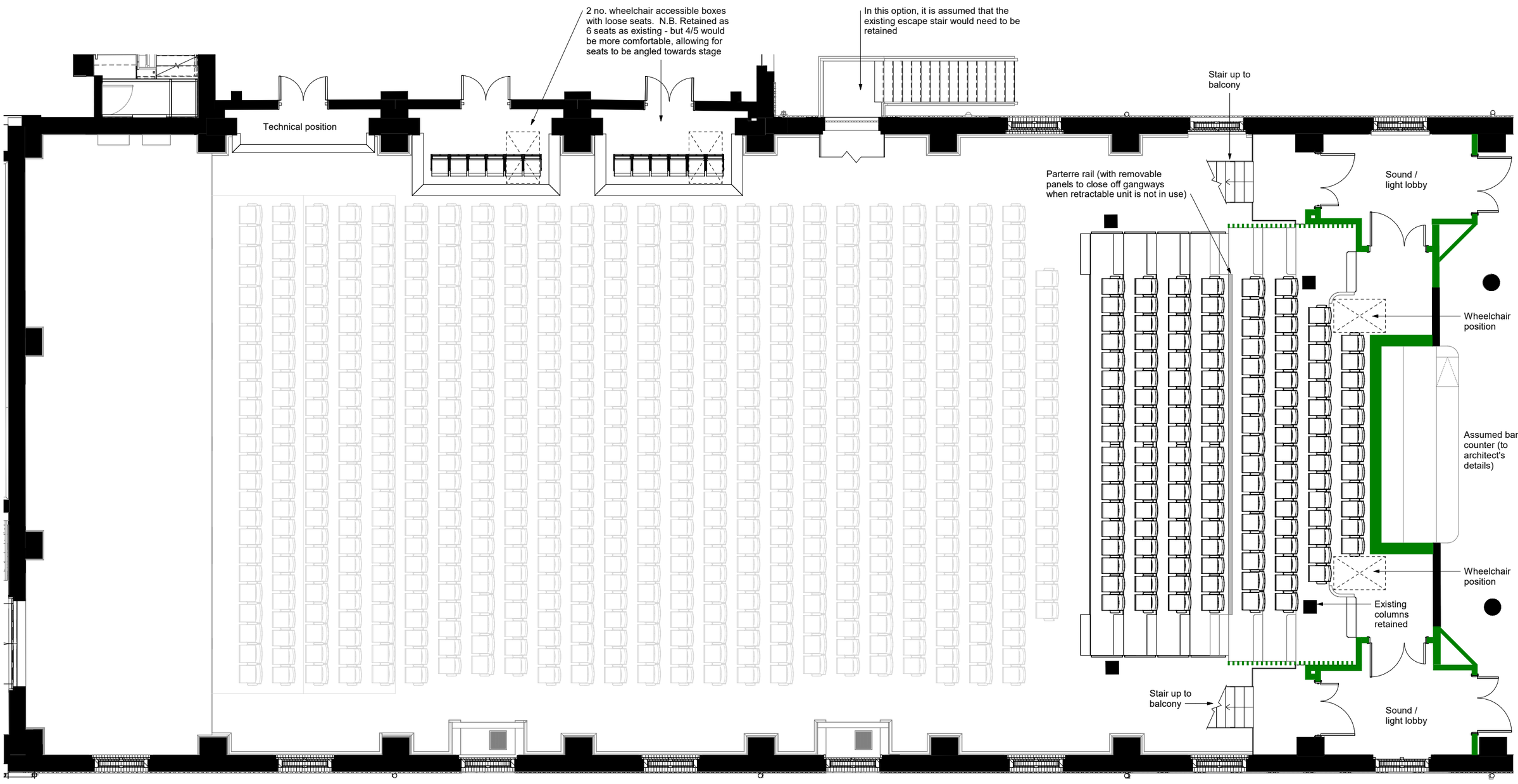
STALLS OPTION B

Ground floor plan



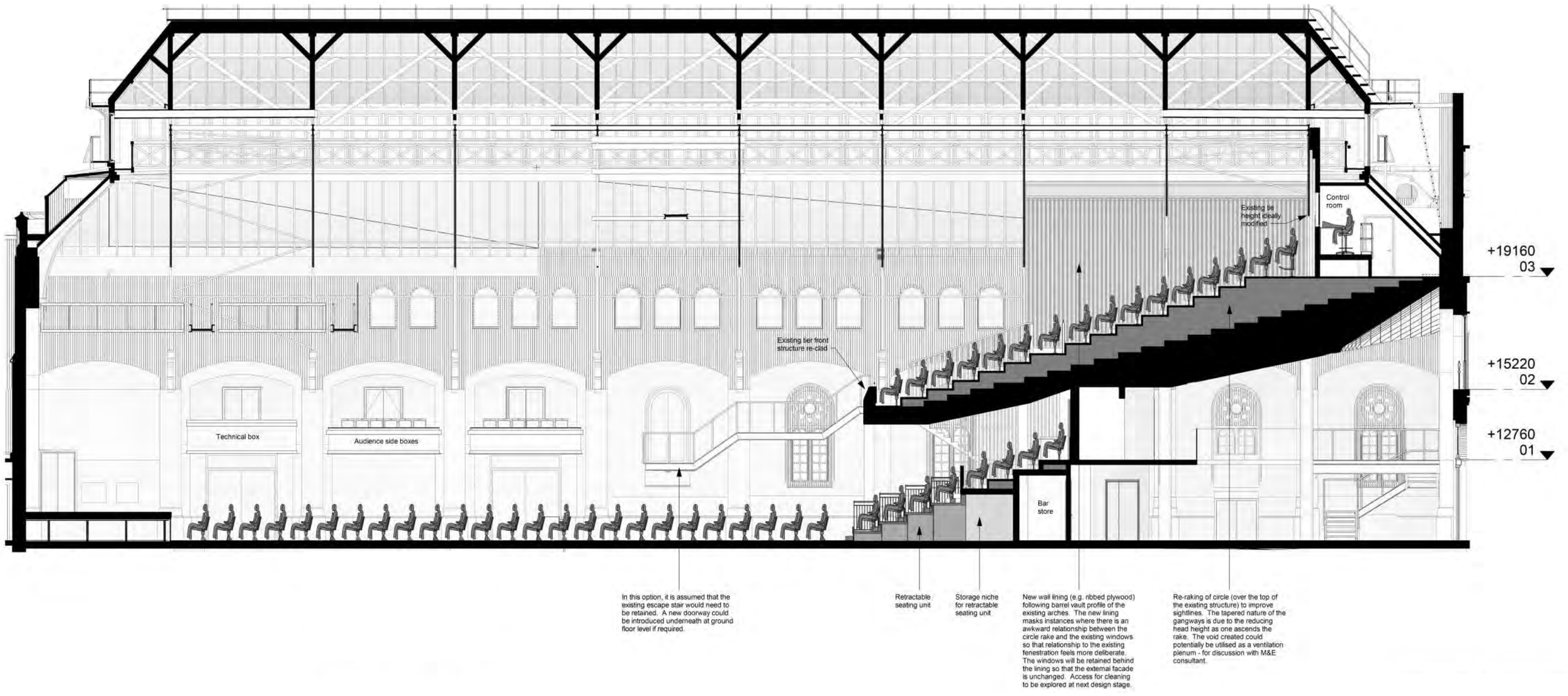
STALLS OPTION B

First floor plan



STALLS OPTION B (WITH BALCONY RE-RAKING)

Long section



Seating Capacities (without extended stage or orchestra pit)

Stalls capacity (allowing for sound desk)
757 seats (or 725 with 9 wheelchair positions)

Balcony capacity (including boxes)
308 seats (or 304 seats with 2 wheelchair positions)

TOTAL = **1065** (or 1029 with 11 wheelchair positions)

Standing events (without extended stage or orchestra pit)

Stalls standing capacity *(N.B. This may be slightly reduced by up to approx. 35 people where travelling bands set up their own control booth in the flat floor zone - booth size varies)*
745 (if allowing 0.45m2/person) or 1060 (if allowing 0.3m2/person)

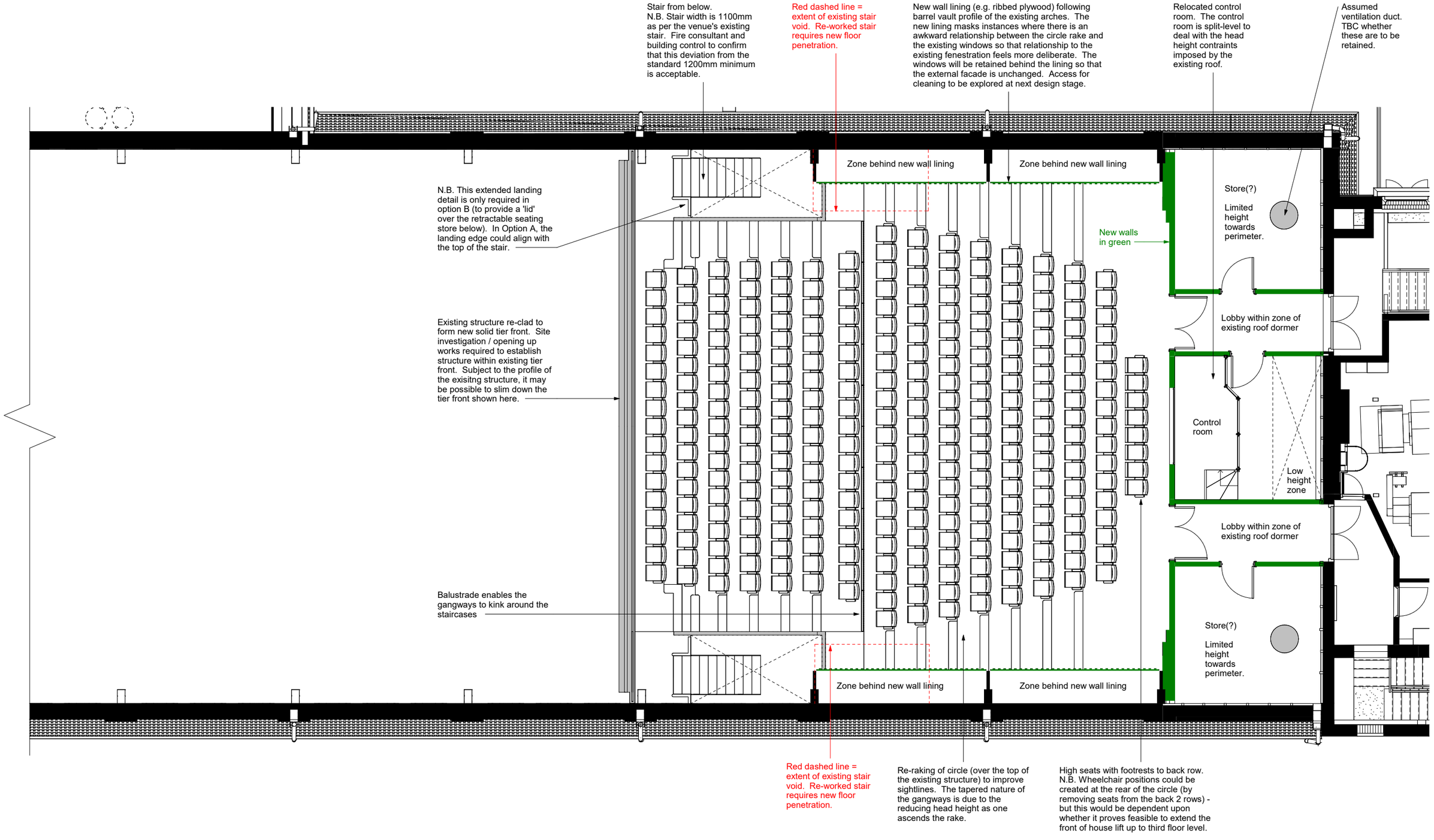
Rear stalls seated capacity
62 seats with 2 permanent wheelchair positions

Balcony capacity (including boxes)
308 seats (or 304 seats with 2 wheelchair positions)

TOTAL (at 0.45m2/person) = **1115** **(or 1111 with 4 wheelchair positions)**
TOTAL (at 0.3m2/person) = **1430** **(or 1426 with 4 wheelchair positions)**

BALCONY RE-RAKING OPTION

Second/Third floor plan

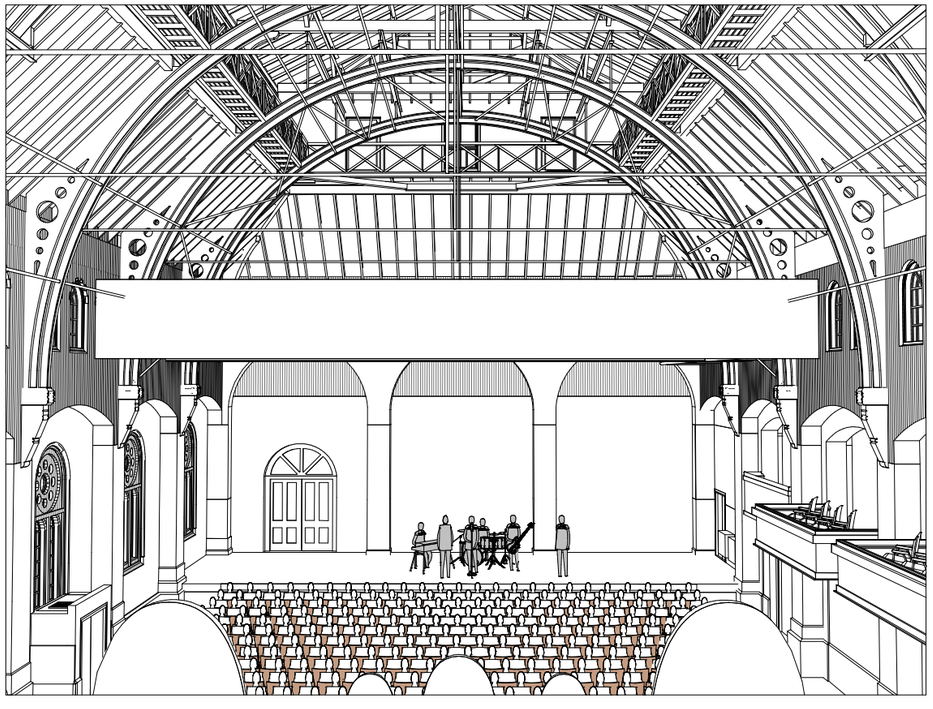


BALCONY RE-RAKING OPTION

Sightlines comparison

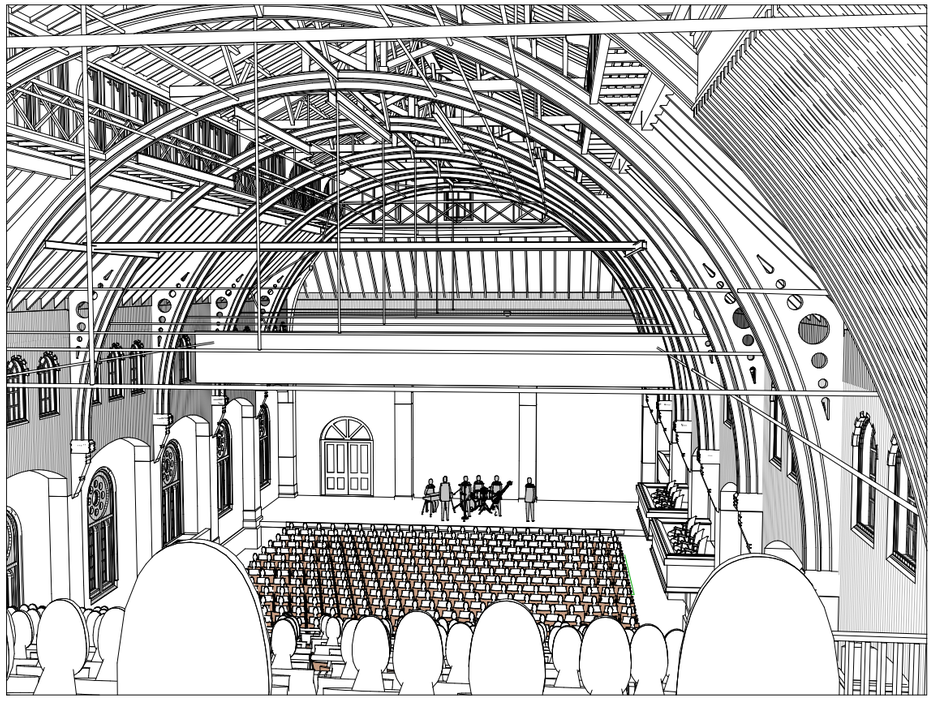
The existing balcony seats have generally poor sightlines due to the shallow rake and the absence of a stagger between seating rows. Whilst it would reduce the seating capacity, re-raking the balcony would considerably improve the sightlines (and legroom). The plenum created could potentially be used for under-seat supply ventilation. Wheelchair positions could be provided at the rear of the balcony (subject to third floor lift access).

Existing sightline, 4th row



Proposed sightline (re-raked balcony), 4th row

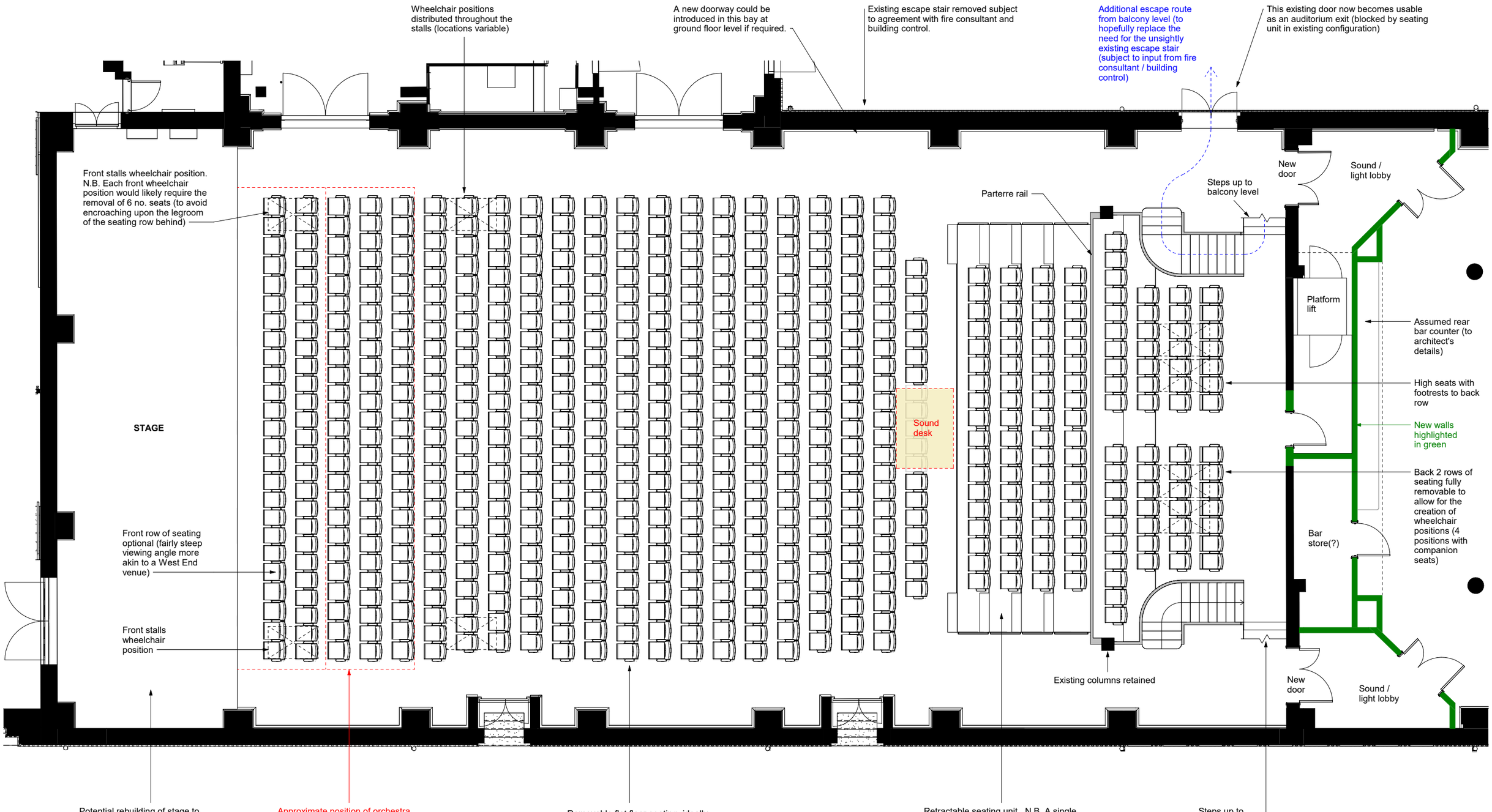
Existing sightline, 15th row



Proposed sightline (re-raked balcony), 15th row. N.B. If wheelchair positions were provided at the rear of the balcony, this would be the view.

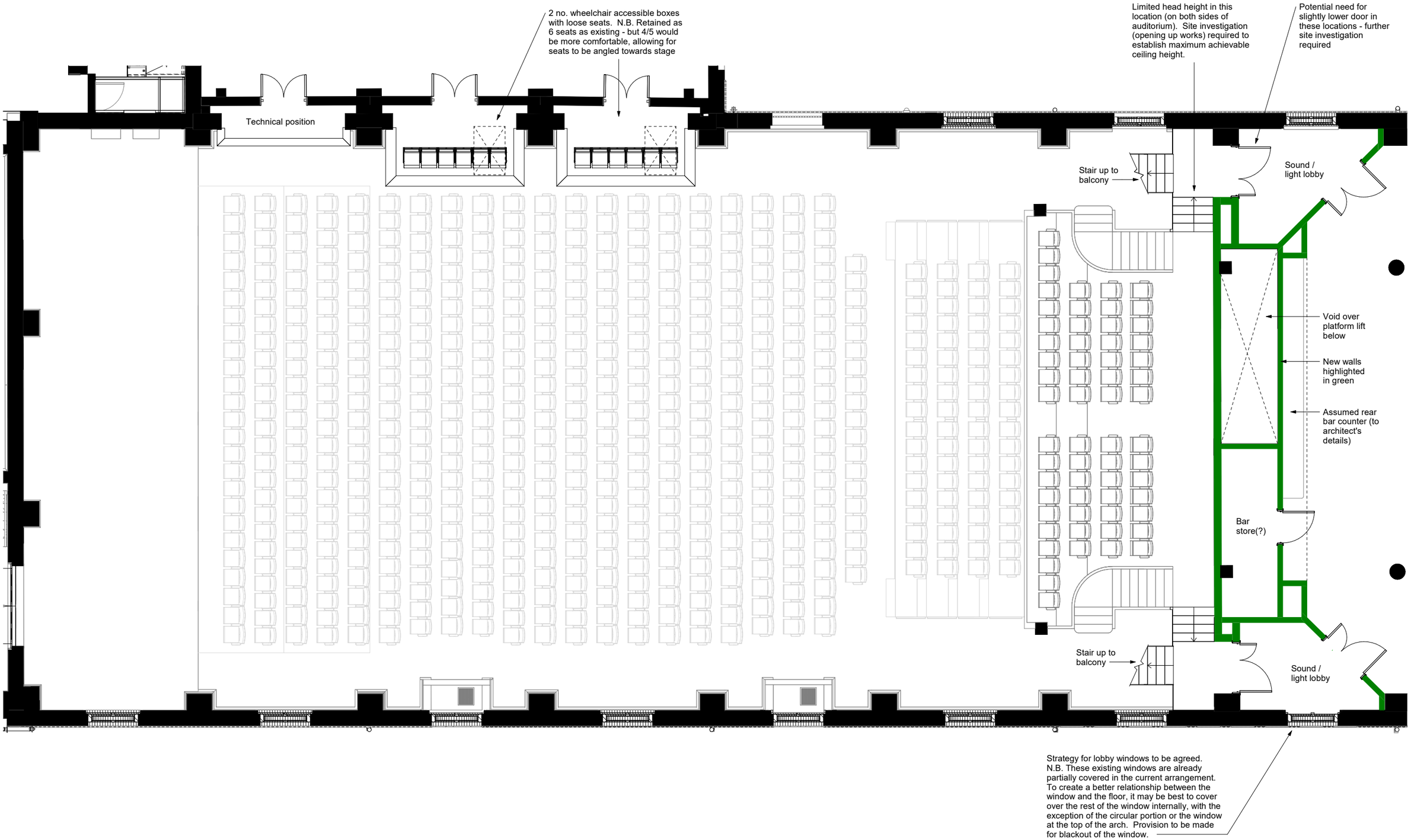
STALLS OPTION C

Ground floor plan



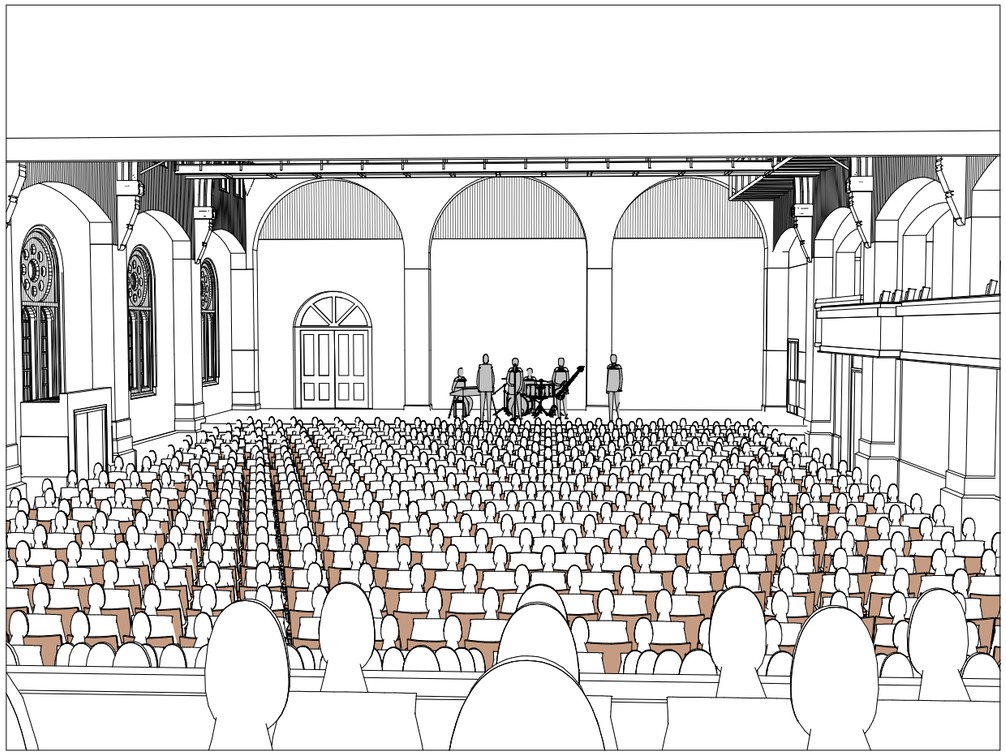
STALLS OPTION C

First floor plan



REAR STALLS SIGHTLINES

Comparison between Option C and Option A

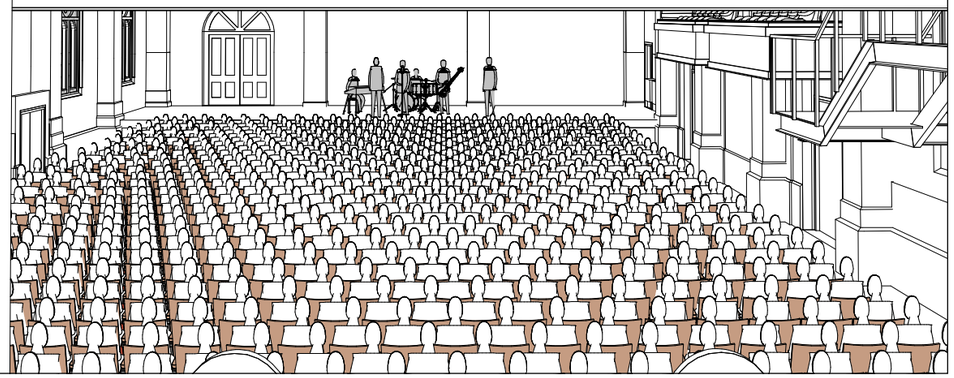


Option C - Sightline from back row of stalls

One of the compromises in Option C is that the rear of the stalls does not tie in with the first floor level, meaning that more space is given over to circulation. This also adds complexity to the evacuation of wheelchairs in the event of an emergency. However, the advantage of setting the back floor level lower is that the sightline from the back row is excellent.

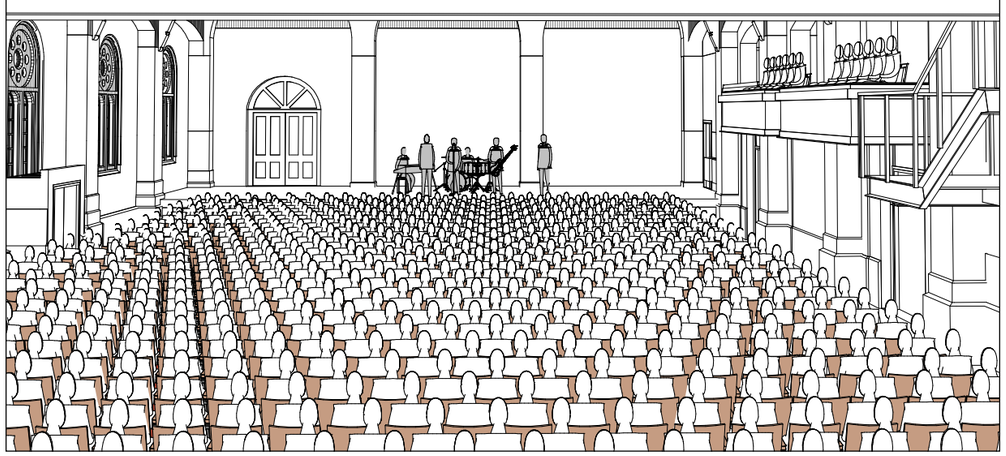
Option A - Sightline from back row of stalls

In Option A, the sightline from the back row is gives a clear view of performers on the stage. The view is, however, quite 'letterboxy' due to the deep overhang of the balcony above. This is one of the compromises associated with the higher seating capacity in Option A. The view below is from the seat immediately next to the control booth, so the control booth wall is in one's peripheral vision from this seat (when the lights are up) but the view is not obstructed.



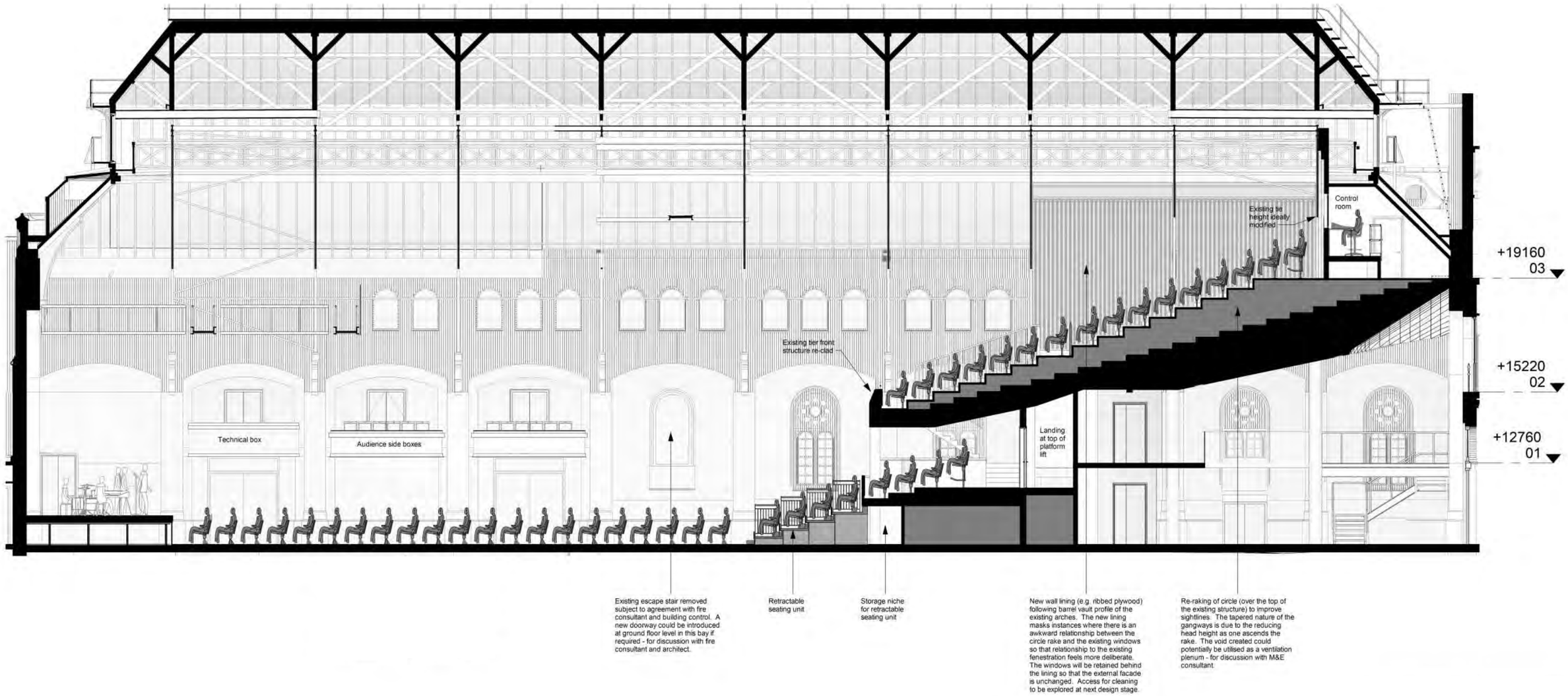
Option A - Sightline from penultimate row of stalls

Whilst the upward sightline is still slightly limited by the balcony above, the view from the penultimate row feels much less 'enclosed' than the view from the back row (and going forward, each row gets better).



STALLS OPTION C (WITH BALCONY RE-RAKING)

Long section



Seating Capacities (without extended stage or orchestra pit)

Stalls capacity (allowing for sound desk)
655 seats (or 619 with 8 wheelchair positions)

Balcony capacity (including boxes)
308 seats (or 304 seats with 2 wheelchair positions)

TOTAL = **963** (or 923 with 10 wheelchair positions)

Standing events (without extended stage or orchestra pit)

Stalls standing capacity *(N.B. This may be slightly reduced by up to approx. 35 people where travelling bands set up their own control booth in the flat floor zone - booth size varies)*
650 (if allowing 0.45m2/person) or 910 (if allowing 0.3m2/person)

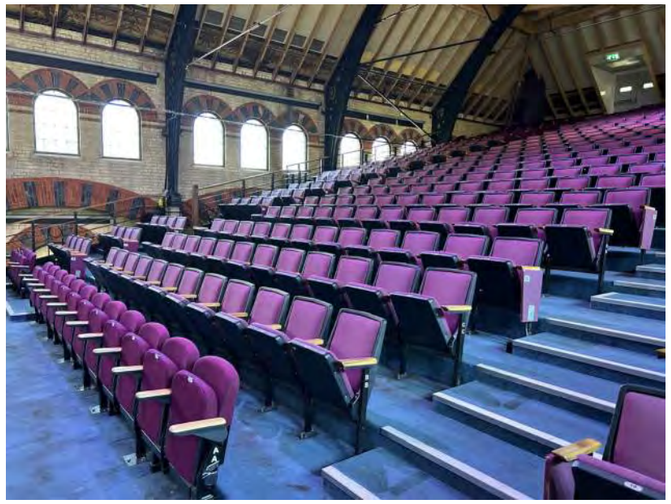
Rear stalls seated capacity
62 seats (or 46 with 4 wheelchair positions)

Balcony capacity (including boxes)
308 seats (or 304 seats with 2 wheelchair positions)

TOTAL (at 0.45m2/person) = **1020 (or 1000 with 6 wheelchair positions)**
TOTAL (at 0.3m2/person) = **1280 (or 1260 with 6 wheelchair positions)**

STALLS OPTION C (WITH BALCONY RE-RAKING)

Perspective section

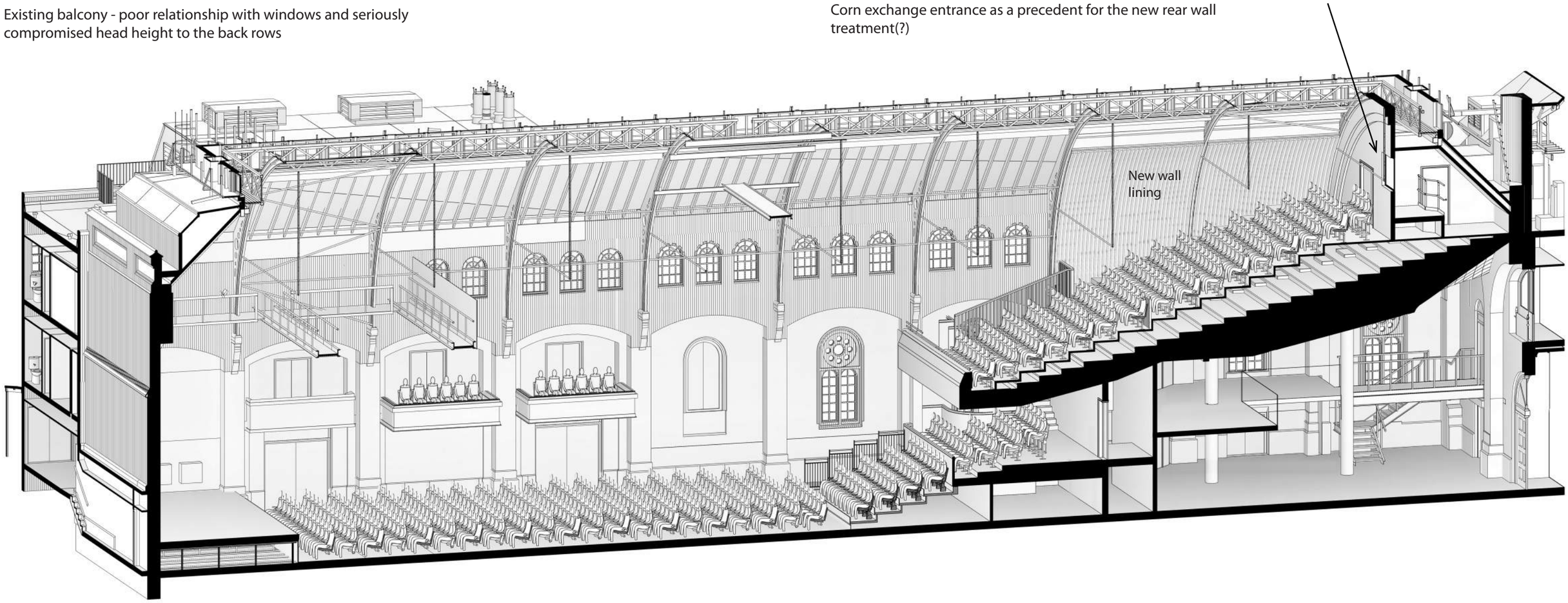


Existing balcony - poor relationship with windows and seriously compromised head height to the back rows

The relationship of the existing balcony to the windows does not really feel 'considered'. One option would be to introduce a new wall lining to the rear bays (following the curved profile of the arches) to mask the awkward junctions with windows. This lining would be internal only - the facade would be unchanged. Only the windows which work with the design are visible from within the auditorium space. The relationship to the windows therefore feels more deliberate and those windows which are visible can be properly celebrated.

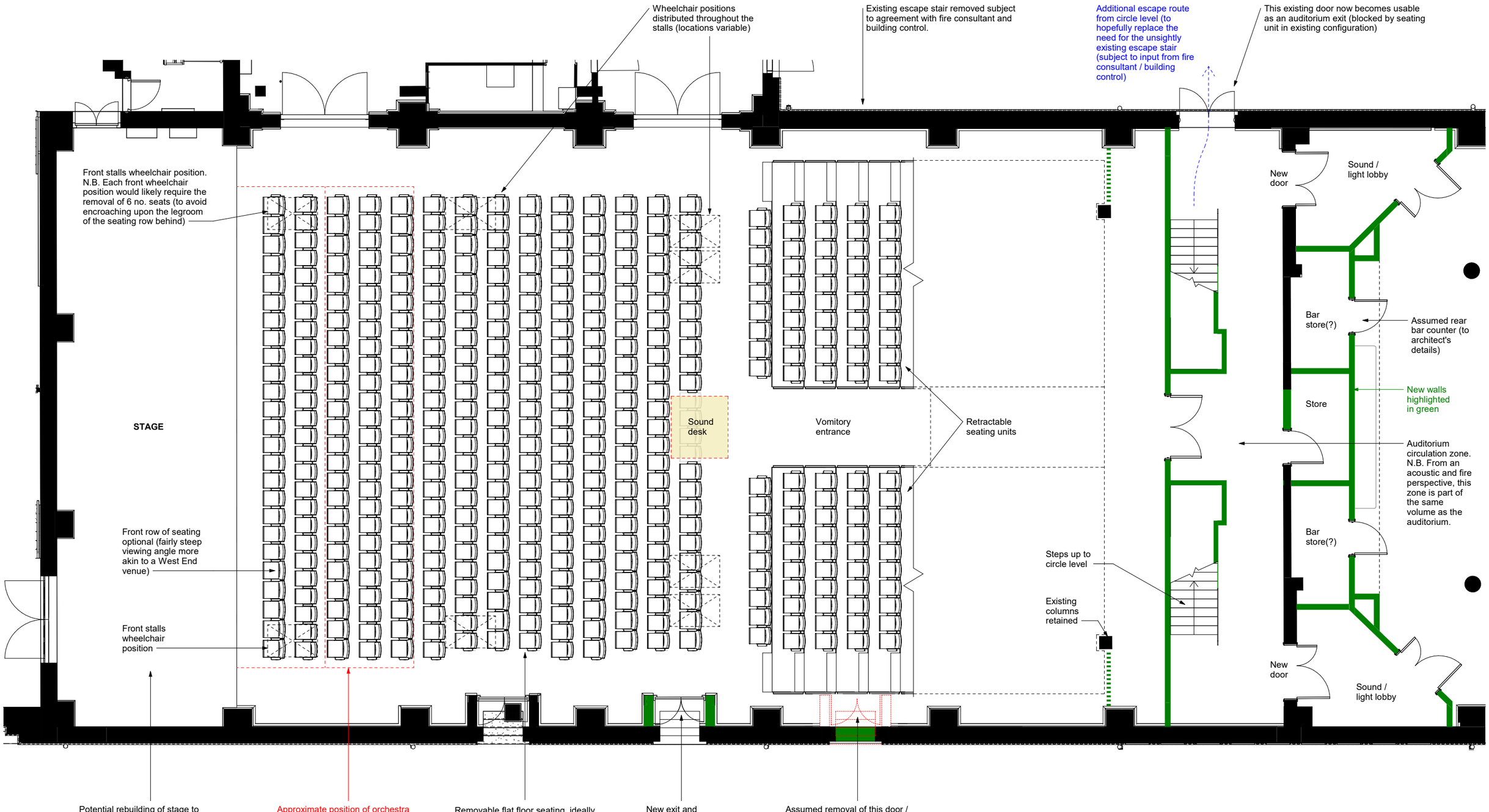
Corn exchange entrance as a precedent for the new rear wall treatment(?)

New rear wall of the auditorium to create space for a control room behind (and to eliminate the restricted height seating rows to the rear). The thinking was that this wall would essentially be a screen following the arch profile (with the spaces behind formed as enclosed boxes). Perhaps the new back wall of the auditorium could draw upon the concentric arches of the main entrance(?). On a practical level, this layered arches idea would be useful in creating more space at the rear for potential wheelchair positions



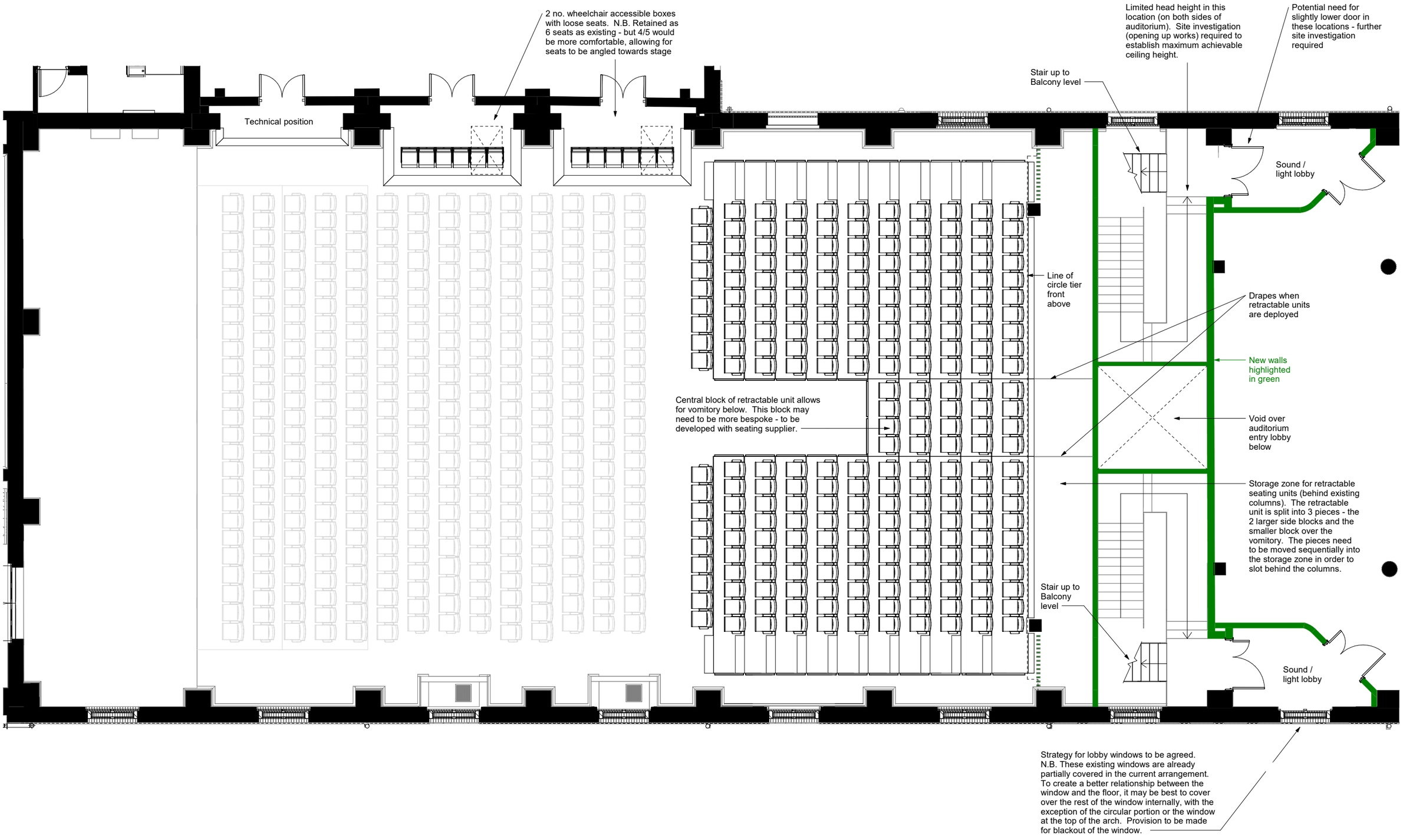
STALLS OPTION D

Ground floor plan



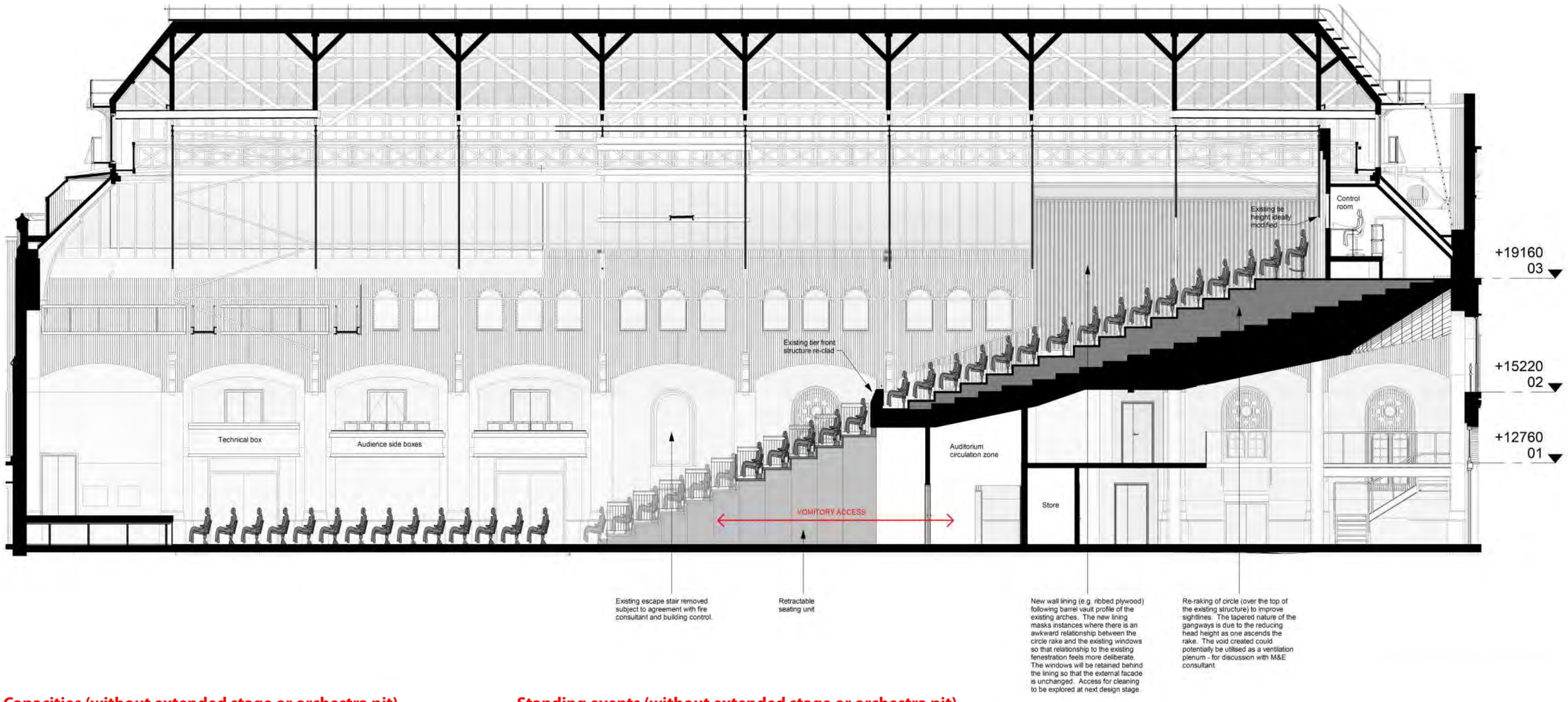
STALLS OPTION D

First floor plan



STALLS OPTION D (WITH BALCONY RE-RAKING)

Long section



Capacities (without extended stage or orchestra pit)

Stalls capacity (allowing for sound desk)
588 seats (or 560 with 8 wheelchair positions)

Balcony capacity (including boxes)
308 seats (or 304 seats with 2 wheelchair positions)

TOTAL = **896** (or 864 with 10 wheelchair positions)

Standing events (without extended stage or orchestra pit)

Stalls standing capacity *(N.B. This may be slightly reduced by up to approx. 35 people where travelling bands set up their own control booth in the flat floor zone - booth size varies)*
660 (if allowing 0.45m2/person) or 940 (if allowing 0.3m2/person)

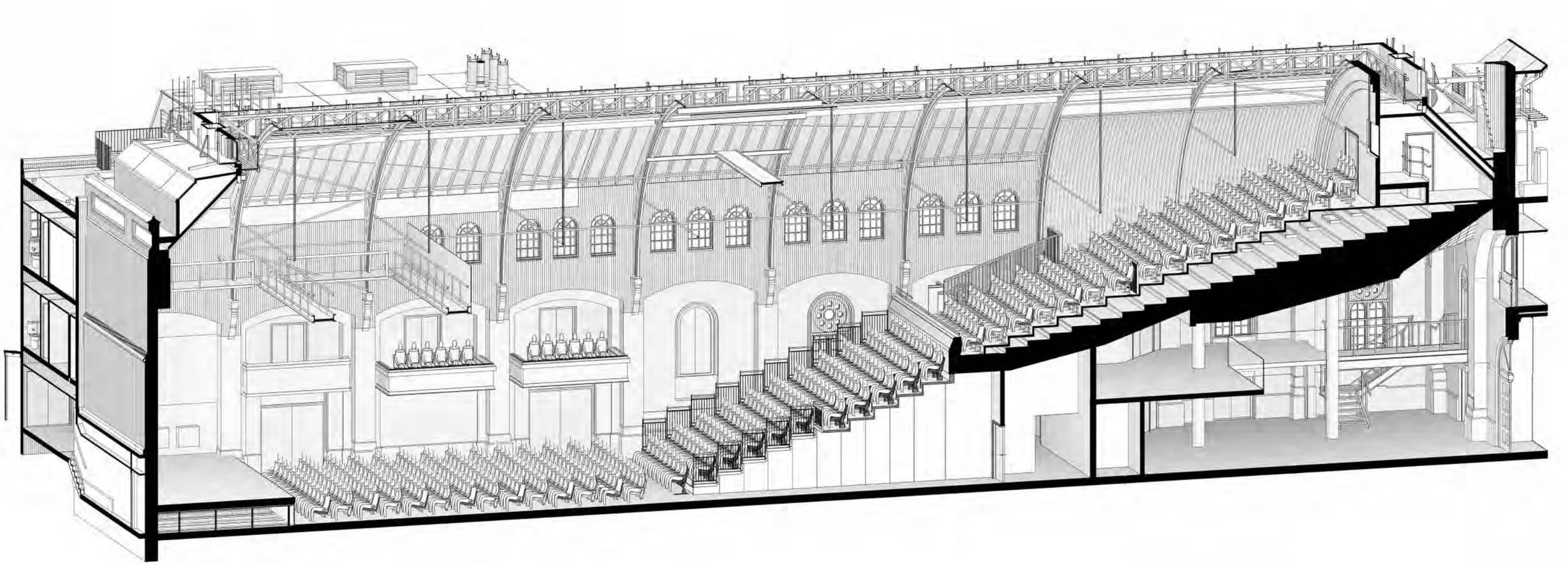
Rear stalls seated capacity
None

Balcony capacity (including boxes)
308 seats (or 304 seats with 2 wheelchair positions)

TOTAL (at 0.45m2/person) = **968 (or 964 with 2 wheelchair positions)**
TOTAL (at 0.3m2/person) = **1248 (or 1244 with 2 wheelchair positions)**

STALLS OPTION D (WITH BALCONY RE-RAKING)

Perspective section



	Seating capacity	Wheelchair positions	Standing zone	Head height issues	Sightlines	Unsightly existing escape stair	Impact on foyer space	Control room
OPTION A1 *Baseline Option - minimal intervention, maximum capacity*	Up to 1294 (see previous pages for assumptions made in this figure). Highest capacity of all the options.	Largest overall capacity therefore requirement for the largest number of wheelchair positions. Creates 2 prime wheelchair positions at the rear of the stalls (with quite good sightlines, albeit a slightly 'letterboxy' view). These can be retained for standing events. Level access through to first floor foyer. The remainder of the stalls wheelchair positions are on the flat floor (as is the case in the existing arrangement). 2 wheelchair positions are retained in the balcony side boxes. Overall slight improvement upon the existing provision.	Largest standing zone of all the options.	Head height issues at the rear of the stalls are designed out (albeit that the ceiling height remains modest at the rear of the salls).	Rear stalls sightlines are good, if a little 'letterboxy' in the very back row. Overall quality of the stalls sightlines is limited by the large proportion of flat floor seats. Without re-raking the Balcony, the sightlines at this level remain poor.	It is assumed that the existing escape stair would need to be retained in this option.	Assumes the re-arrangement of the stalls bars, consolidating the 2 side bars into a single central bar. Creates less additional foyer space at first floor level than the other options, so the foyer floor may need to be extended slightly further to accommodate a central bar counter, or alternatively, 2 smaller bottle bars could be incorporated to the sides of the space.	Control room remains at the rear of the stalls but is pushed further back (and slightly enlarged). The operator's sightline remains relatively poor due to the overhang above. In theory, the control booth would be wheelchair accessible, though the compact size may make this difficult in practice.
OPTION A2 ***N.B. This is the option that forms the basis of the Stage 2 plans.*** *As per Option A1 but with a modified control room arrangement in order to accommodate a recessed rear bar counter in the first floor foyer.*	Up to 1288 (see previous pages for assumptions made in this figure). Second highest capacity of all the options.	As per Option A1	As per Option A1	As per Option A1	As per Option A1	As per Option A1	As per Option A1 at Stalls level. Allows for a recessed rear bar counter at first floor level so that the bar counter zone protrudes around 600mm less into the foyer space compared to Option A1.	As per Option A1 except that the control room is wider (and slightly shallower).
OPTION B *More significant intervention to provide a better audience experience and a better control postion (at the expense of seat count)*	Up to 1065 (see previous pages for assumptions made in this figure)	As per Option A, Option B creates 2 prime wheelchair positions at the rear of the stalls (with quite good sightlines, albeit a slightly 'letterboxy' view). These can be retained for standing events. Level access through to first floor foyer. The remainder of the stalls wheelchair positions are on the flat floor (as is the case in the existing arrangement). 2 wheelchair positions are retained in the balcony side boxes. Overall slight improvement upon the existing provision. *N.B. If lift access to the third floor level proved feasible, multiple wheelchair positions could be provided at the rear of the balcony in this option.*	Standing zone is the same as in Option A - the largest of all the options.	Head height issues at the rear of the stalls are designed out .	Rear stalls sightlines are good, if a little 'letterboxy' at the very back. Overall quality of the stalls sightlines is limited by the large proportion of flat floor seats. The re-raking of the Balcony significantly improves the sightlines at this level.	It is assumed that the existing escape stair would need to be retained in this option since the side stairs serving the balcony do not continue to ground floor level. However, this should be reviewed with the fire consultant since re-raking would reduce the audience capacity at balcony level, potentially allowing for the external escape stair to be removed.	Assumes the re-arrangement of the stalls bars, consolidating the 2 side bars into a single central bar. Creates more additional foyer space at first floor level than Option A, but less than Options C and D.	Relocated to balcony level. This offers a better view for the operator, but the control room would not be wheelchair accessible.
OPTION C *More significant intervention to provide a better audience experience and a better control position (at the expense of seat count). Aim to also make aesthetic improvements with the removal of the unsightly escape stair (subject to approval by the fire consultant).*	Up to 963 (see previous pages for assumptions made in this figure)	Creates 4 prime wheelchair positions at the rear of the stalls (with excellent sightlines). These can be retained for standing events. However, evacuation of the wheelchairs is more challenging in this option since the rear of the stalls is not aligned with first floor level - a managed assisted escape strategy would need to be discussed with the fire consultant / building control. The remainder of the stalls wheelchair positions are on the flat floor (as is the case in the existing arrangement). Overall improvement upon the existing provision. *N.B. If lift access to the third floor level proved feasible, multiple wheelchair positions could be provided at the rear of the balcony in this option.*	Smallest standing zone of all the options.	Head height issues at the rear of the stalls are designed out (although there is a slight pinch point where the steps link the new rear stalls level with the first floor level). Site investigation is required in order to establish the maximum achievable ceiling level here.	Rear stalls sightlines are excellent. The overall quality of the stalls sightlines is limited by the large proportion of flat floor seats. The re-raking of the Balcony significantly improves the sightlines at this level.	The aspiration is to design out the existing escape stair in this option (subject to approval from the fire consultant / building control).	Assumes the re-arrangement of the stalls bars, consolidating the 2 side bars into a single central bar. Creates a good amount of additional foyer space at first floor level.	Relocated to balcony level. This offers a better view for the operator, but the control room would not be wheelchair accessible. A temporary open control position could be created at the rear of the stalls if needed (by removing some seats). This would be wheelchair accessible (though the same challenges apply regarding evacuation of the wheelchair user - see notes on left).
OPTION D *By far the biggest improvement to sightlines of all the options (but also the biggest loss of seats and the highest level of complexity). Improved control position. Aesthetic improvements with the removal of the unsightly escape stair (subject to approval by the fire consultant).*	Up to 896 (see previous pages for assumptions made in this figure). Lowest capacity of all the options.	All of the stalls wheelchair positions are on the flat floor (as is the case in the existing arrangement). No improvement upon the existing provision. *N.B. If lift access to the third floor level proved feasible, multiple wheelchair positions could be provided at the rear of the balcony in this option.*	Standing zone is slightly larger than Option C, but smaller than Options A/B.	Head height issues at the rear of the stalls are designed out as there is no seating beneath the balcony (although there is a slight pinch point over the stairs which go from ground floor level to first floor level within the auditorium volume)	Optimum option in terms of sightlines. The sightlines from the seats on the retractable unit are very good. The proportion of flat floor seating is reduced. The re-raking of the Balcony significantly improves the sightlines at this level.	This option is fully reliant upon the removal of the existing escape stair (subject to approval from the fire consultant / building control). Without the removal of this stair, Option D is not viable.	Assumes the re-arrangement of the stalls bars, consolidating the 2 side bars into a single central bar. However, if the decision is made not to change the existing bar configuration, Option D could still be workable with some slight tweaks. Creates a good amount of additional foyer space at first floor level.	Relocated to balcony level. This offers a better view for the operator, but the control room would not be wheelchair accessible. There is no option for a temporary rear stalls control position.

THEATRE
PLAN

CAMBRIDGE CULTURAL QUARTER

TECHNICAL MASTERPLAN

CCQ792-THP-ZZ-ZZ-RP-YT-000003 Revision: S2-P04

THEATRE PLANNER

Contents

Document History

Revision	Issued by	Date	Comments
S0-P01	Chris Needle	16 Aug 2024	Draft Issue
S2-P02	Lara Kerrison	16 Sept 2024	Seating section expanded
S2-P03	Lara Kerrison	11 Oct 2024	Existing seating capacity figures updated
S2-P04	Lara Kerrison	31 Oct 2024	Capacity clarified for standing events

Notes:

Glossary

AD	Audio Description
ALS	Assistive Listening System
AVN	Audio Video Network
BGM	Background Music
BOH	Back of House, or Backstage
BYOD	Bring Your Own Device
CCU	Camera Control Unit
DCI	Digital Cinema Initiatives
DLP	Digital Light Processing
DMX	An industry standard protocol for control of stage and other lighting (a subset of RS-485)
DSC	Down Stage Centre
DSL	Down Stage Left
DSR	Down Stage Right
DVS	Dante Virtual Soundcard
FOH	Front of House, including Foyers
FP	Facility Panel
GUI	Graphical User Interface
HLCP	House Light Control Panel
HLCS	House Light Control System
IEC	International Electrotechnical Commission
I/O	Input / Output
IWB	Internally Wired Bar
LCP	Lighting Control Panel
MCC	Motor Control Cabinet
MET	Main Earth Terminal
MIS	Matrix Intercom System (matrix production communications)
MM	Multi-Mode (fibre)
OPS	Open Pluggable Specification
PDU	Power Distribution Unit
PLB	Production Lighting Box
PSU	Power Supply Unit
PTZ	Pan, Tilt, Zoom
RCD	Residual Current Device
RCP	Remote Control Panel
RCS	Room Control System
Redundant Network	A network with all critical components duplicated such that the network continues to function following any single failure of one of its component parts (wired or fibre link, network switch, router, etc.)
RIS	Ring Intercom System (partyline)
SCR	Sound Control Room
SI	Simultaneous Interpretation
SL	Stage Left
SLCS	Stage Lighting Control System
SM	Single Mode (fibre)
SMD	Stage Managers Desk
SR	Stage Right
SVC	Sound, Video and Communications
SWL	Safe Working Load
TWG	Tension Wired Grid
TMS	Theatre Management System: software for managing the essential operations of cinemas
UCI	User Control Interface
UPS	Uninterruptible Power Supply
USC	Up Stage Centre
USL	Up Stage Left
USR	Up Stage Right
WIS	Wireless Intercom System
WLCP	Work Light Control Panel
WLR	Work Light Rack

1 Introduction

This Technical Masterplan relates to the interventions proposed for the Cambridge Cultural Quarter. The Cambridge Cultural Quarter project involves the redevelopment of the Guildhall building, Marketplace and Cambridge Corn Exchange.

There are a number of public spaces used for events and performances across the project, these include:

- Large Hall (Guildhall)
- Small Hall (Guildhall)
- Marketplace (Outdoor cinema, Christmas Light switch on etc).
- Corn Exchange (operated by Cambridge Live)

This report will only focus on Cambridge Corn Exchange.

The present Cambridge Corn Exchange building is Grade II listed and was opened in 1875 and as well as its use as a corn exchange it intermittently held events such as performances by the Coldstream Guards and LSO. It was not until the 1970s where the building ceased to be used for trading grain and instead shifted to house performances more regularly.

After a refurbishment period in the 1980s the venue reopened in 1986 and has operated as a performance venue ever since.

As part of the Cultural Quarter redevelopment project Cambridge City Council are looking to enhance the Corn Exchange in order to strengthen its financial prospects. The key aims within the Corn Exchange are:

- Refresh foyer and bar space to encourage higher spend per head.
- Improve accessibility for both audiences and artists.
- Enhance technical provision to futureproof venue. Including:
    - New PA System
    - Upgraded Follow Spot System
    - Infrastructure Upgrade
- Assess egress routes and seating provision to look to increase capacity particularly for standing events.

2 Procurement

Experience on other similar projects leads us to recommend the following methods of procuring the specialist installations and equipment:

2.1 Specialist Installations

Several specialist contractors will be required to work with the Main Contractor. Coordination is necessary with other sub-contractors. For instance, with the project Electrical Contractor (power supplies, containment, interfacing with equipment) and the Steelwork Contractor (supports and fixings for stage engineering installations).

An initial list of specialist contractors follows. They are normally direct sub-contractors to the Main Contractor.

2.1.1 Technical Equipment Contractor (TEC)

Specialist lighting, sound, video and communications. This work may be split in to two contracts depending on its complexity.

2.1.2 Stage Engineering / Rigging Contractor (SEC)

Counterweight and other flying systems, orchestra pit decking installation, stage floor trap system, get-in platform.

2.1.3 Theatre Seating Contractor (TSC)

The seating systems in the theatre.

2.2 Loose Equipment (FF&E)

We recommend that cost allowances are made for loose equipment early in the project, and that the allowance is retained outside the main contract for direct purchase by the client (via a competitive tender if required).

This approach has several benefits which include:

- No contractors overhead – this maximises the use of the money
- Decisions on equipment can be delayed until a lot closer to practical completion – this ensures that current equipment which is relevant to future working practices can be purchased

3 Strip Out & Removal of Equipment

Most of the current installed infrastructure and equipment will need to be removed by the Main Contractor.

Storage will be required for equipment that is to be retained from the existing systems (the removal and storage of the equipment to be retained is probably best done by client).

Cost allowances should be made for the above.

4 Corn Exchange

Cambridge Corn Exchange hosts a varied programme of events including:

- Live Music both amplified and unamplified in seated and standing configurations
- Stand Up Comedy
- 'An evening with' style conversational events
- Circus
- Ballet and Opera
- Pantomime
- Conferencing and other events

4.1 Auditorium

4.1.1 Seating

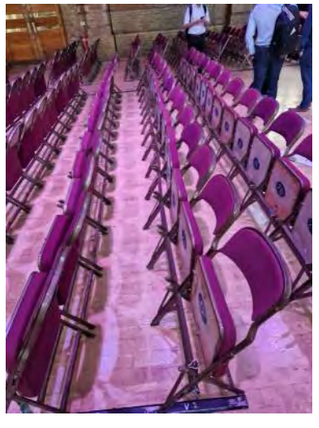
The Corn Exchange currently seats:

- Up to 637 on the flat floor
- 228 on the retractable seating unit
- 42 on the mezzanine behind the retractable seating unit
- 490 at balcony level
- 12 in the balcony side boxes

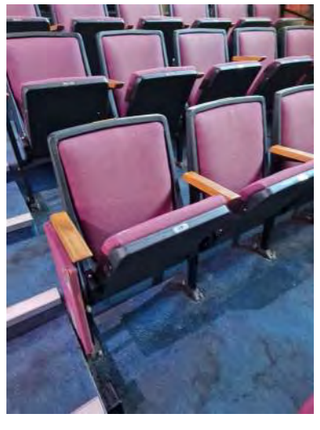
This gives a total seated capacity of up to 1409. The capacity was previously higher but was recently reduced by the local fire authority due to the condition of the seating and the number of exit doors. With a standing audience at stalls level (and a seated audience at balcony level), the overall capacity is around 1550.

The Corn Exchange are exploring a complete like-for-like reseating of the venue within the next 6-12 months. Given the proposals contained within this document, there are likely to be interventions for the Cultural Quarter project which will see further alterations made to the seating scheme and arrangement. Theatreplan would not recommend undertaking abortive works reseating the venue if further works are to be undertaken as part of the Cultural Quarter Project as this would not represent value for money.

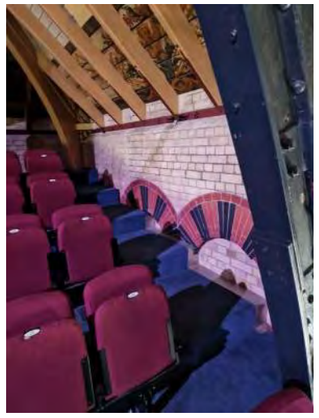
Throughout the auditorium there are varying types of seating, each with different aesthetics leaving a fragmented appearance across the venue.



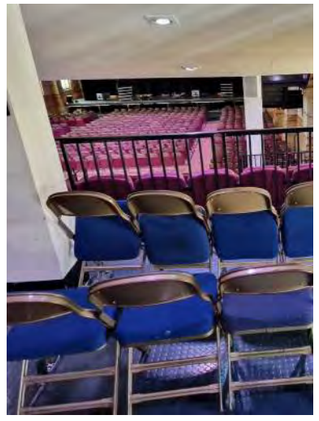
Stalls Seating



Balcony Seating



Balcony Seating



Rear Stalls Mezz Seating

(a) Front Stalls The lower stalls seating is made up of Sandler tip-up loose seats attached to floor bars. These require a lot of space to store and are labour intensive to deploy. The current seat centres are around 460mm. For seats without armrests, the 'good practice' recommendation in the ABTT Technical Standards for Places of Entertainment is a minimum of 500mm centres.

A number of options could be considered for the replacement of the stalls seating. These are explored in greater detail in the Auditorium Layout Options document and will be developed further at the next design stage.

- **Option 1: Floor bar system** (e.g. Audience Systems Matrix or Hussey Logix) – the lowest cost option, consisting of flip-up seats mounted on removable floor bars. The seats and floor bars are stored on bespoke trolleys, specific to the project. Whilst this is the least expensive option, it is the most labour intensive in terms of deploying the seats, and the storage of the trolleys is a big consideration. Ideally, the trolley dimensions would be tailored around at least some of the seats being stored underneath the stage. The under-stage trolleys could potentially be motorised in order to use the full stage depth without manual labour. The detailed design of the trolleys (and an associated study of storage options) can be carried out at the next design stage in collaboration with seating suppliers.
- **Option 2: Floor Rail Seating System** (e.g. Figueras Mutarail) – seating runs in rails recessed into the auditorium floor which can be covered with lids when not in use. As this is an automated system, there are major time and labour savings when reconfiguring the space between seated and standing mode. This system would be reliant upon making the existing lifts into double decker lifts for storage of the seats on the bottom deck. In order to fit all of the stored seating rows, the lift footprint would need to be enlarged, and the pit may need to be deepened. The extent of any excavation is subject to carrying out a measured survey of the existing pit at the next work stage. Option 2 offers major operational savings but is likely to be significantly more expensive than Option 1.
- **Option 3: Wheeled seating system** (e.g. Figueras Mutawheel or Kotobuki K-Roll) – groups of 6/7 seats are set onto a wheelable base. This option sits between Option 1 and Option 2 in terms of cost. It is probably the least likely option as it retains some of the technical challenges of Option 2, without the operational benefits of automation. This is explained in greater detail in the Auditorium Options Document.

(b) Rear Stalls The upper stalls is currently formed of retractable seating units separated by a central vomitory. Additional loose rows are deployed on the mezzanine at the rear of the retractable seating unit.

The seating in this area suffers from obstructed sightlines due to the structural columns and the deep overhang of the balcony above. Head room is very constrained.

A number of alternative retractable seating unit configurations have been explored for the rear stalls in the Auditorium Layout Options document.

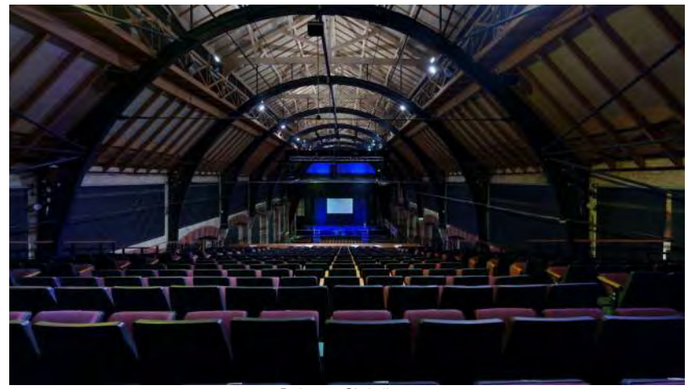
(c) Balcony The overall audience experience in the balcony area is poor, this is due to a number of different issues:

- Compromised sightlines
- Distance from the stage
- Low head height towards the rear
- Limited legroom

Sightlines from the existing balcony seating are poor due to the shallow rake and lack of a seat stagger.

Two options are explored in the Auditorium Layout Options document. The first of these is a reseating of the balcony in its current configuration. The second option involves re-raking the balcony (and relocating the control room here from stalls level) to dramatically improve sightlines and legroom – but at the expense of losing a large number of seats.

It is commonly accepted within the industry and included in publications such as Theatre Buildings: A Design Guide (2024), that for unamplified speech the maximum comfortable distance at which an audience should be seated is 20m from the downstage edge. For amplified or larger theatrical experiences this should not exceed 30m. The current rear row of the balcony is considerably more than 30m from the stage edge, and any efforts to meet these recommendations would see a reduction in seating capacity.



Balcony Sightlines

4.1.2 Forestage Lifts

There are two forestage lifts which can be used to create a stage extension. Each elevator has full height fixed fascia, so the assumption has been made at this stage of the project that the machine pit is at least 995mm.

As space within the venue is at a premium due to the site being constrained on all sides, upgrading the forestage lifts to provide additional storage space would be beneficial.

Instead of a single deck elevator with full height fascia, the structure would be replaced with a “double deck” elevator. The top deck would serve as the auditorium / stage floor in the same way as the existing. The lower deck would be used as an area for seat storage. Removable fascia could then be deployed when the elevators are used as a stage extension.

The storage elevators would free up space elsewhere in the venue where seating trolleys are currently stored.

Further surveys will need to be undertaken during the next work stage to establish whether the existing pit depth is sufficient or whether additional excavation works would be required. With a seating system like the Figueras Mutarail system, the footprint of the lifts would likely need to be enlarged to be able to store all of the seating rows.

The installation of double deck elevators would be useful for any of the flat floor seating approaches. However, it would be critical for the Option 2 (Mutarail) or Option 3 (Mutawheel) approaches.

Existing under-stage storage provision

4.1.3 Control Position

A small, dedicated control booth, mostly used for lighting control, can be found on the rear auditorium mezzanine. The sightlines to the stage from this area are good, but the upward sightline is poor due to the balcony overhang. A number of options have been explored for the control position in the Auditorium Options Document. The chosen approach is influenced by the seating layout adopted. The options within this document include:

- An option keeping the control room more or less the same size but slightly repositioning it to suit the new rear stalls seating layout.
- An option which slightly widens the control room to improve the operating experience and to allow for use of larger equipment in the future. The booth is slightly repositioned but remains at the rear of the stalls.
- An option which relocates the control room to balcony level, removing the upward sightline constraint currently imposed by the balcony overhang.

4.1.4 Lighting Bridges

There is no proposal to change the existing lighting bridges and technical galleries.

4.1.5 Live Sound Mixing Position

The existing live sound mix position is deployed at the back of the flat floor seating (in front of the central vomitory).

The Auditorium Layout Options document explores a number of different options for the mixing position, depending upon the stalls configuration. It would remain towards the back of the flat floor zone. As the seating behind is on the first raised row of the retractable seating unit, the sound desk would not impact upon audience sightlines.

4.1.6 Follow Spot Positions

The existing follow spot position is difficult to access and maintaining the follow spots is labour intensive. Currently the two Robert Juliet Manon Follow Spots can only been operated by trained in house operators. Significantly developments have been made in recent years which allow for follow spots to be remotely operated.

The existing follow spot positions should be decommissioned, with remotely operated follow spots utilised. Sufficient network tielines should be provided in key locations back of house including:

- Lighting & AV Store
- Green Room
- Loading Dock
- Storage Dock

From these locations remote control base stations can be patched in to allow operates outside of the auditorium to control the follow spots in a safe and comfortable environment.

Existing Follow Spot Position

4.1.7 Auditorium Suspensions

Consideration will be given to suspension points for temporary trusses in the auditorium. The current arrangement only allows for the position of chain hoists in a few locations, which is very restrictive. The access to these positions is also poor.

The maximum capacity of any rigging point is currently 500kg, it should be investigated as to whether there is sufficient capacity within the roof, or what work could be undertaken to increase the rating on each point to 1000kg. The installation of load monitoring should be considered.

4.2 Stagehouse

4.2.1 Stage

The stage currently measures around 16.8m wide (wall to wall) by 5m deep and sits approximately 1 meter above auditorium floor level.

The depth of the stage can be increased by deploying either one or both of the forestage elevators. The forestage elevators allow the stage to extend to approximately 7.5m deep or 10m deep.

Clearance to the underside of the grid is 7.8m with restricted areas underneath technical walkways which sit at 6.3m above stage level.

To create more useable storage underneath the stage, the replacement of the stage could be considered at the next work stage, in collaboration with the structural engineer and seating manufacturers. Whether replacement of the stage is necessary or sufficiently beneficial depends partly upon the chosen flat floor seating approach - for instance, the unobstructed column-free span required for the Mutarail system would not be feasible and therefore under-stage storage of the seats would be ruled out in this option. Replacement of the stage may not therefore provide a great deal of benefit in conjunction with flat floor seating Option 2. In flat floor seating Options 1 and 3 (the floor bar system or the wheeled seating system), replacement of the stage may possibly offer a benefit if this allows for less frequent supporting columns (provided that this doesn’t make the structural build-up any deeper), thus improving the efficiency of under-stage storage. However, if the benefit is only marginal, the replacement of the stage probably wouldn’t represent the best use of the budget. For flat floor seating Options 1 and 3, the viability of under-stage seat storage should be fully explored in relation to the

existing stage construction before considering whether replacement of the stage is justified.

Should the decision be made to proceed with replacement of the stage, the stage floor build-up needs to be able to support a distributed load of 7.5kN/m^2, with a sufficiently high point loading. The build-up would consist of something along these lines:

— Structure
— Timber battens (on resilient pads) with noggins between
— 2 layers 18mm plywood
— 6mm sacrificial hardboard, oil tempered, laid smooth finish up, painted matt black.

The existing stage floor thickness is modest (around 170mm) and so realistically, it is unlikely that a thinner build-up than this would be achievable. If the stage were to be reconstructed, the overall thickness should not exceed 170mm as this would reduce the storage height below.

4.2.2 The Grid & Scenery Flying

Cambridge Corn Exchange has no fly tower, instead a localised grid structure overstage accessed by catwalks with a number of across stage walkways which limit where rigging is installed.

Based on current discussions the end users are content with the existing provision of around 15 overstage bars at approximately 400mm centres with 6 meter travel. 400mm-500mm bar centres is common place with a venue of this programme.

Further consideration should be given at the next stage as to whether any suspensions below the across stage catwalks should be investigated.

4.2.3 Safety Curtain & Drencher

There is no provision within the existing venue for a safety curtain and drencher. Due to the form of the venue it is not possible to accommodate a safety curtain.

As the design progresses a Fire Consultant should be engaged to review the current fire strategy alongside proposed interventions in order to ascertain whether any additional fire control or life safety measures need to be introduced.

4.2.4 Backstage Circulation

The backstage circulation areas, doorways and lifts should allow for technical equipment to be moved around between stores, workshops and venues with ease. Equipment in flight cases, on trollies, costume rails, and 8’ by 4’ Steeldeck should be allowed for.

4.2.5 Stage Drapes

As there are no proposed alternations to the stage area the existing drapes, which are in good condition, can be retained and reused.

4.2.6 Get-In

The existing get-in is through a door upstage left, off of a flight case store. There is a level access route to this area however this route is constrained between the building and the boundary line. A secondary route is created through the auditorium right get in door.

The size of the existing get in door is 2.16m wide by 2.42m tall.

4.3 Production Lighting, House / Work Light & Control

4.3.1 Lighting Power Control Circuits (Dimmers)

The production lighting installation proposed to have 144 power control circuits (circuits that are switchable between different modes of operation: DMX controlled dimmers and non-dims. This is a slight increase on the existing provision. These circuits provide facilities for stage lighting in the auditorium FOH lighting gallery and side positions, over-stage, and at stage floor level. These will be installed in the Gallery Dimmer Room and wired to production lighting outlet boxes by the Electrical Contractor. Ideally the dimmers should be located as close to the production lighting outlet boxes as possible to minimise the field wiring and containment installations. Reusing the existing Dimmer Room is the preferred option.

Existing Dimmer Location

4.3.2 Production Lighting Boxes

Purpose-made outlet boxes fitted with mains, DMX and Ethernet sockets. 3kW production lighting outlets will use 16A sockets. In the stage and fly loft production lighting boxes, some of the 3kW circuits will be paralleled to Socapex multi-pin connectors to make it easy to feed multiple circuits to overhead lighting bars and similar. Production Lighting Boxes will be fitted and wired by the Electrical Contractor.

4.3.3 Lighting Control System

The existing lighting desk will be retained and reused.

4.3.4 Lighting Data and DMX Infrastructure

Lighting boxes will contain dedicated ethernet and DMX nodes for the transmission of lighting data. Due to fittings becoming increasable more channel heavy, integrated nodes offer a more granular distribution of DMX universes.

The production lighting Ethernet network will extend to the technician's office to allow for the backup lighting desk to be set up for pre-programming of shows, and backup of show files.

4.3.5 House & Work Light Control

A DMX-based preset control system will be provided to adjust the auditorium and stage area House and Work Lights. Controls will be installed in the lighting Control Room and backstage, but the system will also be controllable via the production lighting desk.

4.3.6 House Lighting System

The existing house light system is already predominantly LED and offers a flexible provision for incoming productions. The light levels should be assessed by the project services engineer and the existing system supplemented or enhanced as required.

Any additional fittings The house lights may be supplemented with higher power luminaires to provide a higher light level for cleaning of the auditorium. Typically, the control system will include conveniently located cleaners' buttons which will turn on the cleaners lighting for a predetermined amount of time. After this time, the cleaners lighting will slowly fade off, or down to a low level. These buttons will be deactivated during show times.

4.3.7 Work Light System

Low-energy, high-brightness general lighting for fit-ups, maintenance, and cleaners. Performance "blues" will be installed for use during productions. Sockets for portable Work Lights will be installed around the stage area and technical galleries.

4.3.8 Production Lighting Luminaires

Some of the existing luminaire stock should be retained and supplemented with a range of more up to date spotlights, follow spots and moving lights. Each will be provided with a plug, colour frames, barn doors, hook clamps, safety bonds and other accessories as appropriate.

4.3.9 Lighting Rigging & Accessories

All fittings should be specified ready to hang, complete with associated rigging and other accessories.

The existing venue supply of other rigging accessories should be reused.

4.4 Sound, Video & Communications Systems

4.4.1 Wiring Infrastructure

The wiring infrastructure will consist of Facility Panels and the wiring that connects them to the permanent equipment racks. The use of industry standard connectors will permit touring company equipment to be easily plugged up to house systems. It is envisaged that there will be an equipment rack and patch in the Control Positions and that the main amplifying equipment will be installed in an Amplifier Room. The Facility Panels will incorporate sound and communications outlets (microphone and audio tie-lines, ring intercom, cue light, video, Ethernet (as CAT6) and similar) and will be located in a number of convenient locations around the stage, auditorium and foyers. Loudspeaker outlets will be installed in the auditorium for delay and surround loudspeakers.

Some Multi-Mode fibre may be considered, mainly for the transport of high-quality video signals using video-to-fibre baluns. The site-wide IP backbone will be utilised for IP traffic – possibly for show-critical control and content. The IP backbone should be resilient and allow for specialist IP traffic. See: 5.3 Site-Wide Corporate IT Network.

The containment for the sound and communications wiring shall be installed by the Electrical Contractor.

Note: this excludes any allowance for general ICT wiring and facilities (structured cabling by Electrical Consultant, active equipment currently by Client).

4.4.2 Installed Theatre Sound System

Whilst the venue has an existing loudspeaker system, the provision of delay loudspeakers within the balcony area is not sufficient. In order to enhance the existing provision consideration will be made to supplement the existing system with additional loudspeakers to improve the quality and coverage across the auditorium. The existing installation utilises industry leading products and should be supplemented rather than replaced in its entirety. This may be used by visiting companies for a small charge instead of touring productions being required to rig their own. Such decisions would be taken on a show-to-show basis and as such income from such should not be relied upon.

The complete installation will include loudspeakers, amplifiers, digital sound mixing consoles for front of house and onstage monitors, signal processing and replay equipment.

New digital mixing consoles should be considered, and the existing mixing consoles will be re-tasked to another venue.

4.4.3 Monitor System

A monitor system will be provided to enable the sound in the auditorium to be played in the Control Room and for it to provide the quality signal source for show relay, assistive listening systems and backstage feeds.

4.4.4 Assistive Listening Systems

The assistive listening systems will include a two-channel assistive listening system, providing a relay of show sound for the hearing impaired and a description channel for the visually impaired. The existing system is infrared and appears to suit the venue and patrons well; therefore, elements of the existing equipment will be reused where possible.

A change to a RF system will be considered.

The system must include a storage / charging unit for the receivers. Different systems / headsets are available which may be preferred by the user group.

The installation of an auditorium-wide induction loop system is now impractical, as it relied on the removal and renewal of the floor and / or ceiling finishes (induction loops are best installed directly under the floor finishes or built into the floor / ceiling structure). Therefore, several induction neck loops will be included. The neck loops are worn around the patron's neck, receive signal from the infrared system, and provide a local induction loop to the wearer, allowing their hearing aid to be switched to the "T" position and receive the show relay feed.

4.4.5 Captions & Surtitles

Data and video tielines throughout the venue will enable the future installation or temporary installation of captioning and/or surtitle systems.

4.4.6 Video Systems

High-quality low-light-level and colour cameras will be mounted in a suitable position in the auditorium to provide video feed of activities on stage to areas around stage and backstage.

Locations of outlets and displays on the fly floor will be considered. These are always needed, but often not considered as an integrated part of the fly floor environment design.

Additional wiring and outlets will enable other cameras and monitors to be plugged in.

Several tie-lines will be provided for integration into FOH systems (latecomers' monitors, etc.). Links to archive facilities will enable the theatre's output to be recorded for future use.

4.4.7 Projection

No fixed projectors will be provided. However, locations to hang projector(s) will be provided.

No provision has been made for a satellite dish / decoder for the reception of "Event Cinema" live transmissions (from the National Theatre, Royal Opera House, Metropolitan Opera, etc.).

4.4.8 Conferencing

There are no specific technical requirements for conferencing, such events will be able to use the renewed technical infrastructure to transport audio and video signals between stage, control locations and display equipment. It is anticipated that additional screens (whether projection screens or physical display screen) will be hired in on an event by event basis as the requirements may change depending on the hirer. The venues existing projection and display equipment will be retained and reused.

4.4.9 Lectern

A lectern will be provided to house controls and power to supply and connect laptop computers as well as projection control facilities, microphone links and incorporate local dimmable lighting.

4.4.10 Performance Communications

The Show Caller position will include intercom, paging microphone, show relay loudspeaker, video relay monitors, Work Light and miscellaneous controls. This shall be movable with infrastructure for use stage left, centre of the auditorium, or in the Control Room.

The intercom will be a multi-channel wired system with outstations, belt packs and single- / double-sided headsets; the extent of the wireless comms system coverage will be defined following discussions with the users.

A wireless system will be considered in the next RIBA Stage.

Infrastructure and outlet panels will be installed for the wired comms system. The outlet locations will include stage area, and other technical galleries, follow spot positions, Control Rooms, etc.

4.4.11 Paging & Show Relay Systems

Audio and video feeds will be provided to integrate into the building-wide facility. See: 5 Building-Wide Systems.

4.4.12 Technical Power & Earth

The sound and communications installations require several power supplies all derived from a single isolator on the main switchgear and not from "noisy" subsidiary circuits. In addition, a low-impedance technical earth will be required in the Control Room. The same earth and phase should be used for these services throughout the building. See: 5 Building-Wide Systems.

5 Building-Wide Systems

There are number of services mentioned in the descriptions above which should be considered as building-wide services. These include:

5.1 Technical Earth

A distinct isolated earth is required for all sound and communications applications throughout the complex. This will include installations for sound, video, broadcasting or recording.

5.2 Tie-lines

A small number of audio, video and communications tie-lines between the Proscenium Theatre, Learning Studio and Events Space is proposed. Other meeting and office spaces should be included in this infrastructure network. The tie-lines will return to a central location to allow for the patching of signals.

These tie-lines could be traditional copper point-to-point connections, but considering the scale of the site, the number of rooms to be connected (and therefore the possible combinations to allow for) and the need to future-proof the installation as much as possible, an IP-network-based solution should be considered. Some fibre may be installed for the transmission of high-quality video and multichannel audio.

5.3 Site-Wide Corporate IT Network

There is an opportunity to implement a “converged”, site-wide, resilient IT network to allow for a flexible approach to site-wide connectivity. In order to adopt this methodology, the high bandwidth IT backbone would have to be set up with QoS to allow for traffic such as:

- AES67
- AVB
- ACN
- Dante
- Q-SYS Q-LAN

Consideration should be given to the requirements of the technical departments when defining and configuring the site-wide corporate network, with particular consideration being given to the allocation of bandwidth and priority of traffic.

5.4 Paging & Show Relay Systems

The paging, show relay and bar bells systems will allow announcements across BOH and FOH areas, and audio show relay where required. Bar bells will indicate to the audience in the foyer that a performance is about to start.

The detail of this system will be agreed during the design stages. Initial discussions have revealed the need the following features:

- Paging stations:
  - Show Caller Position
  - Box Office / FOH Office
- Background music (BGM) and input points:
  - Stalls Bar
  - Mezzanine Bar
  - St Johns Bar
- Loudspeakers and controls (volume, venue selection, local input, isolate)
- Bar bells

The loudspeakers will be integrated into the building architecture and finishes. The loudspeakers will likely be circuited into “zones” (particularly in the FOH areas) to allow paging and BGM to be sent to specific areas, along with the isolation of certain areas (for public events, etc.):

- Main foyer areas / public spaces / toilets, etc.
- BOH Dressing Rooms (loudspeakers with show relay volume control)
- BOH circulation
- Theatre stage (paging to stage during day / fit-up operational modes)

The paging and show relay system shall include:

- Loudspeakers with controls to adjust volume of show relay, paging cut switch (where applicable), local input selection (where applicable); discussions with users will define which areas / loudspeakers require the different controls
- Bells to warn the audience that the show is about to commence; these shall be installed in foyers and audience toilets

5.5 Video & Audio Systems

Beyond the main performance space, fixed video relay screens are required in key locations:

- Green Room
- FOH Manager’s office
- Technical offices

Screens in other locations are desirable (for instance in Dressing Rooms), and the infrastructure should be installed to provide this functionality, although the screens themselves have been omitted.

5.6 Assistive Listening Systems

Local infrared or RF transmitters will be installed at the latecomers monitor positions to allow the hearing impaired to listen to the audio from the venue as they are waiting to be seated if arriving late.

An infrared / RF testing station will be supplied / installed at the point where the headsets are issued to allow users to check the equipment. Usually this is done with a two-channel recorded message and / or music running on a loop.

5.7 Loose Equipment Pool

Basic production equipment – access equipment, stage weights, braces, aluminium tube, tools, rigging accessories, portable staging, stage ironmongery and the like – will come from the existing stock and be reused across the facility.

5.8 Broadcasting Facilities

Provision is required for the parking of broadcasters’ vehicles, their powering, and the access ways for temporary sound and camera cables to all parts of the complex.

Planning and provision of cable routes for temporary cabling is essential whether it is internal for a production or external for an Outside Broadcast (OB). These routes include:

- Touring sound multicore from stage to live sound control position
- Stagehouse to OB truck location
- Amp room to stagehouse

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