REPORT

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VENUE CYMRU, LLANDUDNO
UPGRADE AND IMPROVEMENT OPPORTUNITIES
FEASIBILITY STUDY

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Issued for Information

June 2022

MAX FORDHAM

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CHARCOALBLUE THEATRICAL INNOVATION ESTD 2004

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EXECUTIVE SUMMARY

Venue Cymru is a key building in the success of Llandudno as a tourist destination and a major cultural facility in North Wales. It is approaching a natural point for a major refurbishment after almost 30 years of operation. Investment in the building has provided additional floor space with a front of house extension in 2006 but little upgrade to infrastructure. The flexible use of the auditorium with retractable seating has not been necessary and elderly patron find the steps difficult to navigate. Sea breezes and corrosion have not contributed to economic and effective air handling so there are many opportunities for upgrade and improvement within the building.

The auditorium may be improved by removal of the retractable seating unit in favour of fixed tiered seating.

Substantial foyer area gains are achieved by projecting the Balcony rows forward towards the stage. This also helps to place the balcony front nearer the stage for increased intimacy as well as retain a body of audience at the critical eye level of the performers.

A shallower raked stalls floor forward of this line will help to maintain capacity and provide more seats near points of entry without needing to climb steps. This is especially important for an aging audience demographic.

Whilst a wider seat would help to improve comfort, increased leg room is thought to be more important. Capacity cannot be reduced by any improvements, but this is difficult to achieve when implementing accessibility standards. There are therefore several conflicting outcomes that need to be interrogated further.

Improvements are also possible to the awkward sightlines and tighter rows in the Circle but investment in these would not achieve as great a benefit as those to the stalls. These might therefore be implemented as part of a larger refurbishment project.

Changes to the auditorium will impact on adjacent areas and costs for these are also included in the outline cost estimates.

A further opportunity is proffered to improve the ventilation strategy by supplying air from a plenum under the seat in the new areas. Reversal of the current system elsewhere may also be possible. This work would be intrusive and would require a longer closure period to be implemented. A lighter touch option is also available.

Foyer areas can be repurposed to provide more space for audiences with additional bar, café and restaurant areas adding to the ambience and to the revenue streams.

Additional toilets are also necessary to meet expectations as well as to convince audience that they can order a drink and still get to the toilets in the short interval times.

The total cost for the preferred construction option with associated client costs, contingencies and allowances for inflation are reported elsewhere.

Some smaller works items may be extracted and worked on independently perhaps without course to a longer period of closure, but a longer closure period would offer good value overall if funding targets can be achieved. It is important that the upgrade of production electrical systems and other more intrusive repairs and maintenance can be undertaken under optimum site conditions to ensure the venue is handed back in optimum condition.

Further investigations are necessary but the strategy for implementation is robust and certain aspects of the works could begin with a relatively short lead-in time.

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INTRODUCTION

Charcoalblue were invited to carry out a viability study and options appraisal on the auditorium and public areas of Venue Cymru.

Areas for investigation include:

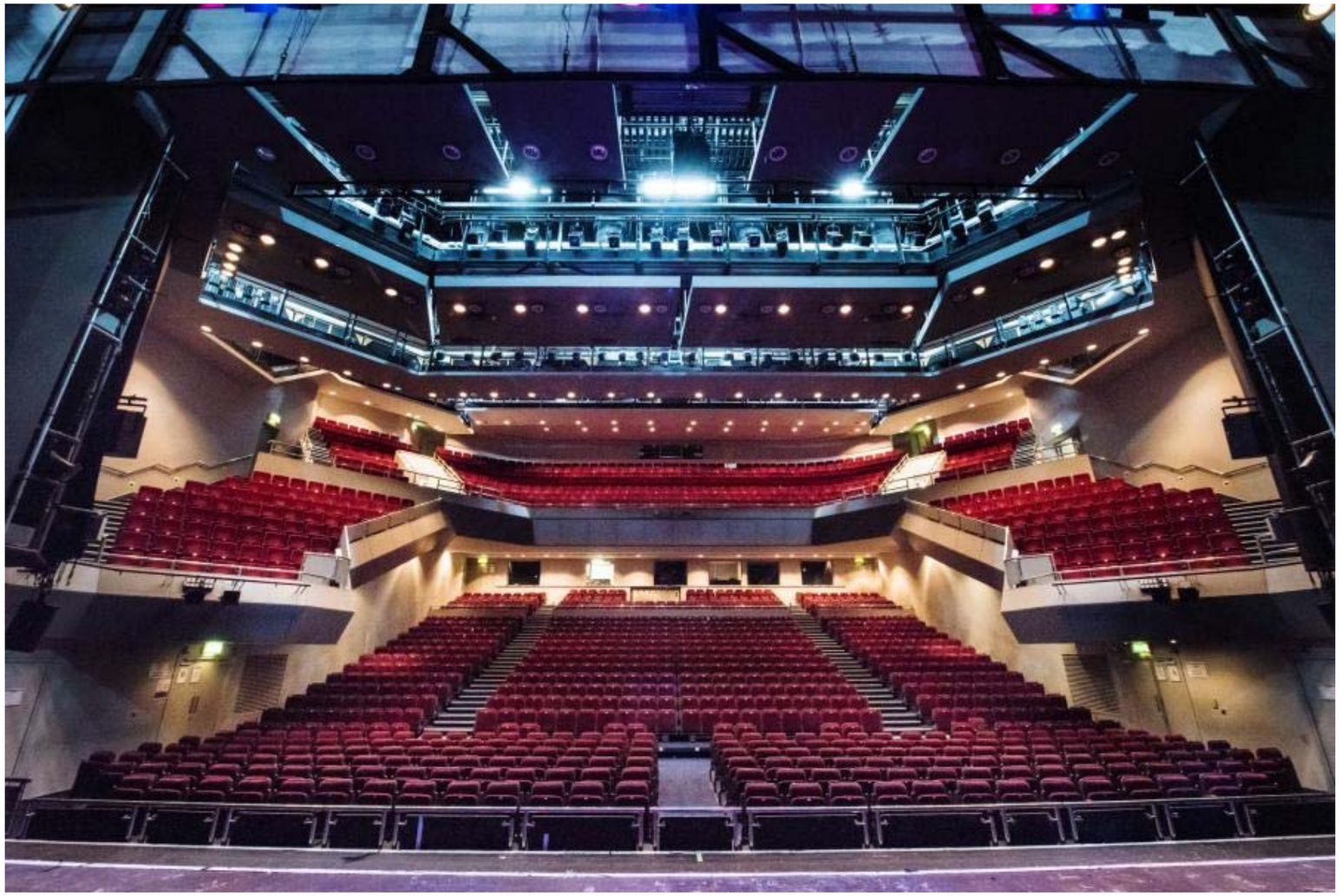
- New seats in the Stalls to improve comfort and kneeroom.
- Budget permitting, replacement Circle seats to match.
- A new permanent Stalls seating rake to create space for foyer bar under the overhang.
- Extending the stalls rake forward to reduce flat floor seating.
- Adding a seating row on the forestage elevator.
- Adjustments required to S/L lobbies to address any level changes resulting from new seating configuration.
- Improvement of accessibility provision throughout the auditorium to include addition of wheelchair spaces to the rear and possible conversion of translation booths to rear Balcony audience boxes.
- Temporary live sound mix desk position and access to it.
- Sense check of the Circle seating layout to improve comfort and sightlines, particularly in the extreme corners.

- Reversal of ventilation strategy in preference of a displacement system (supply through plenum under seats and extract at high level) to address high ambient temperatures and cold draughts.

- General uplift to the auditorium finishes and overall look and feel.
- Guidance on acoustic performance and impact of any changes to the acoustic quality of the auditorium.

We engaged two external consultants to work with us on future strategies: Max Fordham (Bristol) on heating and ventilation systems and Elliot Consulting as the cost consultant on the wider project costs.

Charcoalblue met with representative of Venue Cymru on several occasions including site visits in 2020 and 2022 and numerous on-line discussions and workshops. Peter Ruthven Hall (auditorium design and space planning), Simon Brown (acoustics), Simon Denman-Ellis (stagelighting) and Dicky Burgess (audiovisual) from Charcoalblue have been engaged with Sarah Ecob (Head of Economy and Culture), Adrian La Trobe (Conference and Events Manager), Bryn Rosenwould (Head of Sound), John Owen (Technical Operations Manager) of Venue Cymru. The visits included an initial discussion and review of potential improvements, a tour of the key spaces in the building, a series of site measurements (on which these proposals are based), an acoustic test for the reverberation time of the auditorium and a thorough investigation of the current state of the stagelighting (SL) and audiovisual (AV) systems.



The auditorium of Venue Cymru, 2020

Subsequent feedback includes input from Emma Joyce (Programming Manager) and Ben Hankey (Front of House Services Manager). Comments from this feedback has influence this report and lead us to determine a preferred solution.

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1 AUDITORIUM IMPROVEMENTS

A study was undertaken on the acoustic properties of the auditorium and on desirable improvements so that we are aware of these when considering potential physical changes to the auditorium. The report is included in the Appendix.

When considering the detail of any changes in the auditorium there are several factors that come into play, not always in harmony. For instances: improving comfort can lead to a loss of capacity; optimum sightlines are more easily achievable with stepped auditoria than with raking floors; compliant wheelchair positions also lead to a loss of capacity. Any solution needs to balance these factors.

Client guidance offered priorities as follows:

1. Maintaining total capacity
2. Increased legroom
3. Improved comfort by adopting a better seat design
4. Improved auditorium temperature control
5. Improved sightlines where possible

Lower priorities include:

6. Improved comfort by adopting wider seats
   (there are rarely complaints about this even though the seats are on the narrow side)
7. Improved options for seating late arrivals

Improved accessibility should underly any proposal for reconsidering an auditorium. Currently all the wheelchair positions are in the Stalls just forward of the tiered seating. There are just 8 positions, and each is slightly smaller than the standard for wheelchair positions and does not have sufficient passing space in front of each space. Any changes should also provide:

- Fully compliant wheelchair positions at min. 1% of capacity, in a variety of locations about the auditorium
- More seats within easy access of a level entry
- Loop rails and handrails to stepped level changes
- Transfer arms and space for the wheelchairs when not required
- Space for guide dogs next to amenity seats
- Additional removable seats for relaxed performances
- Other accessibility aids that do not impact on the physical space (e.g. sufficient contrast between adjacent surfaces; dementia friendly patterns and textures, suitable lighting levels).

A further driver for removing the retractable seating unit – which is rarely used – is that the area gained under a fixed tier of seating could be redeployed as bar and foyer space. Localised bar storage would enable improved supply of draught beers with less wastage from remote supply and overlong pythons.

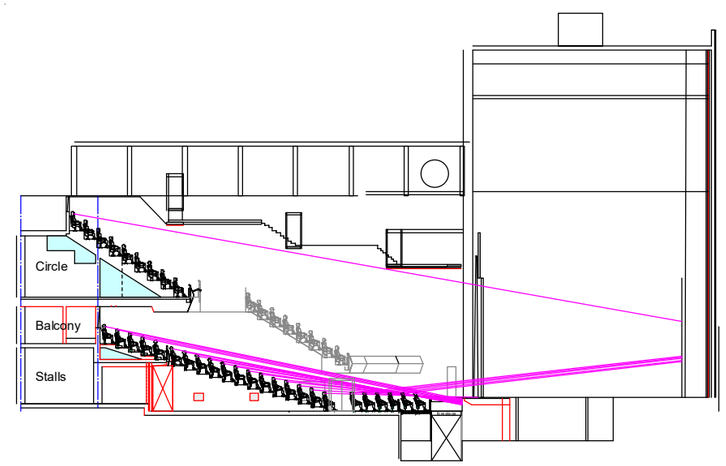
1.1 STALLS SEATING IMPROVEMENTS

Comfort and good sightlines are key factors in the experience of attending the theatre or conference.

Comfort can be assessed in a number of ways:

- An ergonomic profile to the seat
- Improved shaping of foam pads
- Appropriate height of seat pan
- Increased leg room
- Increased width of seat

Sightlines are determined by the clear view over the heads of those seated in front. On a steep retractable unit the person in front could sit directly in front without affecting the view; for a shallower rake the rows need to be offset so that an improved sightline is obtained between the heads of the row in front and over the head two rows in front. For this reason, we will be proposing offset rows wherever possible.

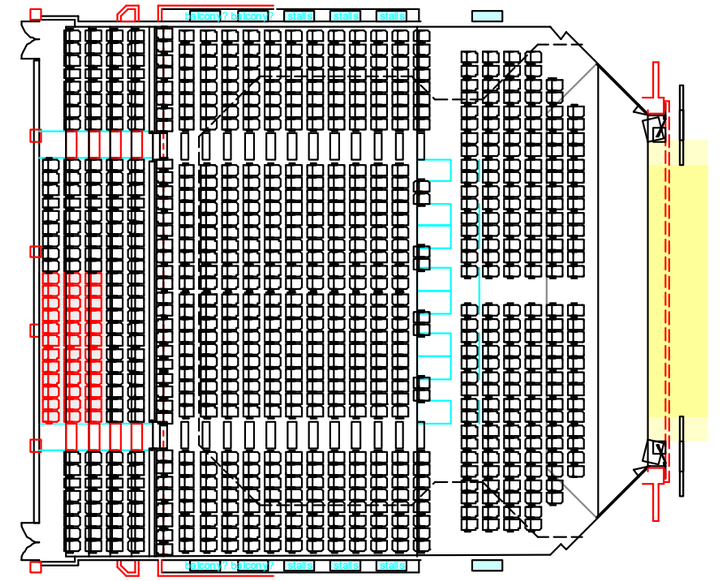


Existing auditorium section

This section highlights the relatively poor sightlines from the front rows of seats on the flat (the pink lines that reach high towards the back of the stage.

Wheelchair positions are limited to just in front of the retractable seating.

Space under the retractable seating is not otherwise available for other use.



Existing auditorium stalls plan

This plan shows the current situation in the Balcony and Stalls (these are combined into one plan as the two levels are linked by the retractable seating unit.

It is worth noting that the aisles are not compliant (too narrow), and the wheelchair positions are non-compliant and need more space around them than is currently provided.

The live sound mix position is at the rear of the Balcony and requires 36 seats to be removed for it to be set up. A simpler solution is being sought.

Currently the seats on the extreme sides of the auditorium have relatively poor sightlines to the depth of the stage. Further, touring shows expect to set speakers on the extreme ends of the forestage elevator which blight 12-14 seats on each side of the auditorium.

There are 656 seats in total across stalls levels

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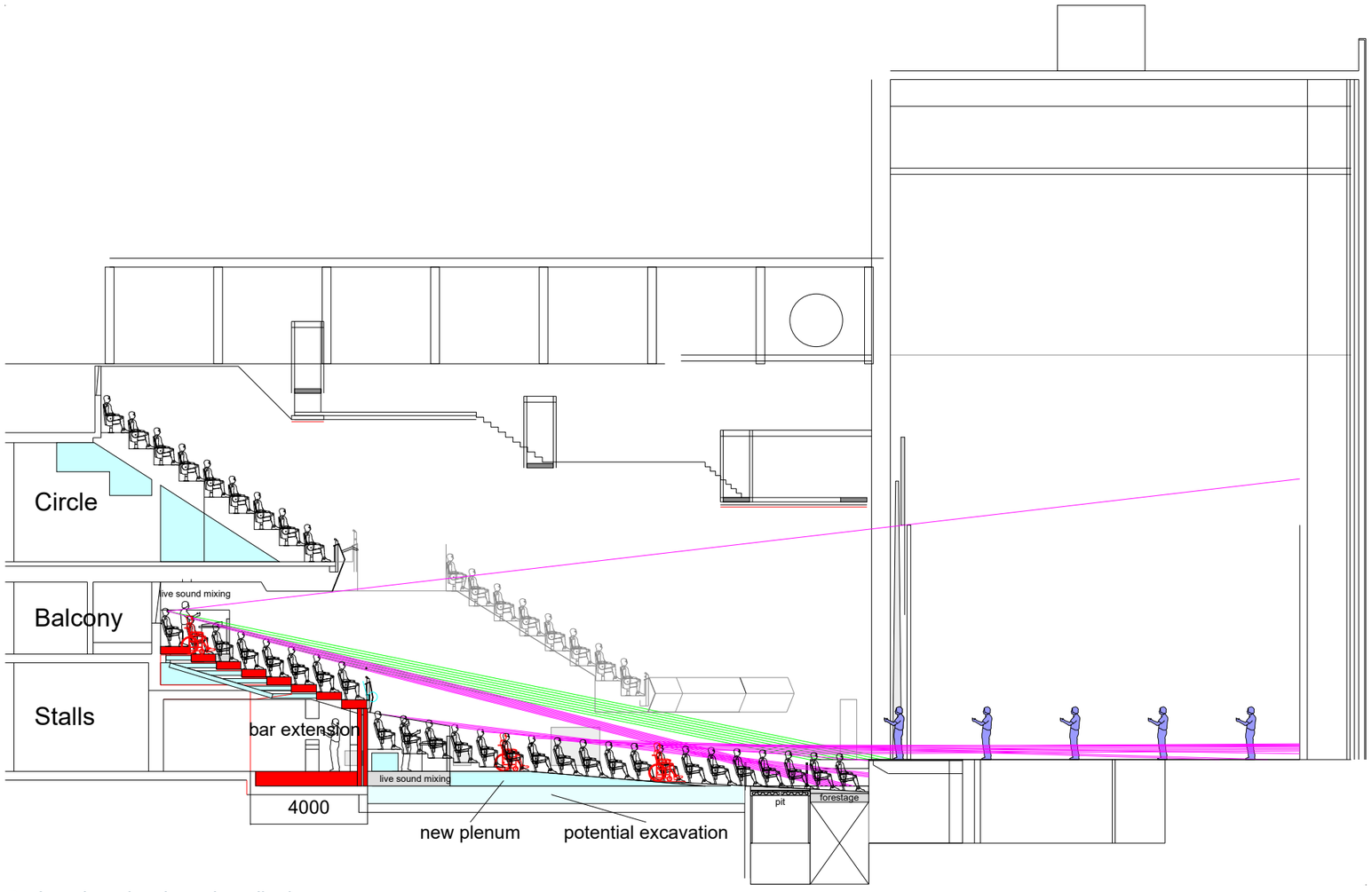

Preferred section through auditorium

1.1.1 PREFERRED STALLS SECTION

The preferred section therefore adopts the best of the options investigated.

The Balcony is built forward by an extra four rows with a solid balcony front closer to the stage. The levels of the Balcony are built up to maximise clearance under the extension so that air can be supplied under the seats and the whole construction acoustically isolated from the new bar below.

The bar extends about 4m under the balcony extension to increase the foyer area for Stalls patrons. The floor of the bar would be built up to account for the change in level between the existing foyer and the flat floor of the Stalls. All new construction is shown in red block.

Forward of the Balcony extension is a new semi-shallow raked Stalls floor: ramped at the front and stepped towards the back to optimise sightlines and ease of entrance. The forestage elevator is lowered to continue the rake up to the stage front which will improve sightlines further back on the rake.

Wheelchair users can be accommodated in two positions about one-third and two-thirds of the way back providing up to 12 wheelchair places when required.

Air can be supplied to the Stalls seating from the rear and the side walls but would be immeasurably improved if it could be supplied from under the seat. To achieve this a shallow excavation would be required. This would not be without risks but would be achievable.

The live sound mix position at the rear of the Stalls is excellently placed for representing the effect of amplified sound within the auditorium. The sound technician would hear precisely what the audience in that location were hearing. The position would be recessed to place the operator's head level with those of seated audience close by and this would achieve level entry through the centre of the bar without need to remove seats. This may seem awkward for the bar but would ease manual handling of sound desks and seats.

The green sightlines show the effect of lining seats up directly behind each other. These sightlines are still better than adequate, but our recommendation is to offset rows for improved sightlines.

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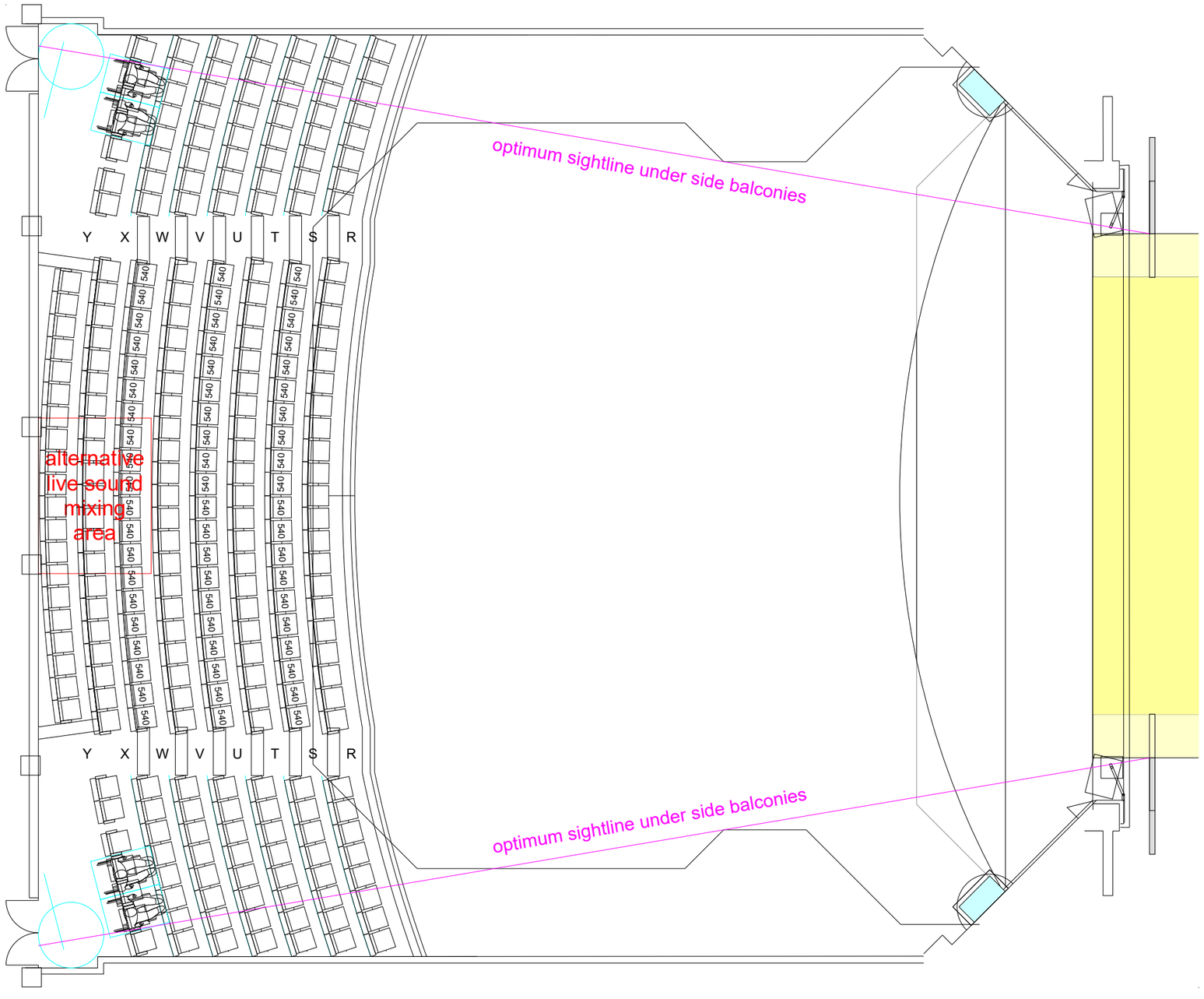

Preferred Balcony seating plan

1.1.2 PREFERRED BALCONY PLAN

The balcony is extended forward by three rows of seats with a new balcony front that would become much closer to the stage. This would improve acoustic clarity and because it places audience a few degrees above eye level for a performer standing on stage would also improve rapport.

The levels would be built higher than the existing to allow air to be supplied beneath all the seats at this level.

Four wheelchair positions are shown just inside the entrance doors with statutory clearances all round. The two nearest the lift on the bottom of the diagram (Audience Right) will probably be more popular than those on the opposite side that have further to travel. But all four positions contribute towards the statutory requirement for min. 1% capacity provision.

A sound mix position could still be achieved at the rear, but the new Stalls position is likely to be preferred in all instances and this alternative not to be necessary.

It is worth noting that the seats outside the pink lines will have their sightlines clipped by the overhanging side balconies. The effect of this could be tested on the extreme ends of the existing rows.

Seats are shown at 520mm and 540mm wide with a total capacity of 266 seats. Capacity is limited by the width of the doors to 279. With 500mm wide seats in this format there is room for 277 in total.

Maximum Capacity = 277

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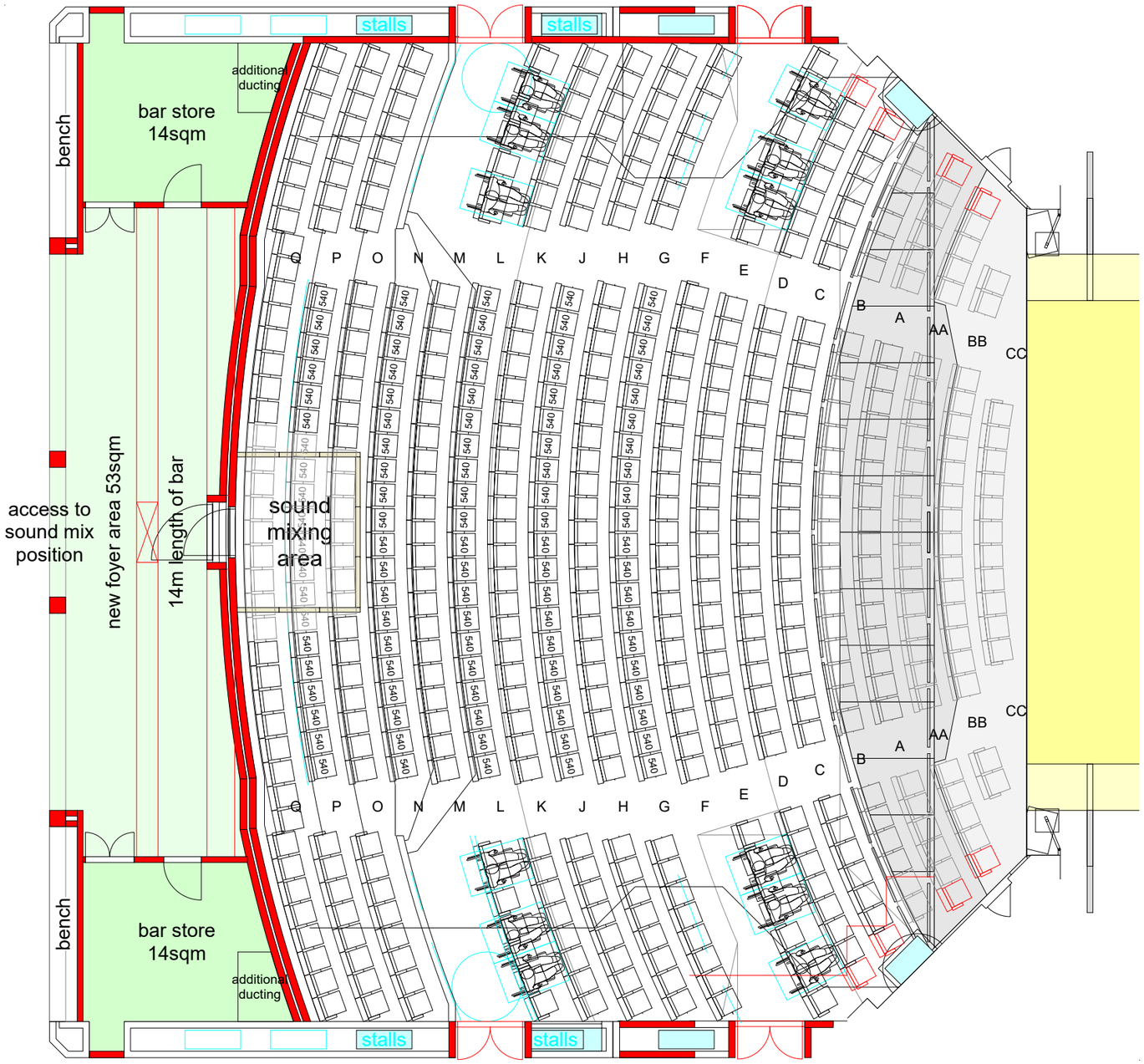


Preferred Stalls seating plan

1.1.3 PREFERRED STALLS PLAN

The preferred Stalls plan has adopted the curved geometry. The seats are shown at 520mm and 540mm widths but could revert to narrower seat for increased capacity. Predominantly 500mm wide seat would accommodate up to 516 seats with a small pit or **582** seats in total.

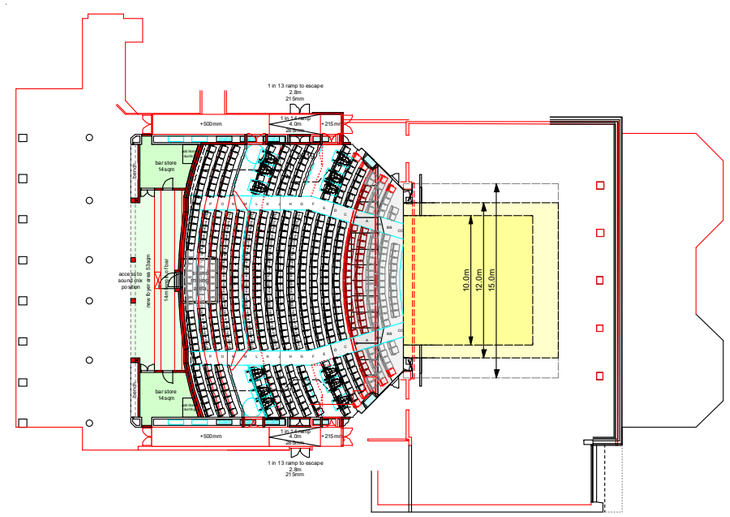
New side entrances from adjusted ramps outside the auditorium provide four points of entry. Each of these leads to the main aisles via a stub-cross-aisle with three wheelchair positions set forward of these.

The rear five rows are stepped with the forward aisle on a raked floor that shallows towards the front. The larger orchestra pit platforms would be adjusted to a curved front line reusing existing orchestra pit rails on the new line. The existing motorised forestage elevator would remain as it is.

All these layers are shown built on top of the existing slab but for improved ventilation to each seat the slab would need to be dropped. If it were, this would open further possibilities for improvement.

The live sound mix position at the rear would be set at the same level as the foyer (for reasons previously discussed) with a double layer acoustic door direct from the bar for ease access for heavy equipment.

The bar area could be fashioned in a number of ways but is shown as a single linear bar with storage areas in the corners. The wall between the bar and the auditorium requires high quality acoustic properties.



Full context of enlarged foyer

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1.1.4 POINT OF ENTRY ADJUSTMENTS

The preferred option requires four points of entry into the Stalls. Entry ramps left and right would need to be raised to foyer level with further ramps moved forward of the first set of doors within these corridors. New side doors into the auditorium would be required in all four positions to create optimum wheelchair positions. These are contingent on fitting in ramps or new steps and levels towards the outer escape doors and adjustment to air handling ductwork away from the side diaphragm walls of the Stalls. Both changes present a degree of risk to achieving seating capacity and do therefore need further investigation.

1.1.5 NOTE ON THE LIVE SOUND MIXING POSITION

We have an unusual link at the back of the Stalls between the sound mix position and the new bar area. The access door required for movement of heavy touring sound mixing desks needs to maintain acoustic isolation between the two spaces. We are proposing two layers of door with a 350mm acoustically absorbent air gap between them.

We are therefore recommending one door achieves an acoustic performance of 45dB Rw which is the highest rating typically achievable by solid core timber door set. The second door could be rated at 35 Rw door.

We do make the following general recommendations:

- Neoprene or silicone compression sound seals at hinge jamb, strike jamb, head jamb, and meeting stiles
- Door bottom seals to be fixed compression seals against flat thresholds as required to meet accessibility requirements
- Doors at the interior of auditorium should not have automatic drop bottom seals

These seals will need to be properly aligned and regularly maintained to ensure the door continues to provide adequate sound separation.

1.1.6 S

We were asked to consider if wheelchair positions could be created within the existing translation booths at the rear of the Balcony. The sightlines work here when the translation booths are raised above the seats in the row in front. As such, these are inaccessible to wheelchair users. For this reason. it seems sensible to accommodate them within the Balcony seating and to repurpose the translation booths for other uses as required.

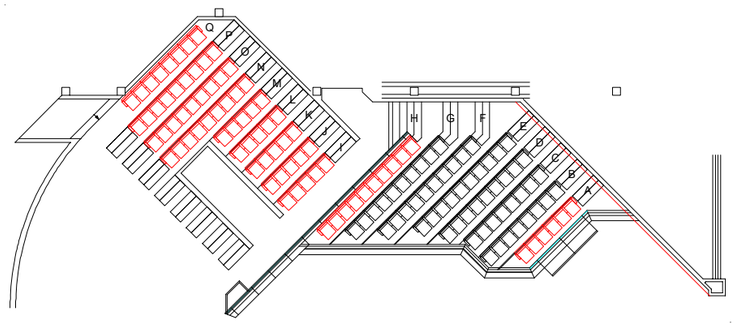
Although the change from the 8 existing wheelchair spaces to the 15 proposed seems a significant increase we advise implementing this upgrade. Although many of these wheelchair positions will be dedicated to wheelchair users only, it is often regarded acceptable to install replacement seats when there is no take up of the spaces. To implement a quick change-over it would be important to ensure these can be moved to and from local storage and attached in position in the simplest possible manner for a robust fixing. Details such as these are normally discussed when seating layouts are more advanced.

1.2 CIRCLE SEATING IMPROVEMENTS

Seating in the Circle is generally considered to be comfortable and offering good sightlines.

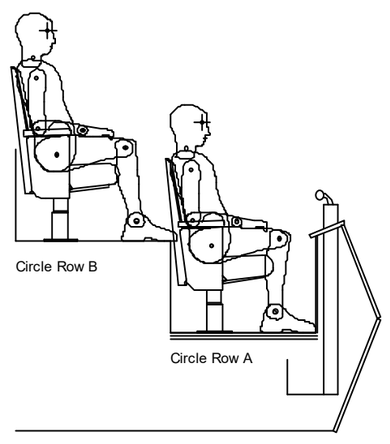
But there are three specific areas of the Circle that require improvement:

- Row A where there is insufficient leg room
- Row H where there is insufficient leg room
- Side Blocks Rows I to Q where higher rails to the cross-aisles blocks views.

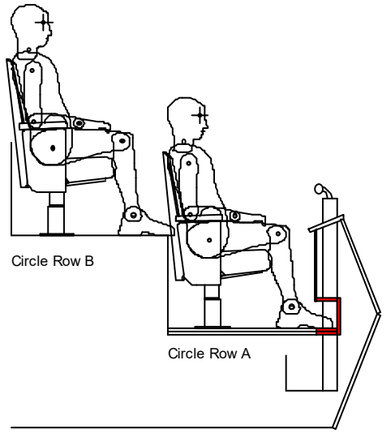


Part plan of Circle showing affected seats in red

1.2.1 CIRCLE ROW A



Existing



Proposed with additional toe room

The first and last rows of seats require extra space to account for the overlap of the seat back over the riser. For the front row, toes would normally project into the space of the seat in front. In this instance (Auditorium Left) the row spacing, or pitch is 810mm rather than 860mm elsewhere. The leg room therefore appears to be pinched and as a top price seat location could be improved.

The aim would be to reform the fascia panels to eat out extra toe room within the structure.

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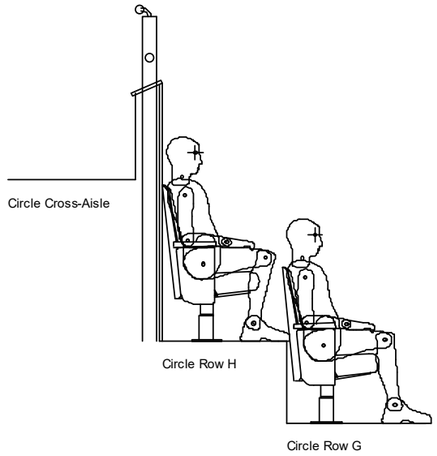
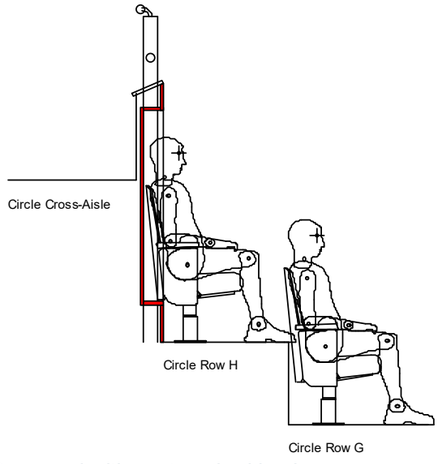
1.2.2 CIRCLE ROW H



Existing

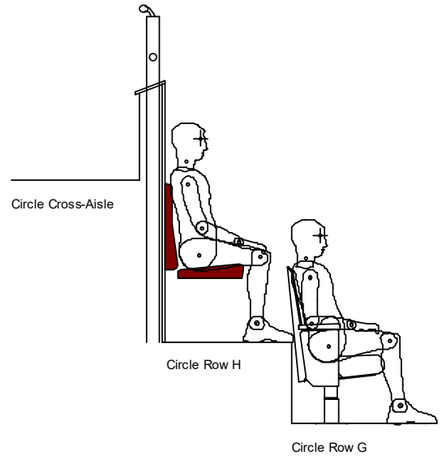


Proposed with seat pushed back

Row H has a pitch of 880mm rather than 860mm but makes no allowance for the overhang of the backrest over the riser behind. As a result, the leg room is squashed even more than in Row A.

The remedy would be to cut into the fascia behind and move the seats back by 110mm to achieve the same legroom as forward of Row H. As the seats would need to fit between the posts which support the handrail above, there may need to be some realignment of the seats to fit and this could lead to loss of a seat or two.

1.2.3 ALTERNATIVE CIRCLE ROW H



Proposed with bench type seating with/without arms rests

An alternative would be to replace the standard circle seats in Row H with a customised design with the back angle taken up in shaped foam to adopt a thinner profile for the seat. This would allow those seated in this row to have more leg room, but the different experience may suggest that these are no more top price seats than at present, just a little bit less cramped than before.

1.2.4 SIDE BLOCKS I-Q

Circle side blocks, cross-aisle and raised rail

The aisle crosses in front of the wheelchair spaces and companion seats placing the seats in these areas of the auditorium too far away from the balcony front to have a good view of the stage. The view is obstructed by the solid balcony front and the upstanding rail at 1100mm which also protects passage along the aisle to the escape doors.

The aim of any improvement would be to get the seats closer to the balcony front but as the cross aisle cannot be removed the seating would need to be raised to achieve a clear view over the rail.

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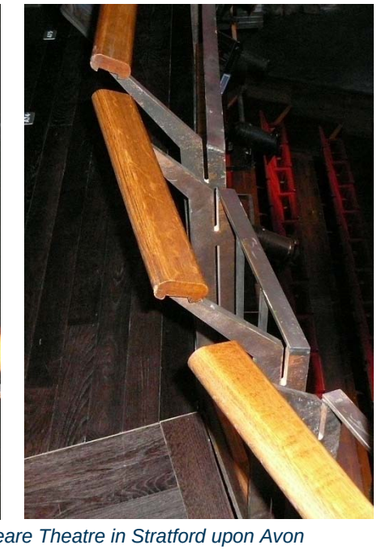
1.2.5 REPLACEMENT OF BALCONY TOP RAILS

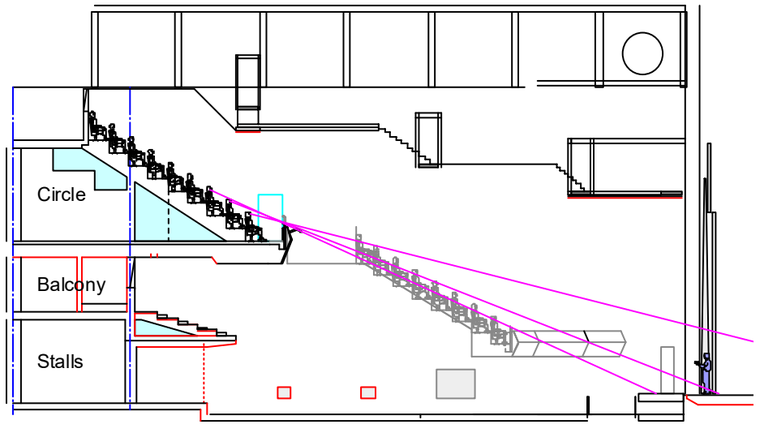
An immediate improvement could reduce the impact of the rail. Currently the shiny aluminium rails are 50mm diameter at a height of 1100mm. Reducing these to thinner sections at the same height would diminish their impact. 10mm plate would be compliant and less conspicuous.

Existing Condition: the view from Row I Seat 1

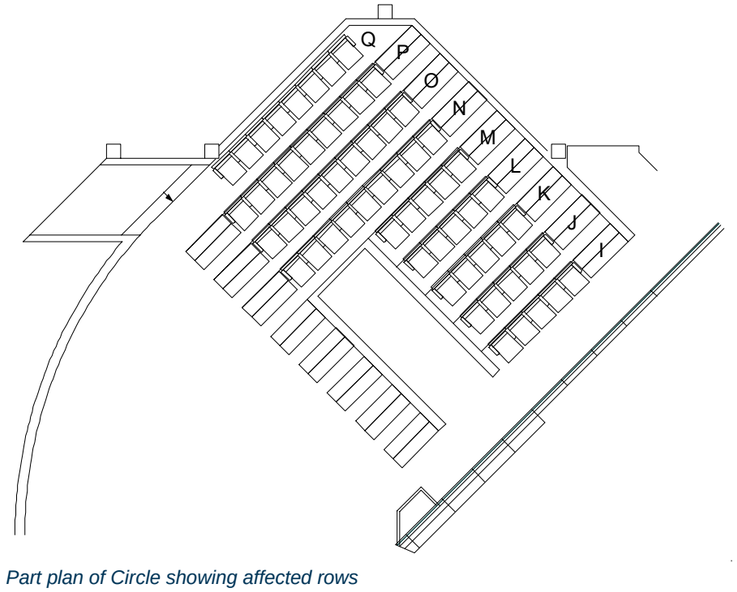


Thinner rails at the RSC Royal Shakespeare Theatre in Stratford upon Avon

CIRCLE OPTION 0 – EXISTING

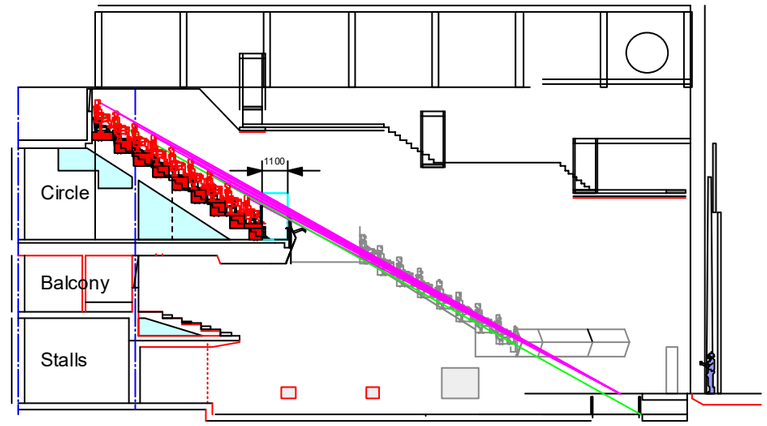


Existing sightlines showing impact of the standard height rail on the front three rows.

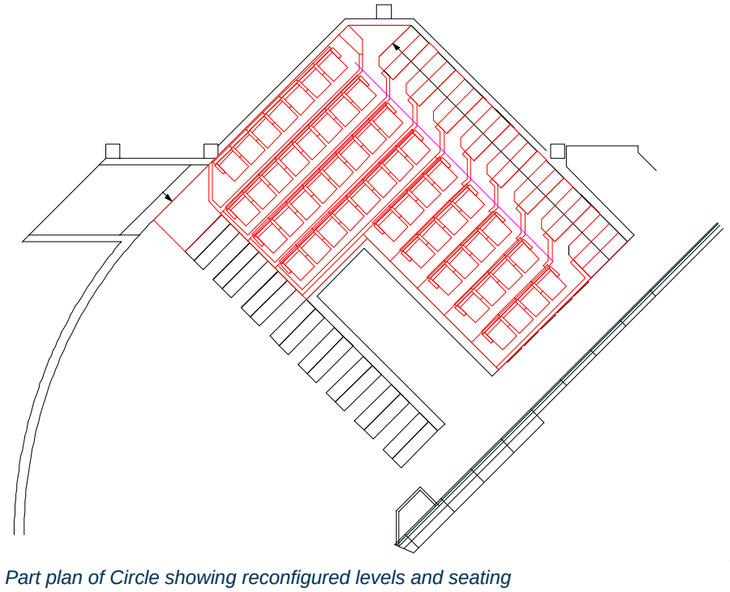


Part plan of Circle showing affected rows

CIRCLE OPTION 3A – RAISING SIDE SEATS AND SQUEEZING LEGROOM



- Loses ends seats only (9 seats each side = 18 total)
- Legroom reduced by 34mm
- Incremental raising improves sightlines over solid rail (for 6 rows)
- Raised rail visible to only front two rows
- Achieves clear cross-over
- Rear row of high crown seats



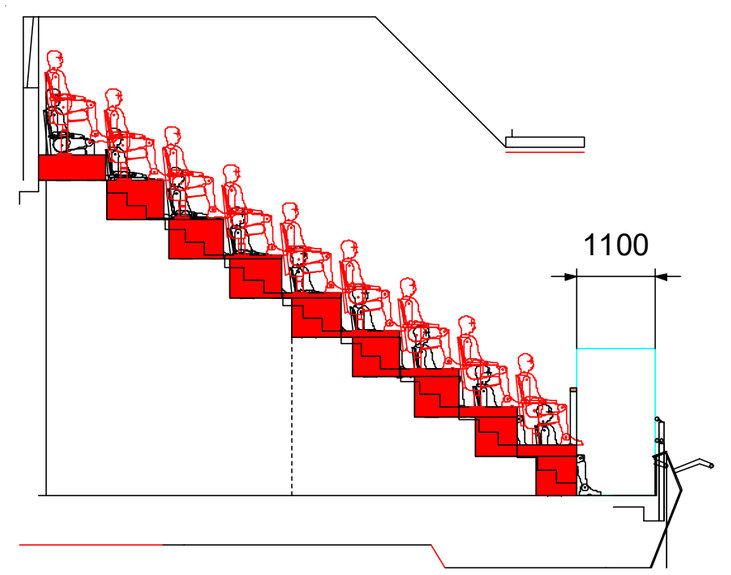
Part plan of Circle showing reconfigured levels and seating

© Charcoalblue LLP

As the seats that get sold last and are in the lower/lowest priced band these seats are going to take longer to pay off additional investment in them.

The simplest solution would be to adjust the front rail which would be necessary in most of the options that raise and reposition the seating. This would reduce the impact of the rail on all seats but not improve the views from the front three rows.

Option 3 A offers the greatest improvement by building over the existing tiers with marginally reduced leg room and a high crown seat for the rear row. The consequent loss of 18 seats (9 either side) would need to be offset against gains elsewhere or possibly against potential rating in a higher price band.



Part section of side Circle showing reconfigured levels and seating (Solid red block shows where the tiers are built up and forward)

1.3 IMPACT ON CAPACITY

Each change to the auditorium will impact on capacity. The ultimate combination of changes has yet to be determined and verified against more accurate survey information. The options are best described in the table below.

	Existing	Preferred
Circle	636	618
Balcony	169	curved wide seats 266
Stalls	464	459
Pit 2	192	41
Pit 1	0	[66]
Total	**1461**	**1384**

Wheelchair places are not counted in these totals; kills will be associated with each wheelchair introduced but, in most instances, this would be the loss of just one additional seat per wheelchair position.

In these figures we have **not counted** the additional two rows of seats on the forestage elevator that are not currently available nor usable very often but could potentially push the seat count to **1450**. The numbers of additional seats are shown in square brackets.

We acknowledge that there are an additional six Stalls seats either side (12 seats in total) that are outside the extreme sightlines currently experienced.

The new Stalls level live sound mix position would kill nearer 24 seats when used compared with the 36 seats that need to be removed for the current Balcony position.

2 AUDITORIUM DÉCOR

With a desired change to a more theatrical ambience and the potential for redecorating much of the auditorium as a result of proposed changes, this is a good opportunity to consider appropriate measure to effect these changes.

Charcoalblue's acoustic analysis identifies that there is no need to reconsider the angles of the side walls or reflectors other than some additional texture would increase diffraction of sound around the auditorium. Applied textures don't need to be costly but let us consider these exempted for now.

A factor that would improve the acoustic quality would be the introduction of a forestage canopy for choirs and orchestra performances. This would help with sound projection and assist communication. This item would be easier to accommodate as a separate element inserted for live music events as it could easily obstruct placement of a central cluster or side speaker arrays. There would be options for combining the two, but the optimum solution would be a removable item. Again, this does not need to impact on the décor.

The other acoustic headline is that the room has a rather low reverberation time, making it suitable for drama (albeit amplified), musical theatre, and amplified music We has assumed it would be deemed too dead for opera or unamplified music (although this is not corroborated by opera and music users). We would normally suggest removing the carpet under the seats and introducing some variable acoustic elements (banners or drapes) at high level to compensate for this. If there were to be any dissatisfaction with the acoustic (and there appears to little) it would be with amplified music, and users seem quite happy with it for opera.

BALCONY FRONT TREATMENTS

The balcony fronts want to remain solid and angled downwards towards the stalls and stage as they provide useful sound reinforcement to these areas, particularly for opera. That does not mean we cannot change the aesthetic of them and soften their shaping.

Many theatres focus attention on the balcony fronts to disguise the larger volume of the auditorium. By bringing attention to the balcony fronts with ornament and lighting, the dimensions of it determine the perceptible scale of the room.

There are several approaches that might be relevant. Here are a few:

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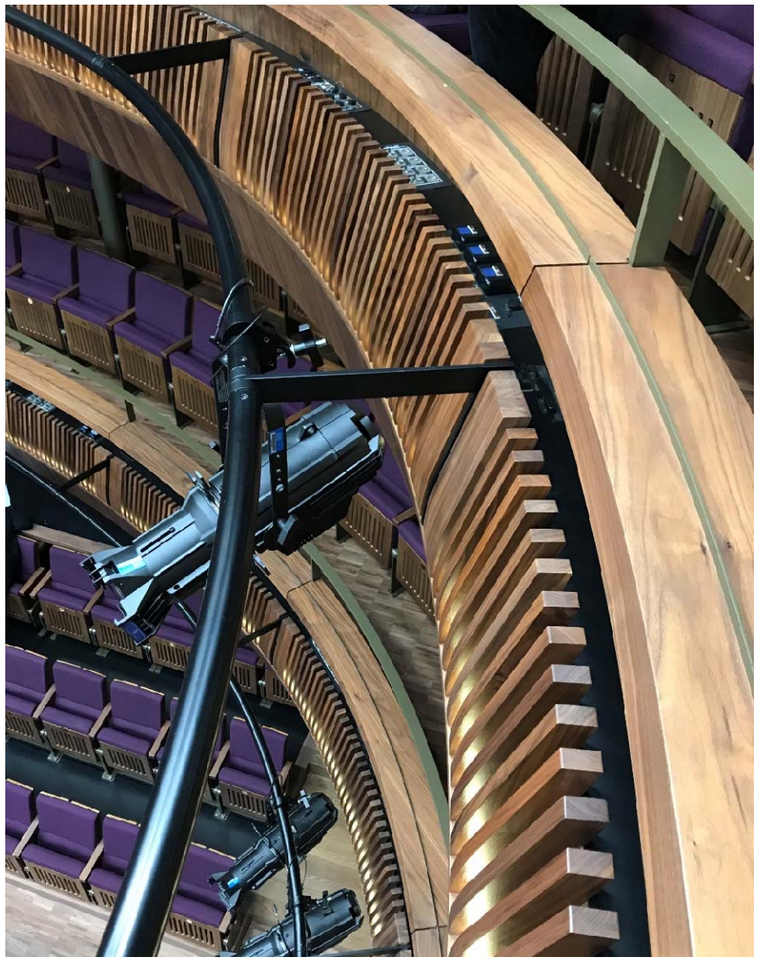
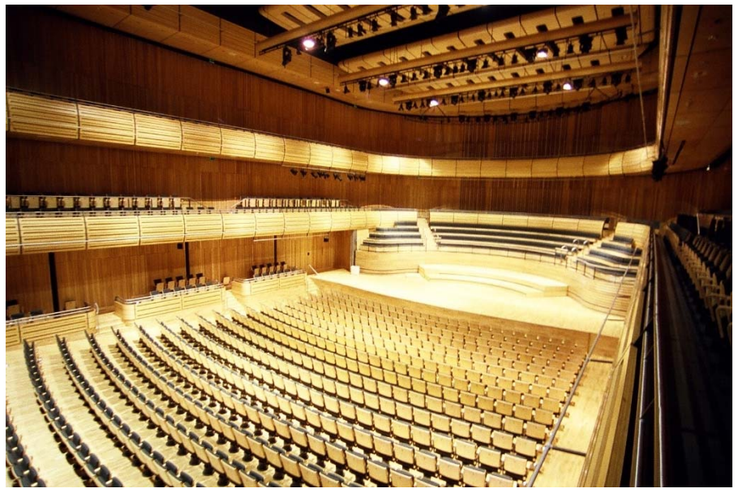
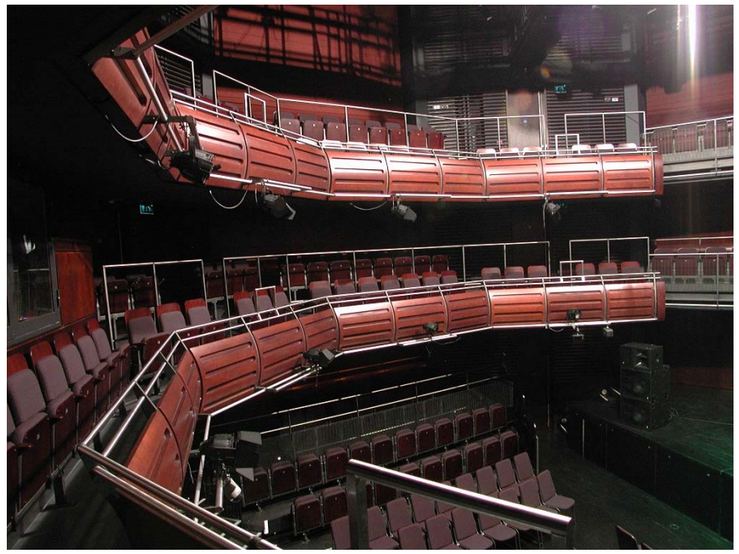


Timber striations at the Royal Opera House's Linbury Studio Theatre, London

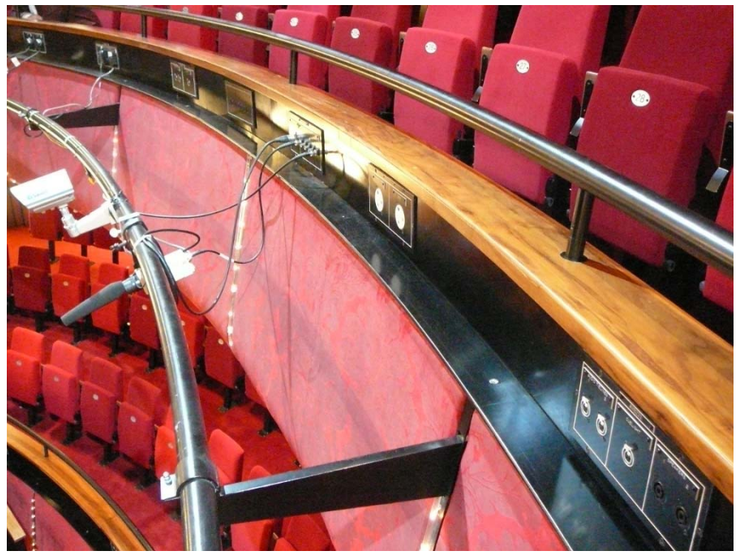
Shaped timber balconies, Marlowe Theatre Canterbury



Shaped timber balconies on a different profile, Hall One, The Sage, Gateshead

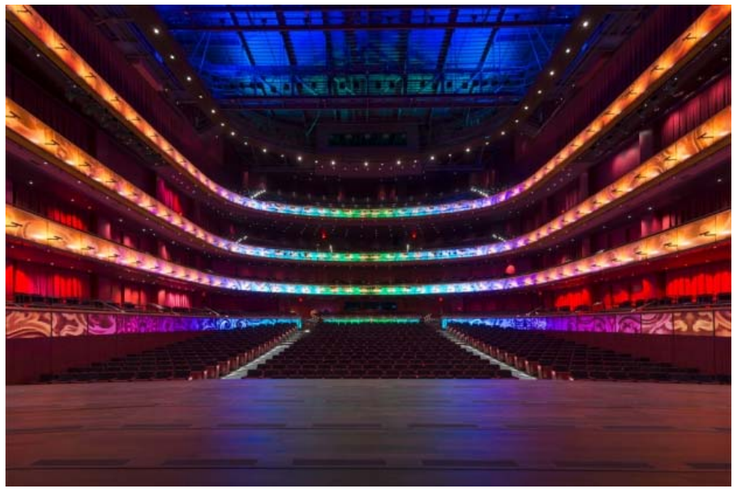


Shaped timber balconies in a different stain, Hall Two, The Sage, Gateshead



Figured velvet covered panels, Core Theatre at Corby Cube

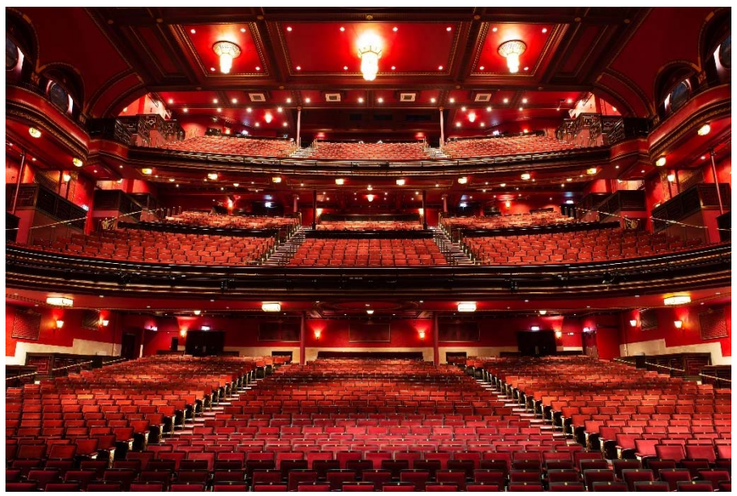
© Charcoalblue LLP



LED illuminated balcony fronts, Tobin Centre, San Antonio

It often helps that the outer walls of the auditorium are coloured dark tones as well as warmer ones. A deep red would help to create a cosier feeling of a theatre as well as help the auditorium to disappear into the darkness when the show is on.

Brighter house lights may then be required for conference use, but we found bright house lights did not need to detract from the warmth of the room when we refurbished the Mayflower Theatre in Southampton in 2018.



Mayflower Theatre, Southampton in 2018 after redecoration and refurbishment.

3 FURTHER IMPROVEMENTS

There are several other improvements in the larger project. These are discussed below.

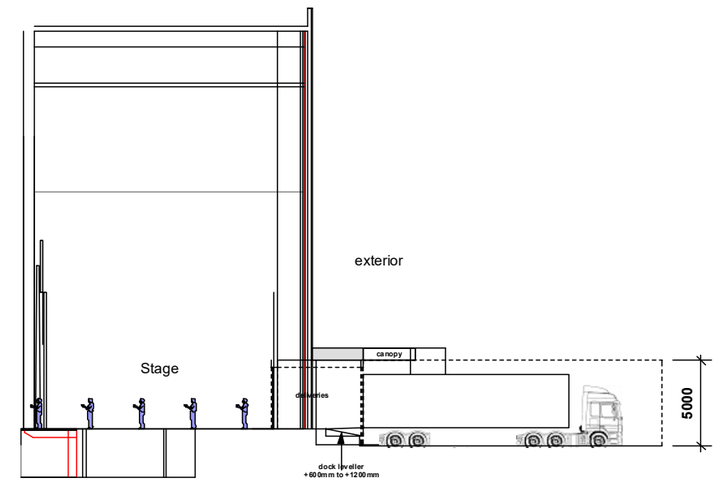
3.1 GET-IN AND SCENE DOCK

As part of the desire to lose less warm air from the stage and auditorium when the scene dock doors are opened, we have sketched a proposal for a new docking lobby to the scene dock. This new dock extension would not have much affect when both sets of doors are flung open during a busy change-over but would reduce the heat loss for smaller and intermittent deliveries.

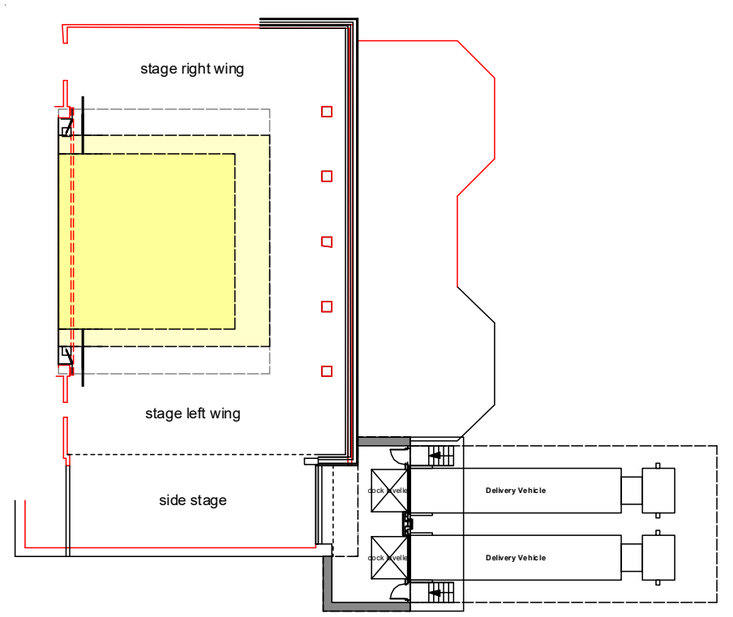
There are perhaps four approaches to this from simplest to more elaborate:

1. New docking door for single truck delivery
2. New docking doors for a pair of trucks delivering simultaneously
3. New docking into a lobby with sound door separation
4. New docking into an enclosed loading bay including one or two trucks

The proposal based on option 3 is sketched below and the one costed in the cost report:



Section though proposed scene dock extension



Plan showing proposed scene dock extension for two trucks

It is probably not necessary to enclose the delivery bay unless there are likely to be complaints from neighbours about antisocial working house. The dotted outline delineates the scale of the larger enclosure if this became necessary, and if it did it would be possible to reorientate the enclosure to sit more comfortably within the shared car park space.

3.2 TECHNICAL UPGRADE

The full report on essential technical replacement and upgrade is provided is a standalone report by Charcoalblue. A summery of the given below.

3.2.1 STAGELIGHTING

There are numerous replacements and upgrades necessary for a venue of this age and scale. The dimmers have reached the end of their life and should be replaced. Some or all the stagelighting facilities panels are only just serviceable; but more data outlets are required, due to the increased use of LED and automated fixtures. The provision of large power panels for temporary equipment is also important to the future operability of this venue.

© Charcoalblue LLP

The worklight control system has reached the end of its life and should be replaced. The new system should be based around a central processor which can interface to the stagelighting console. Venue Cymru will need to replace the stagelighting console in the near future.

The houselighting system is failing and fittings should be replaced with LED fixtures.

Some backstage blue worklights are tungsten lamps: an allowance has been made for replacing these with LED blues.

The front of house stagelighting is provided by Strand Cantatas: it will become increasingly difficult to obtain lamps for these fixtures in the future, partly due to the EU Ecodesign regulations. Whilst there are exemptions for most types of theatre lamp, this represents a disincentive for manufacturers to continue production. It would be sensible to replace these either with tungsten Source Four fixtures (Ushio, the lamp manufacturer, have committed to continue the supply of HPL lamps) or LED.

The fixture stock for general use over-stage needs an upgrade: LED cyclorama lighting fixtures and colour mixing Fresnels will be a good start for an LED ‘workhorse’ rig, retaining minimal tungsten fixtures for ‘specials.’

Front-of-house rigging positions such as balcony fronts and side slips also need replacement with low energy fittings.

3.2.2 AUDIOVISUAL

The proposal assumes a full re-wire of audio and data tielines to serve new digital audio and video systems, together with an allowance for active network equipment and revisions to patch racks. Surround-sound is more widely used than when the building opened, so an allowance for surround sound positions has also been included.

An allowance has been included for upgrades to / replacements of loudspeaker system components and audio mix console.

The stage manager’s console will need replacement; and upgrades are required to most of the technical communications systems.

It would be wise to plan enhancements to auditorium positions for staffed video cameras, fixed cameras and associated infrastructure for live capture, both for archiving and broadcast.

3.3 ORCHESTRA PIT AUTOMATION

The larger orchestra pit platform was never motorised and given its seldom use – usually when Welsh National Opera visit – its change-over could remain a manual operation. Replacement platforms would need to match the new geometry of the auditorium and can offer lower lifting loads whilst maintaining required loading factors.

3.4 STAGE SMOKE VENTS

One of the potential causes of adverse drafts in the auditorium is that the smoke vents on the top of the fly tower are not properly sealed. As these vents need to spring open to release smoke should there be a fire on stage, the seals are an important factor in maintaining an ambient temperature at other times.

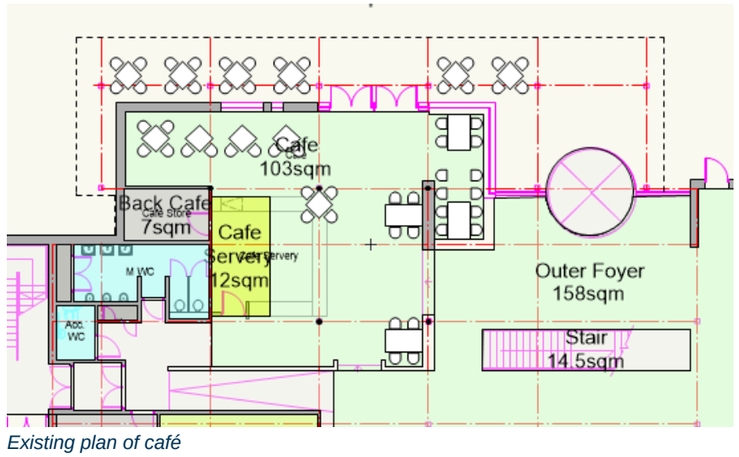
A full inspection of these is required and an allowance has been made in the cost report for upgrade or replacement of a portion of these.

3.5 FRONT OF HOUSE IMPROVEMENTS

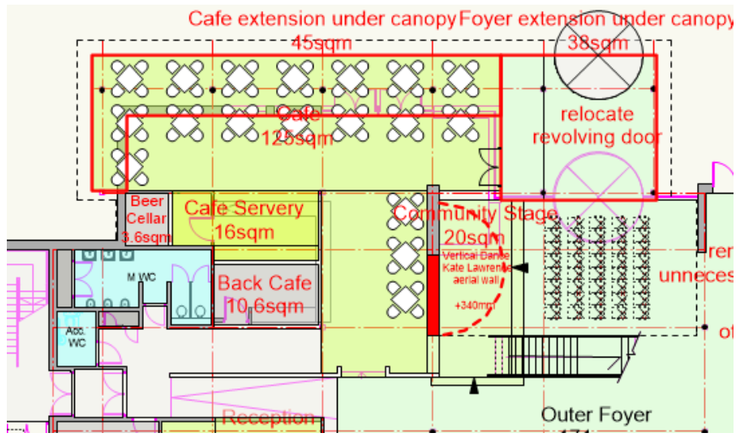
The 1994 theatre was not provided with generous public areas. These were probably as compressed spaces as many in Victoria and Edwardian Theatres but are insufficient to deliver the revenue income of more generous foyers. The 2006 atrium extension to the side almost doubled the available public area but did not resolve the inconvenience of its side-position to the existing theatre nor the extensive distances to travel to reach facilities. Overall, bar and catering offers remain cramped and toilets provision woefully below recommendations. The proposals seek to address these oversights.

An expansion of additional foyer area would tend to exacerbate the situation. So proposals aim to achieve better value from the existing spaces and to decant activities into new accommodation where adjacencies are less critical.

3.5.1 GROUND FLOOR CAFÉ



Existing plan of café



Proposed plan of café

The café holds an excellent position on the seaside promenade, but lack of weather lobbies, insulation and reduced visibility detract from this being a go-to destination in Llandudno. It could become a busy daytime destination as well as a popular part of the theatre’s evening activities.

The proposals remove the masonry enclosure, push the enclosure forward under the overhang with full height double-glazed units and a new connection to an enlarged weather lobby entrance to the north. The interior will be fitted out as a café with its own ambience addressing the splendid view.

© Charcoalblue LLP

View from the first-floor restaurant towards the sea

Panoramic view of the atrium from the staircase looking forwards towards the café and to the right to the seaward entrance

Panoramic view from existing café into atrium stairs up to the first-floor foyer

Panoramic view from across the existing restaurant from the servery end

Panoramic view of the first-floor atrium looking to the restaurant to the left and the stair to the second-floor foyer.

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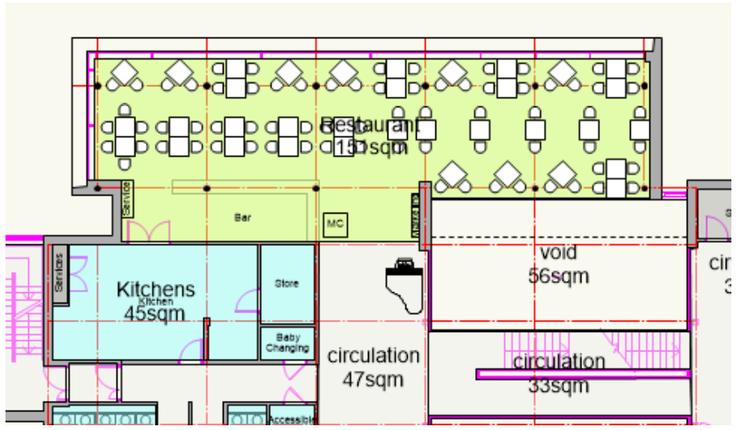
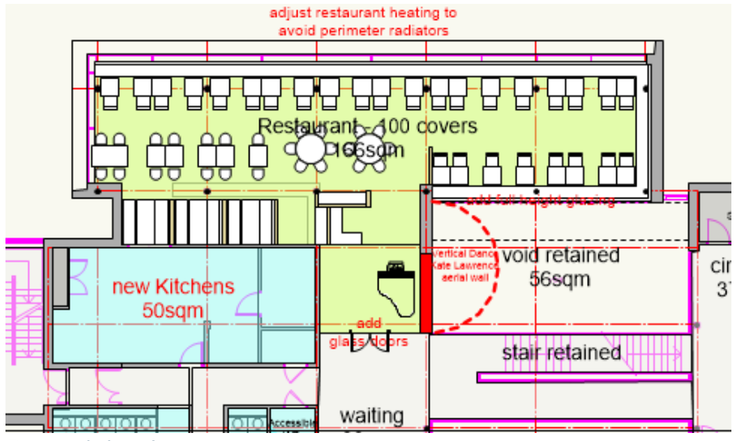
3.5.2 FIRST FLOOR RESTAURANT



Existing plan of restaurant

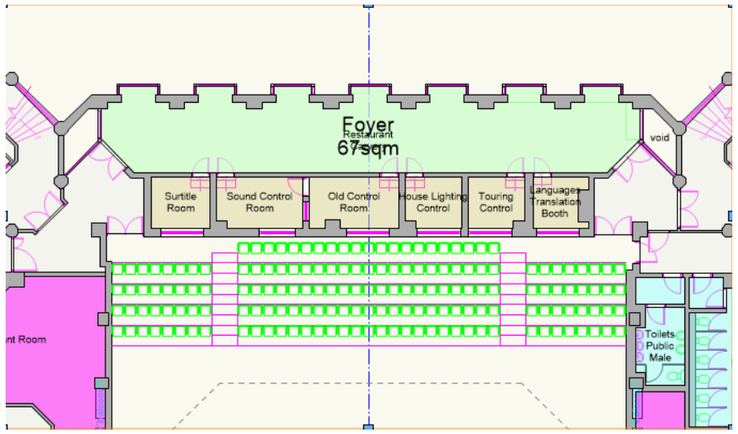


Proposed plan of restaurant

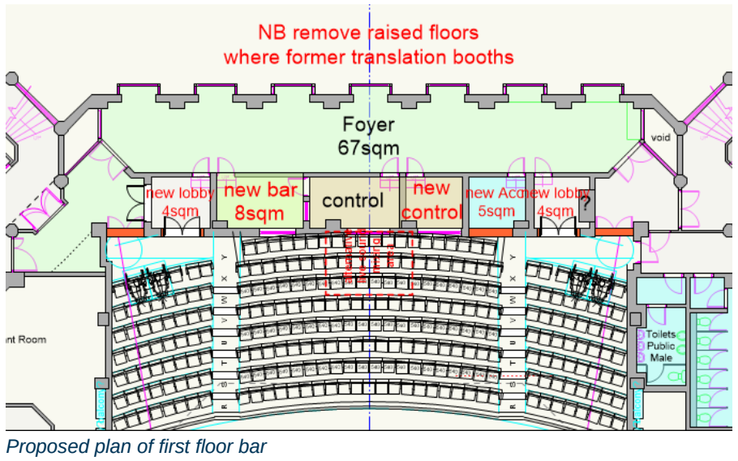
The restaurant is placed with superb views over the bay. Seating is currently optimised to exploit these views, but the ambience of the room requires over-generous spacing of tables. The intention is to increase covers from 60 to 100. With modular tables and some screens a standard arrangement can be adapted for larger parties and for privacy when required.

The existing kitchens are too small and provide access from the far end of the restaurant. An enlarged kitchen will fill out the existing area with stores and staff accommodation moved across the corridor into the toilet area. As the auditorium will accommodate fewer numbers at this level, these toilet numbers are superfluous.

3.5.3 NEW BALCONY (FIRST FLOOR) BAR



Existing plan of first floor bar

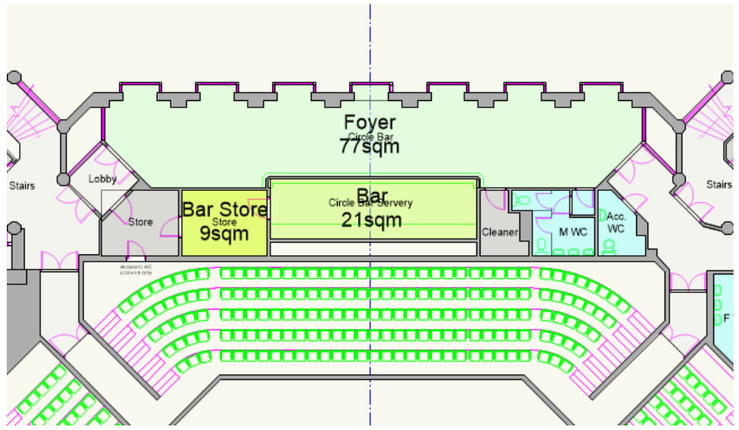


Proposed plan of first floor bar

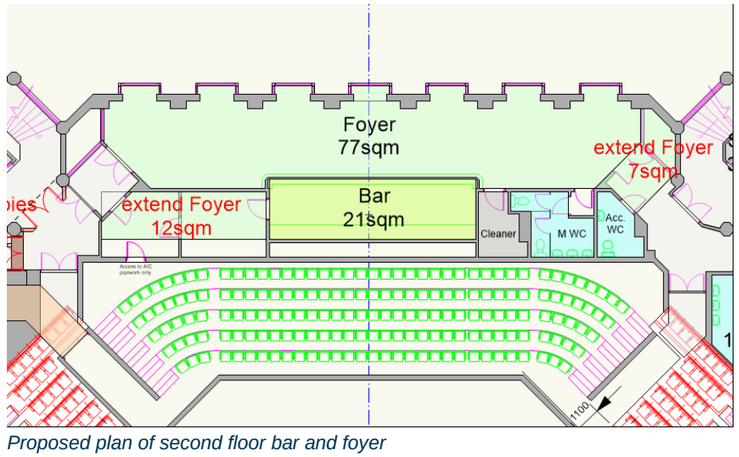
A reconfiguration of the former translation booths (which are largely unused) and control rooms at the rear of the Balcony will provide Balcony audiences with their own bar with views over the bay.

As much of the control room electrical installation will be new, this repurposing of existing spaces will also allow some pre-install works to commence before closure.

3.5.4 IMPROVED CIRCLE (SECOND FLOOR) BAR



Existing plan of second floor bar and foyer



Proposed plan of second floor bar and foyer

Small adjustments to the second-floor bar area should improve access to the bar as well as providing a larger hireable room.

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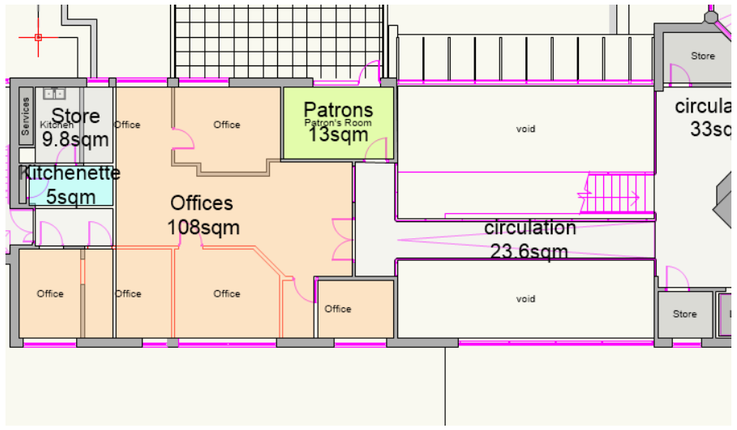
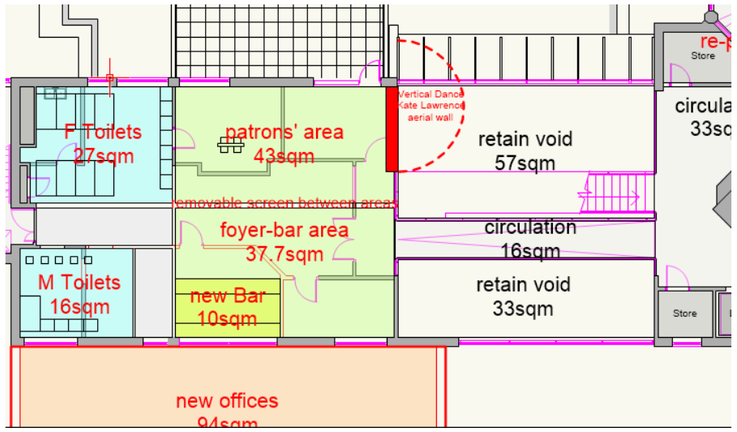
3.5.5 ADDITIONAL CIRCLE (SECOND FLOOR) BAR



Existing plan of second floor atrium



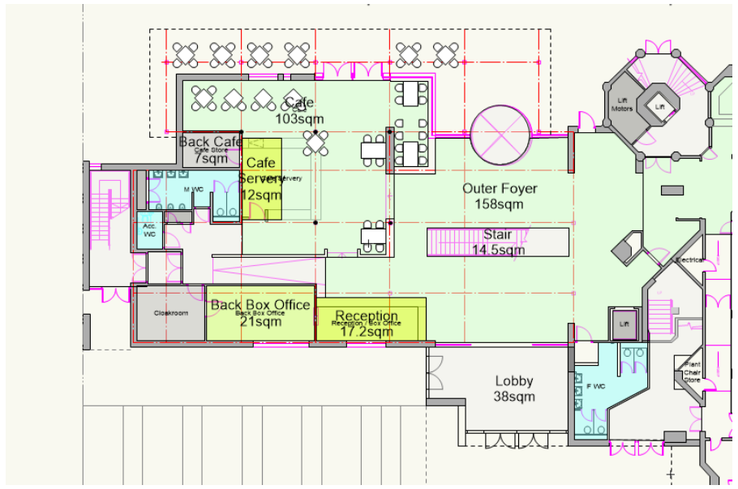
Proposed plan of second floor atrium

With over 42% of the audience accommodated at this level, the foyer space is especially tight. Therefore decanting offices to make way for a second bar at this level, an enlarged patrons' area and some additional toilets will make a huge difference to the audience experience. The new areas should generate important revenue for the theatre.

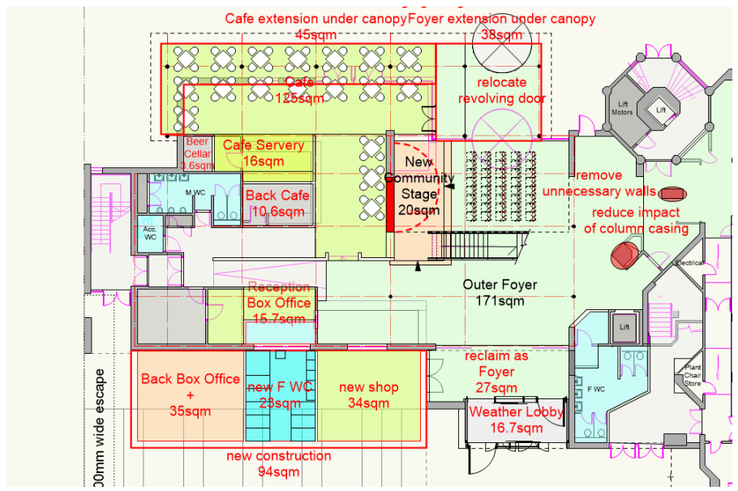
3.5.6 FOYER EXPANSION

Works in an around the foyers offer an opportunity to freshen the décor and to rethink use of the spaces. At ground floor entry a new community stage will offer a platform for pre-show music as well as daytime performance.

3.5.7 COMMUNITY STAGE



Existing plan of ground floor atrium



Proposed plan of ground floor atrium

The Glanfa stage at the Wales Millennium Centre in Cardiff offers one very successful precedent for the intentions of the community stage in Llandudno. The performing artists may be professional at times but are often a reflection of community cultures – singing, dancing, playing music and telling stories or reading poetry – performed by voluntary groups and individuals.

Placed at ground floor within sight and earshot of both main entrances, the new community stage will enliven any welcome into the building. The existing atrium staircase will land two steps higher than at present so that the stage becomes a continuation of this landing. The new level will also tie in with the existing raised level of the café therefore improving the link from the upper floors to the café and vice-versa. The generous bottom steps will also offer focus to an otherwise open space.

3.5.8 ADDITIONAL FOYER IMPROVEMENTS

The sizeable **weather lobby** to the south is the most used entrance to the building. The area could be reduced in size allowing 27sqm to be reclaimed as foyer area. A set of sliding doors offset across the width of the new lobby reduce the quantity of hot or cool air passing through. In exit mode, hinged doors can open to allow free passage across the lobby.

Adjacent to this would be a new theatre shop which will offer greetings cards, stationary, fashion accessories and craft items. The shop at Aberystwyth Arts Centre offers a good precedent.

Otherwise the foyers will retain much of their light and airy character.

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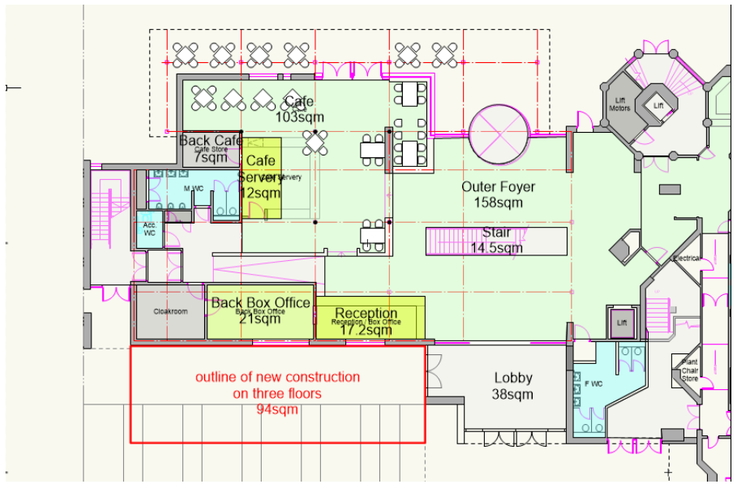
3.5.9 NEW ACCOMMODATION



A three-storey extension of 94sqm footprint and 282sqm overall is proposed to the south of the 2006 extension. The new floor area will allow offices to decant from the existing building to free up space for much needed bars, kitchen, toilet, foyer and hospitality space. The placement to the side of the atrium allows the magnificent views from the atrium walkways to be preserved and offers natural daylight and air into habitable spaces.

The new accommodation will house, on the ground floor: a shop, public toilets and back box-office workers; on the first floor: administration and public toilets; on the second-floor further offices including rentable space for film production companies and other creative partnerships.

4 AUDITORIUM VENTILATION STRATEGY

Charcoalblue have invited Max Fordham's Bristol office to advise on strategies for improving air flow and maintaining air temperature in the auditorium. Reversing air flow within the auditorium to supply at low level under the seats and extract at high level – a displacement system - is the favoured option but other options may also offer good value.

We are aware of efficiencies of adopting the displacement ventilation strategy especially in relation to the specific criteria for reducing infection during a pandemic. Supply under the seat and exhaust at high level is the best way to ventilate as it moves aerosols away from the audience as quickly as possible. High level supply (as per the present system) is likely to entrain some fraction of the aerosols down to the audience, and cross flow supply virtually guarantees aerosol transmission across the body of the audience. CIBSE have produced a guidance note on this [CIBSE-coronavirus, SARS-CoV-2, COVID-19 and HAVAC Systems].

A displacement system is ultimately less costly to manage because it requires air to be supplied at a few degrees below ambient temperature. But it does require larger duct sizes and air plena under the seating. These exist under the Circle and Balcony but would need to be created under the new shallow Stalls construction, probably requiring some excavation for the best solution. It also requires diffusers under every other seat which requires close integration and also has an impact on cost. Instigating the strategy is therefore more costly in capital terms which may be why it was value engineered out of the original construction programme.

Max Fordham's report follows.

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Llandudno Venue Cymru

Auditorium Ventilation Feasibility

Issue 1

November 2020

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ISSUE HISTORY

Issue	Date	Description
1	3/11/20	Feasibility Issue

MAX FORDHAM LLP TEAM CONTRIBUTORS

Engineer (Initials)	Role
IJ	Senior Partner
JS	Project Engineer

MAX FORDHAM

CONTENTS

MAX FORDHAM

1.0 INTRODUCTION

1.1 Study Brief

Max Fordham have been approached to provide a desktop feasibility study to explore potential developments of the Venue Cymru Auditorium ventilation system as part of expected renovation works.

Proposed Development
The key changes proposed as part of the renovation works are:

- Removal of stalls retractable seating unit
- Extension of the fixed balcony (at the back of the retractable seating unit) forward over a new stalls bar
- New shallow rake stalls tiering
- Adjustment to the shape of the orchestra pit
- Adjustment to the mode of entry into the stalls
- Re-tiering of the extreme corners of the Circle behind the front cross-over aisle.
- Reversal of air supply to under the seats through existing and proposed plena

Also:

- Improving seals on smoke extract vents over the stage (to reduce stack effect and downdrafts)
- New Stage docking lobby/extension to avoid heat loss when the dock doors are opened for deliveries and changeovers between shows.

Issues Identified
Through discussion with CharcoalBlue it is evident that the performance of the auditorium's ventilation system is considered poor. The ventilation system seems to have been part of a Design-and-Build procurement strategy and subsequently the detail of the system may have been driven by the minimum permissible standard and at the lowest cost. The issues identified include:

- Complaints of drafts
- Overheating in the balcony
- Heat disappearing into the stage house (cold on the flat floor stalls seating from the downdraft)
- It is said to be a noisy system
- There is no heat in the orchestra pit which can be cold

Noise Criteria
Charcoal Blue have highlighted that thermal comfort and efficiency will be the main drivers for works to the ventilation system, although noise associated with plant equipment is an important consideration.

A low background noise level is expected in the auditorium. The current system, as measured during CharcoalBlue's visit in August 2020, achieves PNC-25 which is deemed suitable for amplified speech and music but is on the edge of acceptability for unamplified music. A replacement system provides an opportunity to improve this and should be aiming to provide a noise level of PNC-20.

CharcoalBlue have provided the system air velocity criteria in Table 1.1 as a guide to planning duct dimensions considering the noise rating criteria of PNC-20 in the auditorium.

Table 1.1 Duct air velocity criteria to achieve PNC-20

	Supply	Extract
Diffuser/Grille	1.5m/s	1.8m/s
1.5m of Up/Down Stream Branch Duct or Clear Opening	1.8m/s	2.1m/s
1.5m to 3m Up/Down Stream Secondary Duct	3.0m/s	3.0m/s
3m to 6m Up/Down Stream Main Duct	5.3m/s	5.3m/s

1.2 Record Information Available

The following record information has been made available for the purposes of this study.

Table 1.2 Available record information

Information	Source	Dated
Scanned record plans and sections	Ellis Williams Partnership	20/03/92
Llandudno Theatre – Description of Operation – Issue 06 (Des Ops)	Sauter Automation Ltd	28/10/11
Seating Plans and Sections - Existing	Charcoal Blue	29/09/20
Seating Plans and Sections - Proposed	Charcoal Blue	14/10/20
Photo Set – Auditorium and Vent Plant	Charcoal Blue	Varies

1.3 Scope of Study

Based on the briefing information provided by CharcoalBlue and the record information available, this feasibility study aims to develop a set of options for reworking of the auditorium ventilation system including the potential to reverse/reconfigure the ventilation system. The appraisal of these options includes:

- Spatial feasibility of main options for changing the ventilation system
- Audience and performer thermal comfort
- Capital and/or running cost (based on broad assumptions, not cost consultancy)
- Carbon/efficiency improvements
- Fan and turbulent noise.

Furthermore, a list of risk items that may apply to a building of this age/type is provided, including other services upgrades that may be necessary as a result of changes to regulations or good practice, and recommendations for other opportunities for improvement.

2.0 EXISTING VENTILATION SYSTEM

The diagrams in Figure 2.1 and Figure 2.2 describe our understanding of the existing auditorium ventilation system based on the record information provided. This can be summarised as follows.

Central Plant
There are two main plant rooms serving the auditorium. According to the 2011 Description of Operation, the East plant room Air Handling Unit (AHU) is a supply and extract unit, capable of recirculation. The West plant room AHU is also a supply and extract unit but has heat recovery via a run around coil and no recirculation. The West AHU originally had a humidifier for humidity control, but this is no longer in use. The description of operation suggest that the East AHU runs during all modes of operation including Setback, Rehearsal and Performance Modes. The West AHU only runs during Performance Mode. A calculation of the approximate air flow is given in Table 2.1 based on an assumed ventilation rate per person. It is unclear from the information available how the AHUs are connected to the supply and extract points.

Table 2.1 Approximate air flow rates of existing system

Stall Seats	628
Additional Seats over Rostra	100
Balcony Seats	144
Circle Seats	631
Approximate Total Seated Capacity	**1503**
Air flow @12L/s/person (assumed)	**18 m^3/s**

Supply Air
Air is supplied to the auditorium mainly by 22No. (assumed) high level swirl diffusers integrated into panelling. Additionally, air is (assumed to be) supplied at the back of the upper circle and balcony by the linear bar grilles mounted in the soffit. It is assumed that these grilles diffuse conditioned air along the soffit.

Extract Air
Air is returned to the central plant by a combination of large extract panels at stall level (on each side), and through under seats grilles that connect to plena below the circle seating and behind the side walls of the stalls. The plena combine to provide air paths back to each of the plant rooms on the third floor.

Other Areas Served
We are unaware of any other Heating, Ventilation, or Air Conditioning (HVAC) systems in the theatre, including in the Orchestra Pit and Performance Area (highlighted orange and **green** respectively in Figure 2.1). This is except for the smoke vents at the top of the fly tower.

Issues with Existing Strategy
- Heat gains (e.g. lighting), pulled towards seated audience.
- Supply air flows directed at audience on upper circle and balcony
- Extract panels at stall level concentrate airflow rates in local area
- System does not extend to serve performance space or pit.

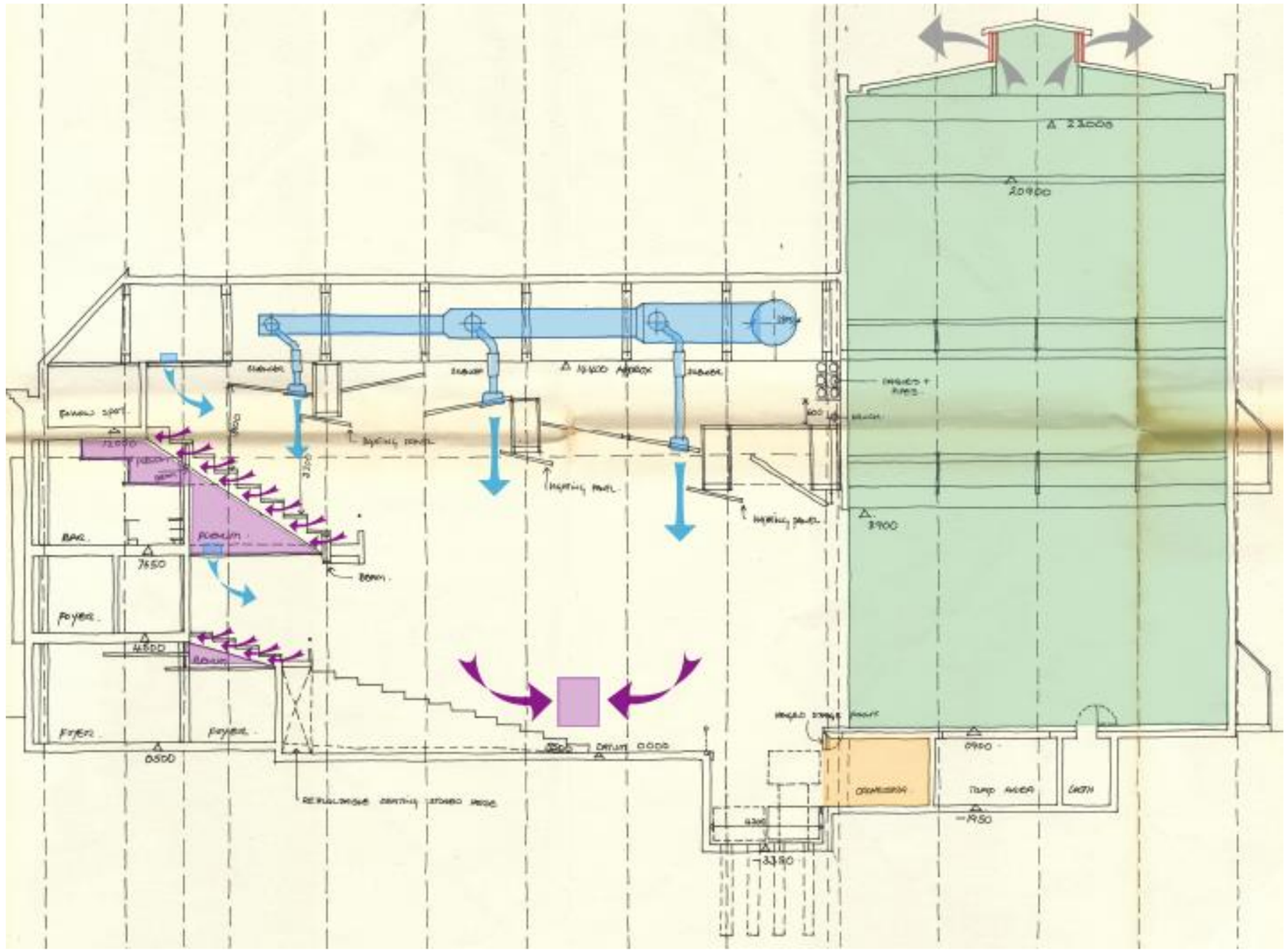

Figure 2.1 Section through auditorium showing existing ventilation strategy

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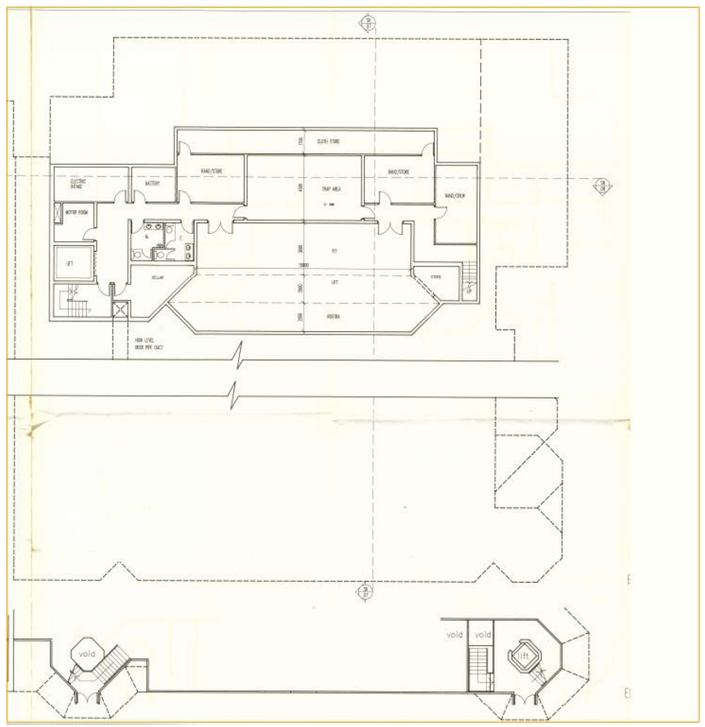
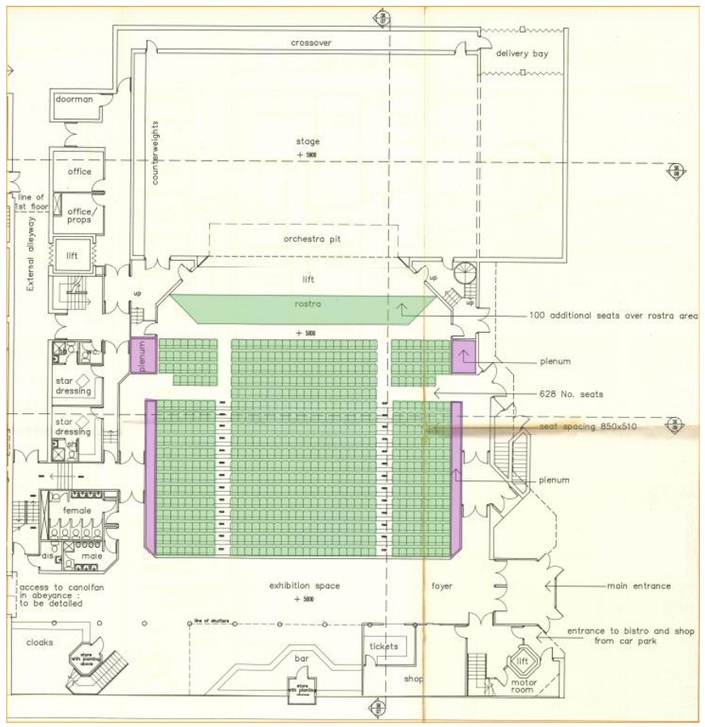
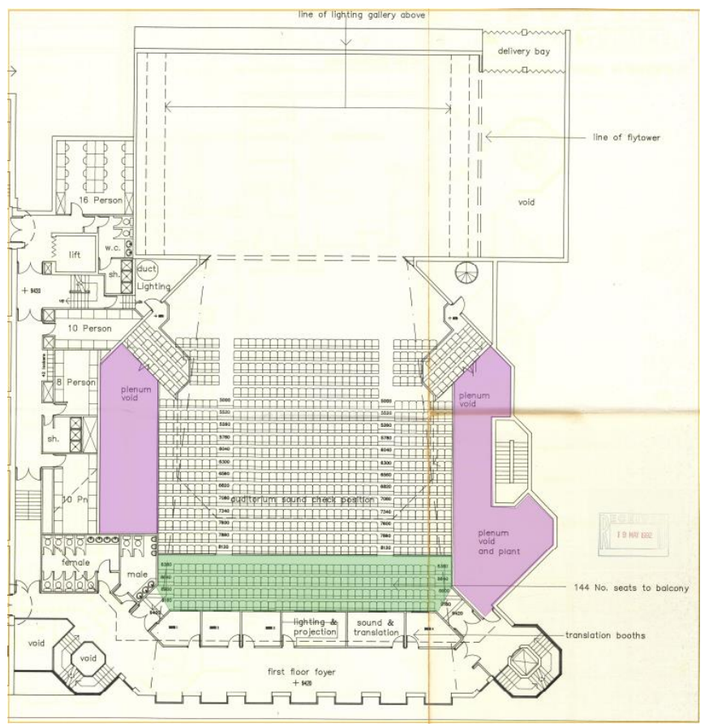


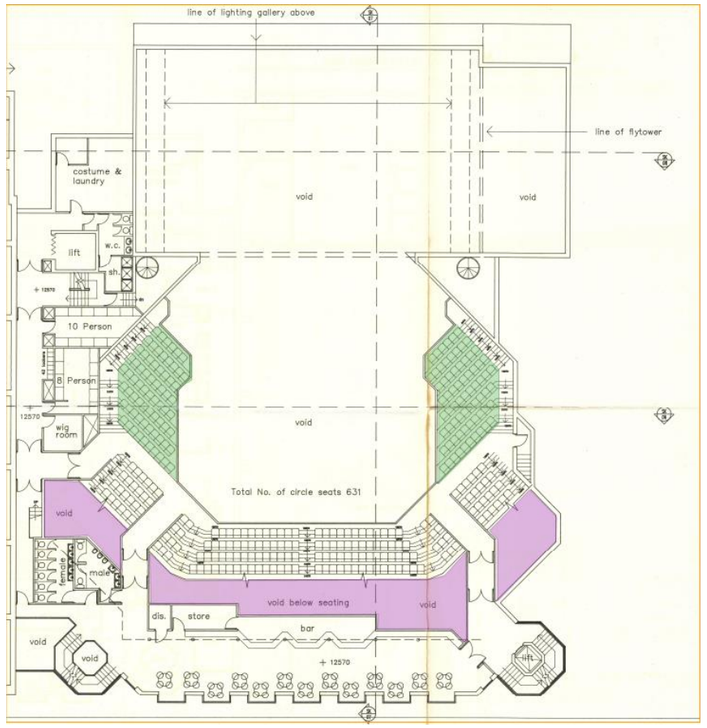
(A) Basement Level



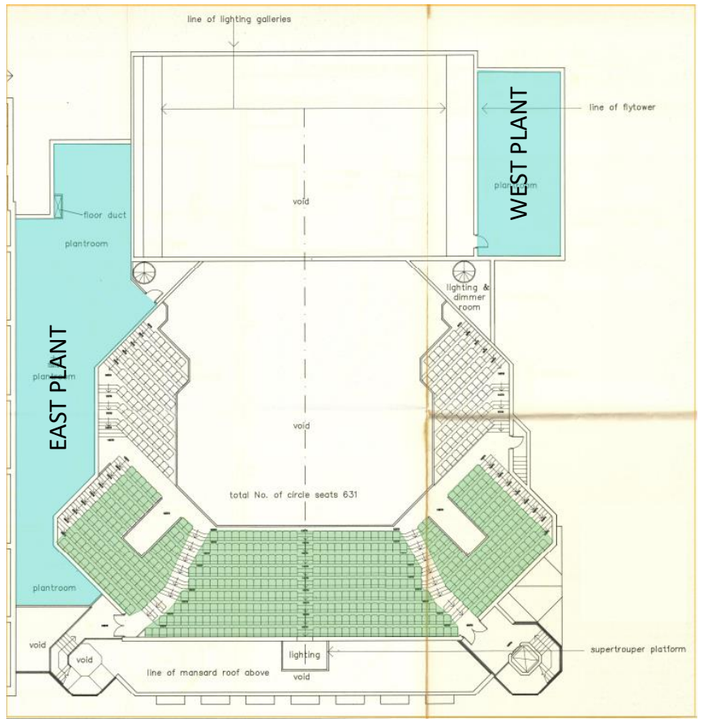
(B) Ground Floor – 728 Stall Seats (inc. Rostra)



(C) First Floor – 144 Balcony Seats



(D) Second Floor – 142 Lower Circle Seats



(E) Third Floor – 488 Upper Circle Seats

Seating Area

Extract Plena

Plant Room

Figure 2.2 Layouts of auditorium showing existing strategy

3.0 PROPOSED AUDITORIUM OPTIONS

This section sets out three options for developing the auditorium ventilation with increasing extents of measures based on our understanding of the existing systems.

We note that the proposed plans from CharcoalBlue show a minor change in seat numbers. The approximate proposed seating plans are given in Table 3.1.

Table 3.1 Approximate air flow rates of proposed system

Stall Seats (inc. Rostra)	581
Balcony Seats	280
Lower Circle	142
Upper Circle Seats	474
Approximate Total Seated Capacity	**1477**
Air flow @12L/s/person (assumed)	**17.7 m^3/s**

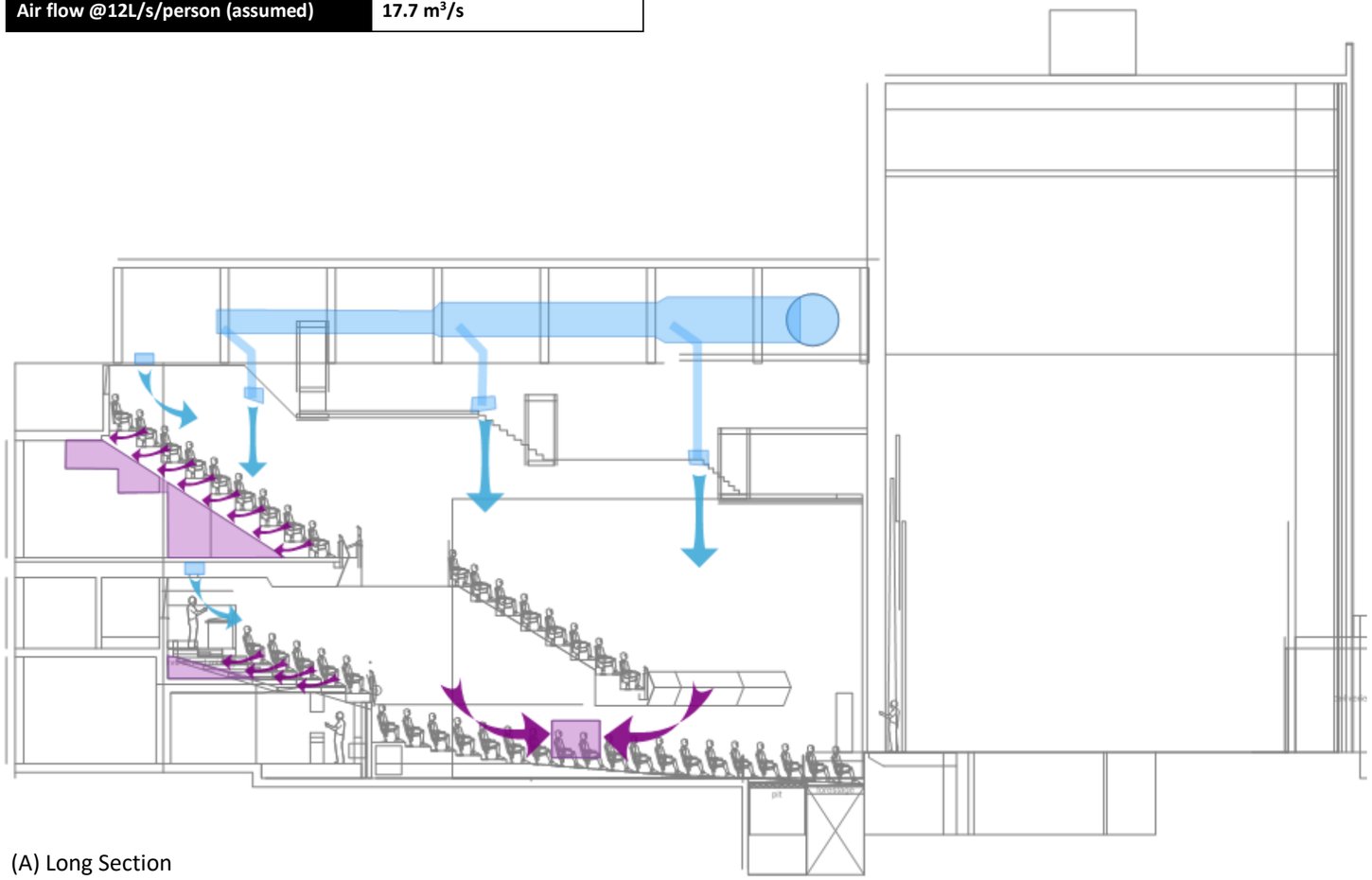
3.1 Option 1: Minimal Interventions

Keep ventilation as existing as seating capacity numbers are largely unchanged. Focus on targeted measures to address complaints including inspecting and cleaning ducts, check balancing and throws of supply grilles, fix defects, recommission system.

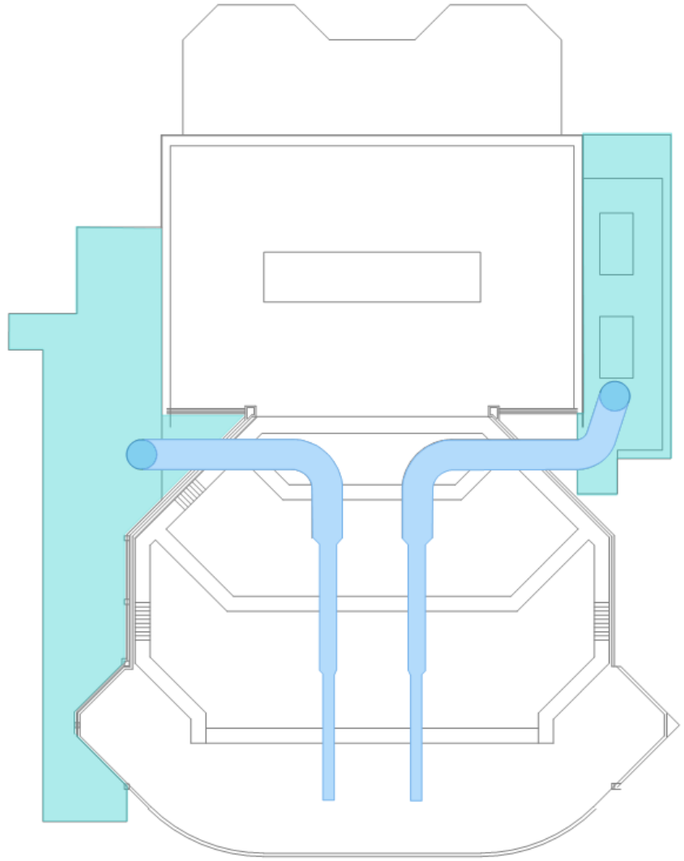
Figure 2.1 shows the existing ventilation strategy overlaid with the proposed seating scheme. Table 1.1 provides an appraisal of this option.

Table 3.2 Appraisal of Option 1

Spatial Feasibility	No change/as existing
Thermal Comfort	Recommission system to reduce complaints
Carbon/Efficiency Improvement	Only minor improvements possible
Noise	Consider targeted measures (acoustic linings/enlarged ducts) to reduce issues
Capital/Running Cost	Minimal capital cost (~£10-50k), limited improvement on existing running costs possible.



(A) Long Section



(B) Notional Layout

Figure 3.1 Sectional and layout sketch of Option 1 proposal

3.2 Option 2: Improve Central Plant

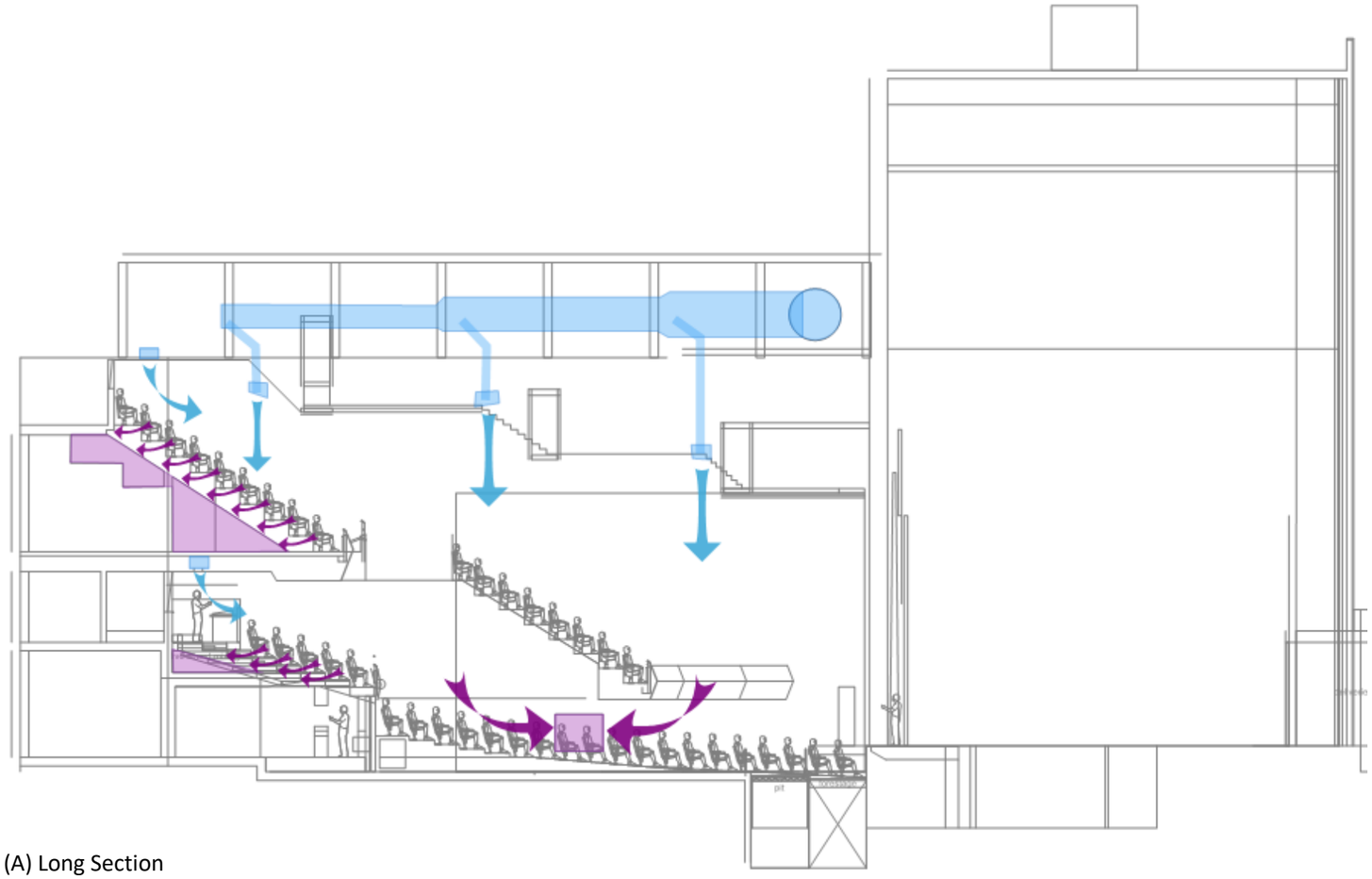
Keep ventilation within auditorium as existing as capacity numbers are largely unchanged. Focus on replacing central AHU plant including heat recovery, recirculation, efficient fans to both the East and West AHUs.

Also undertake targeted measures to address complaints including inspecting and cleaning ducts, check balancing and throws of supply grilles, fix defects, recommission system. Figure 3.2 Figure 2.1 shows the existing ventilation strategy overlaid with the proposed seating scheme and new AHUs in each plant room (not to scale). Table 3.3Table 1.1 provides an appraisal of this option.

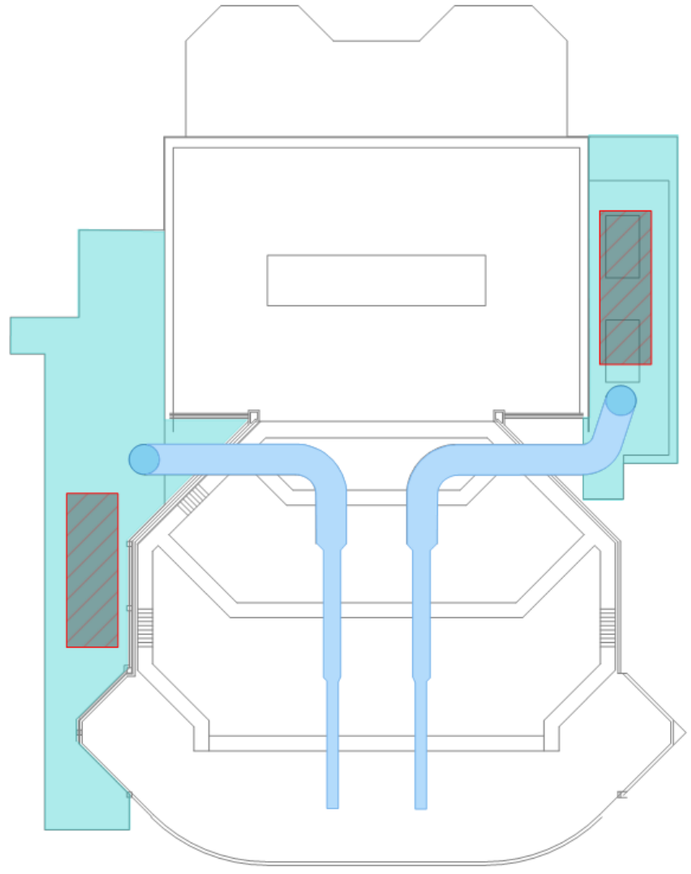
Separately, in this option it is worth appraising the links between the auditorium and the rest of the conference centre to understand any improvements that could be made.

Table 3.3 Appraisal of Option 2

Spatial Feasibility	Appraisal of plant room space required to understand potential to rework AHUs. New AHU's tend to be larger for a given flow-rate.
Thermal Comfort	Recommission system to reduce complaints
Carbon/Efficiency Improvement	Medium improvements with heat recovery, efficient fans, recirculation.
Noise	Consider targeted measures (acoustic linings/enlarged ducts) to reduce issues.
Capital/Running Cost	Medium capital cost for central plant (~£50-150k). Potential significant improvements in running costs by reducing heating and cooling demand and using more efficient fans.



(A) Long Section



(B) Notional Layout

Figure 3.2 Sectional and layout sketch of Option 2 proposal

3.3 Option 3: Change Ventilation Strategy

In this option we consider the feasibility of reversing the ventilation system within auditorium to make use of the under-seat plena for supplying air directly to the audience. Air could then be extracted through high level grilles above suspended panelling. Replace central AHU plant including heat recovery, recirculation, efficient fans to both the East and West AHUs. Commission system.

This option provides the opportunity to address the complaints of draughts and overheating but comes with several technical considerations. Our key concern is the available plena size under the stalls and balcony area. Assuming each plenum is served from both sides and an air supply rate of 12L/s/person, Table 3.4 shows that the available proposed balcony and stall plena are unlikely to be large enough to supply air to these areas alone due to potential velocities. Furthermore, a large proportion of the stalls will not be able to make use of the local plenum. Potential alternatives to this are a) to provide additional side wall displacement vents to the perimeter of both the balcony and stall levels ***or*** b) increase the available plenum depth by approximately 0.5m in both areas (as shown in orange in Figure 3.3A).

Figure 3.3Figure 2.1 shows the potential reversal of the ventilation system overlaid with the proposed seating scheme and new AHUs in each plant room (not to scale). This includes notional additional side wall displacement vents or the recommended extension to the plena. Table 3.5Table 1.1 provides an appraisal of this option.

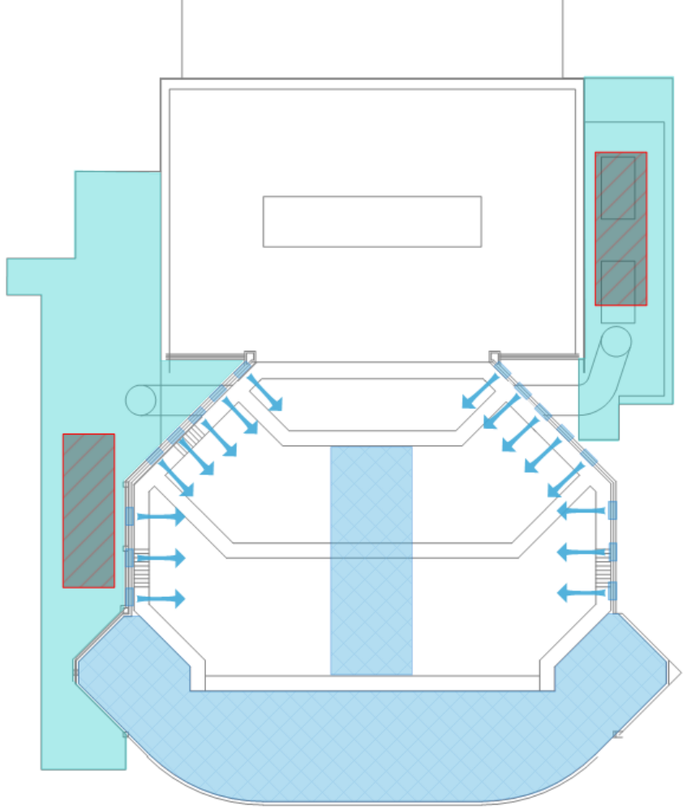
Table 3.4 Proposed under seat plenum size appraisal

	Seats in Zone	Required Air Flow	Plenum Cross Sectional Area	Potential Plenum Air Velocity
Stalls	581	7.0m^3/s	4.4m^2	1.06m/s
Balcony	280	3.4m^3/s	1.2m2	1.87m/s
Upper Circle	474	5.7m^3/s	8.5m2	0.45m/s

Table 3.5 Appraisal of Option 3

Spatial Feasibility	Appraisal of plant room space required. Limited plena under balcony and stall seating is likely to require additional side wall displacement vents, or a reworking of the plena size. Benefit of space gained at high level with removal of duct work.
Thermal Comfort	Potentially significant improvement in audience comfort.
Carbon/Efficiency Improvement	Potentially significant improvement with heat recovery, efficient fans, recirculation, and by supplying air where required and controlling large heat gains (such as lighting) at source.
Noise	Complete control of design to reduce noise. Design of under seat supply displacement diffusers key to achieving targets.
Capital/Running Cost	Significant capital cost for central plant, reworking of ductwork, and architectural coordination of grilles/plena (~£250-500k+ BWIC). Potential significant improvements in running costs by reducing heating and cooling demand and using efficient fans.

(A) Long Section



(B) Notional Layout

Figure 3.3 Sectional and layout sketch of Option 3 proposal

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3.4 Summary of Options

Table 3.6 provides a summary of the three options presented here. Options 1 and 2 look to improve the existing system, whereas Option 3 is a wholesale change to reverse the ventilation system as suggested in the initial brief to us.

Table 3.6 Summary of Proposed Auditorium Options

	Option 1 – Minimal Interventions	Option 2 – Improve Central Plant	Option 3 – Change Ventilation Strategy
Central Plant	No change/as existing	Replace central AHU plant including heat recovery, recirculation, efficient fans to both the East and West AHUs	Replace central AHU plant including heat recovery, recirculation, efficient fans to both the East and West AHUs
Air Distribution Strategy	No change/as existing	No change/as existing	Reverse the ventilation system within auditorium to make use of the under-seat plena for supplying air directly to the audience. Provide additional side wall displacement vents to the perimeter of both the balcony and stall levels or increase the available plenum depth by around 0.5m. Extract air through high level grilles above suspended panelling.
Testing and Commissioning	Undertake targeted measures to address complaints including inspecting and cleaning ducts, check balancing and throws of supply grilles, fix defects, recommission system.	Undertake targeted measures to address complaints including inspecting and cleaning ducts, check balancing and throws of supply grilles, fix defects, recommission system.	Test and commission new system.
Spatial Feasibility	No change/as existing	Appraisal of plant room space required to understand potential to rework AHUs. New AHU's tend to be larger for a given flow-rate.	Appraisal of plant room space required. Limited plena under balcony and stall seating is likely to require additional side wall displacement vents, or a reworking of the plena size. Benefit of space gained at high level with removal of duct work.
Thermal Comfort	Recommission system to reduce complaints	Recommission system to reduce complaints	Potentially significant improvement in audience comfort.
Carbon/Efficiency Improvement	Only minor improvements possible	Medium improvements with heat recovery, efficient fans, recirculation.	Potentially significant improvement with heat recovery, efficient fans, recirculation, and by supplying air where required and controlling large heat gains (such as lighting) at source.
Noise	Consider targeted measures (acoustic linings/enlarged ducts) to reduce issues	Consider targeted measures (acoustic linings/enlarged ducts) to reduce issues.	Complete control of design to reduce noise. Design of under seat supply displacement diffusers key to achieving targets.
Capital/Running Cost	Minimal capital cost (~£10-50k), limited improvement on existing running costs possible.	Medium capital cost for central plant (~£50-150k). Potential significant improvements in running costs by reducing heating and cooling demand and using more efficient fans.	Significant capital cost for central plant, reworking of ductwork, and architectural coordination of grilles/plena (~£250-500k+ BWIC). Potential significant improvements in running costs by reducing heating and cooling demand and using efficient fans.

4.0 FURTHER OPPORTUNITIES FOR IMPROVEMENT

4.1 Performance Area

It is clear from the brief that it is not only the main seating area that suffers from a poor ventilation performance. Furthermore, draughts generated in the stage house area are said to be felt in the stalls. The performance area presents an opportunity for improvement which could include:

- Improving seals on smoke extract vents over the stage (as mentioned in the brief).
- Improve insulation to roof and walls of stage house (Current build up is said to be: Metal inner face, 100-150mm void, 100-200mm glass wool insulation, 45mm external cladding board – Assumed U-Value 0.3W/m^2/K)
- Provide a dedicated ventilation or heating system to the stage to allow separate conditions to be achieved for performers.

Addressing the first two points above may help to reduce cool draughts of air dropping from high in the Stage House and affecting the Stage and front of the Stalls. However assuming that the existing insulation is reasonably intact, we would not expect this effect to be necessarily the main cause of the reported draughts in the first place, and recommend further diagnosis is undertaken.

The 3rd point above could be achieved by taking ducts from the East Plant Room underneath the fly gallery, or by utilising the West Plant Room to serve the Performance Area directly. Achieving independent conditions for performers was an achieved aim of the refurbishment at the Royal Festival Hall in 2003-2007: intended to avoid overheating due to performance lighting on the stage, and conversely to provide additional heating for performers in a dance configuration.

4.2 Orchestra Pit

One issue raised as part of the brief was the lack of heating in the Orchestra Pit. This could be remedied by extending the air system mentioned above, however it is noted that there are limited routes for ducts available due to the proximity of the stage fire line, and local down stand beams. An alternative solution is to use a water-based heating system either by underfloor heating or radiators.

4.3 Share Plant with Conference Centre

With the conference centre in such close proximity to the auditorium, there are potential gains to be made from sharing plant between these two parts of the building and the various usage profiles of each space. These could include:

- Switching system over to serve intervals in foyer
- Recovering heat from one venue into another
- Further benefits of rehearsal vs performance modes

We would recommend extending a feasibility study to take account of the opportunities that the conference centre and other parts of the building may present.

4.4 Potential Risks from Existing Building

A list of risk items that may apply to a building of this age is provided below. This includes other services upgrades that may be necessary as a result of changes to regulations or good practice since any previous developments were undertaken.

- The current lack of available record information presents a risk to any refurbishment work – a review of all available information and surveys (visual, intrusive and operational) are recommended.
- If changed, the AHUs are likely to grow to achieve the latest Specific Fan Powers (SFPs) required by the Building Regulations.
- Fire Alarm updates are likely if there are any changes to the layouts. This may require a change to the main panel controlling the system e.g. if the existing system cannot be upgraded / expanded.
- Significant re-wire of lighting/AV supplies are likely.
- It is usual for more power outlets to be requested in refurbishments.
- Changes to service distribution routes may be necessary due to seating rework.
- The presence of Asbestos is a risk item
- Excavating for enlarged underseat plena in option 3 above clearly presents a number of construction risks in terms of unknown ground conditions and water ingress as well as phasing & cost.

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5.0 CONCLUSIONS & RECOMMENDATIONS

This feasibility study presents a high-level appraisal of three options to improve the ventilation system in the auditorium of Venue Cymru. Although, it appears that a reworking of the ventilation system to reverse the supply and extract is possible, we would first recommend taking the following steps before considering progressing with such a significant change:

Step 1 – Understand the issues from the existing system more clearly by analysing their cause. For example: are complaints of overheating caused by inappropriately balanced grilles, or a more fundamental flaw in the design?

This would require gaining a more in-depth understanding of the existing system by visiting the building and gathering a more comprehensive set of record information for both the auditorium and the wider site.

Step 2 – Assess if the issues identified can be rectified by making improvements to the existing system by developing proposals for each issue and undertaking works. Consider making improvements to the stage house and orchestra pit in combination with this work. If seen to be possible and adequate, then undertake Option 1.

Step 3 – Assess if the extent of the benefit from replacing the AHUs and understand sharing plant with the conference centre would provide significant opportunity to improve thermal comfort (by giving greater control of air flow rates and temperatures), carbon/efficiency improvement (by using more modern equipment and sharing heat/coolth with conference centre) and noise (by using quieter fans). If seen to be beneficial then undertake Option 2.

Step 4 – Only if Steps 2 and 3 are seen to not be adequate then progress with a comprehensive development to the ventilation design, such as Option 3.

5 A NOTE ON OUTLINE COSTS

Outline costs are provided in a separate cost report. Estimates are based on measurements of the preferred option proposals with industry rates applied under the supervision of cost consultants Elliot Consulting. The elemental costs are combined into a list of items that could be procured separately or in combination. Whilst there are some co-dependencies this cost report is intended to guide further investigations based on available funding and opportunities to develop the venue.

Contingencies need to be applied to all items but are otherwise shown across the total project costs.

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APPENDIX 1

KEY DATES

1982
Aberconwy Centre opened

1994
Venue Cymru opened as North Wales Theatre and Conference Centre
Seating 1450
Auditorium seated in blue upholstery (by Auditoria Services)

2005
Renamed ‘Venue Cymru’

2006
Atrium Extension completed

2014
Auditorium re-seated in red (by Audience Systems)

NOTES ON COVID-19[1]

The old truths about good practice in ventilation were reinforced, they are simple, and we should try to ensure our mechanical consultant colleagues are aware of them. CIBSE have specialist groups looking at practical solutions. In short order though the rules are straightforward:

1. Air mixing in a room (commonly used to stabilise temperature) is bad news in respect of infectious disease transmission. For this reason, top supply and top exhaust should be an unacceptable ventilation solution in any theatre or room.
2. Supply of tempered air under the floor/seat in an auditorium and top exhaust draws aerosols from the individual emitter to the free air space and thence to outside air and works with the natural flow engendered by increasing air temperature gain as the air cools the audience. In the same vein, it was emphasised that vertical sliding sash windows should be opened at the bottom and at the top to get low level air input and high-level extract. A minimum of 6 litres per person per second was referred to by an American researcher with 12 l/p/s giving a low-risk environment. She pointed to using CO2 sensing as a useful measure with anything better than 600ppm analogous to the low risk level.
3. Corridors are a major problem as the passage of people ensures that the air is well mixed before it can be exhausted. Increased ceiling heights in new build corridors might be considered as a means of reducing mixing, particularly with bottom-up displacement ventilation.
4. Lavatories were not specifically discussed but water droplets from hands carry the virus and give it more moisture protection so that evaporation takes longer before the virus becomes non-viable. Again, air mixing concerns apply, and air hand dryers should be permanently ruled out for public toilets. Low level supply and high-level extract again ensure minimum mixing air paths. High levels of ventilation are already required but might be increased and this means that heat recovery might become an important factor.
5. Heat recovery with full external air supply and exhaust becomes a critical factor but recirculation and the resultant mixing is highly undesirable and other means of tempering the incoming air must be used (thermal wheels, plate heat exchange, closed liquid loops).
6. air filters will render incoming air very low risk but do require more fan power than less effective filters. In new build larger filter areas can be organised but in existing plant increased fan power and noise seems the only way of reducing any virus intake. Note that as external air is sanitised by sunlight the risk level of external air is quite low.
7. Backstage corridors have the same air mixing through people movement and again higher ceilings and displacement ventilation will be good mitigation to the high proximity/short duration nature of transmission in corridors.
8. Dressing rooms, staff rooms and green rooms should be individually ventilated. Transmission through ducts is being investigated but no results are yet available. Hospital practice is to avoid room to room transmission and given the importance of the performer to the theatre we should take similar precautions. Air cleaning units in each room might be a sensible investment in the winter when natural ventilation will be reduced to keep the rooms warm.
9. Whilst UV-C sterilisation has a low flow restriction in vent systems (compared to HEPA filters), the required exposure time makes is impractical in most instances as air flows in ducts are too fast. For the same reason high level UV-C units in rooms become ineffective in sensible air flows as exposure time become too short. In a displacement air system, one is also sterilising air for return to the outside, rather than the audience! UV-C in a highly reflective duct and facing a primary heating or cooling coil is generally the recommended route to longest exposure and sanitisation of the first deposit surface. In natural ventilation intake labyrinths UV in each bay should prove a very good sanitiser of intake air.

[1] From Observations following the RAMP Task-7 webinar on 8 September 2020; recorded for the Institute of Theatre Consultants

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APPENDIX 2: ACOUSTIC REPORT

5.1 ROOM ACOUSTICS

Through discussions with the technical team, we understand that Venue Cymru functions well in an unamplified condition for an auditorium of its size. We understand that acoustic quality of amplified events can be variable based on the audio system configuration and quality and the experience of the operators. This is to be expected from any venue which caters to such a broad range of touring product.

The acoustic volume and the reverberation time are fundamental in assessing the acoustic suitability of a performance space. For every venue there is an optimum range for both factors which depend on the intended performance types, i.e. whether the space is required to accommodate speech or music, and what type of music.

5.1.1 ROOM VOLUME

The overall size of the room is the most significant factor in establishing the acoustic environment. We expect small rooms (and rooms of small seating capacity) to sound differently than large rooms. Larger rooms are characterised by more reverberance and reduced loudness—both things to avoid in small intimate drama rooms.

To assist in benchmarking designs, we classify rooms by the volume per occupant. Greater volume per occupant tends to be appropriate for music rooms; smaller volume per occupant tends to be used for rooms for speech and amplified music. The following list gives common guidelines:

- 12 to 16m^3/person: excellent orchestra acoustic for mid-sized rooms
- 10 to 12m^3/person: excellent orchestra acoustic for large rooms
- 6 to 10m^3/person: multi-purpose / opera / adequate orchestra
- 4 to 6m^3/person: drama / spoken word / amplified music

The calculated volume of the auditorium is approximately 12,000m^3 which equates to 8.3m^3 per person in its current condition. This makes it perfectly suitable as a multi-purpose venue intended to accommodate musical theatre, amplified music and opera. Figure 1 shows a comparison of the room volume with both opera halls and venues intended to largely hold theatre and amplified music. This reinforces our view that the volume per person is suitable for the venue's intended uses. As it towards the upper end of these requirements, the addition of more seats (thus effectively reducing the volume per person by a small amount) is not expected to have

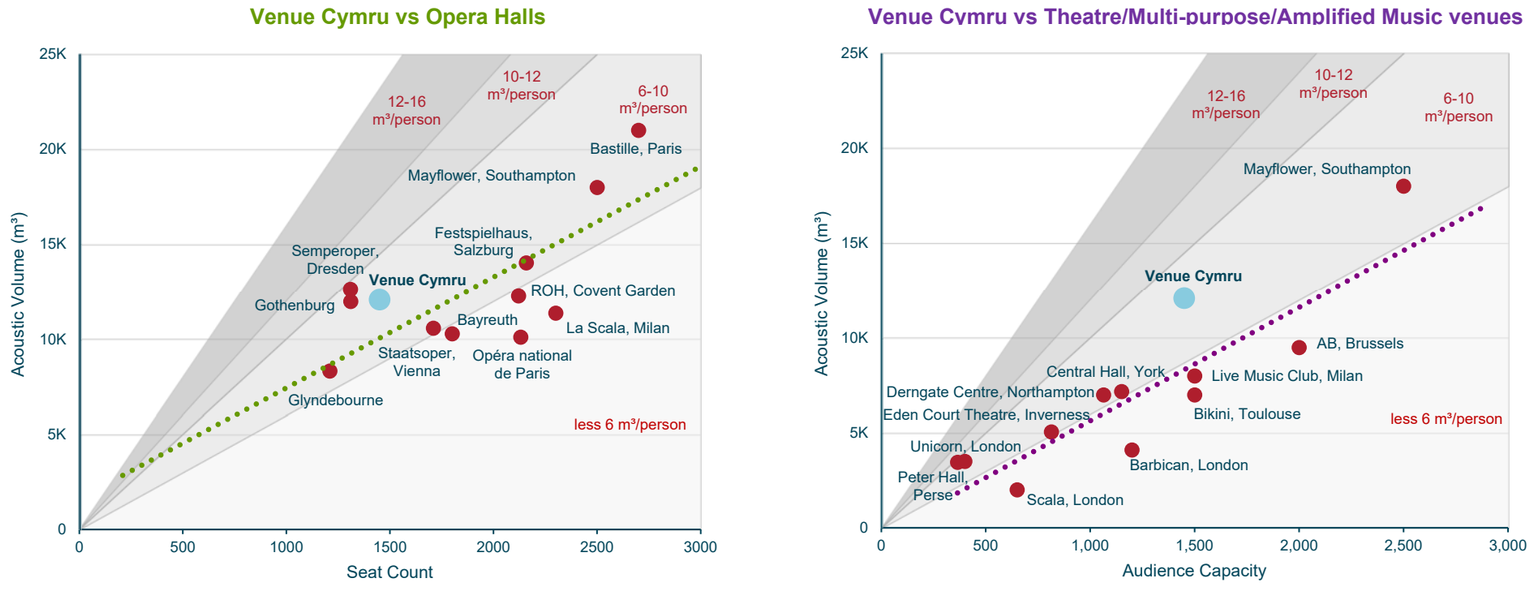

Figure 1: Volume of venue Cymru compared to precedent venues

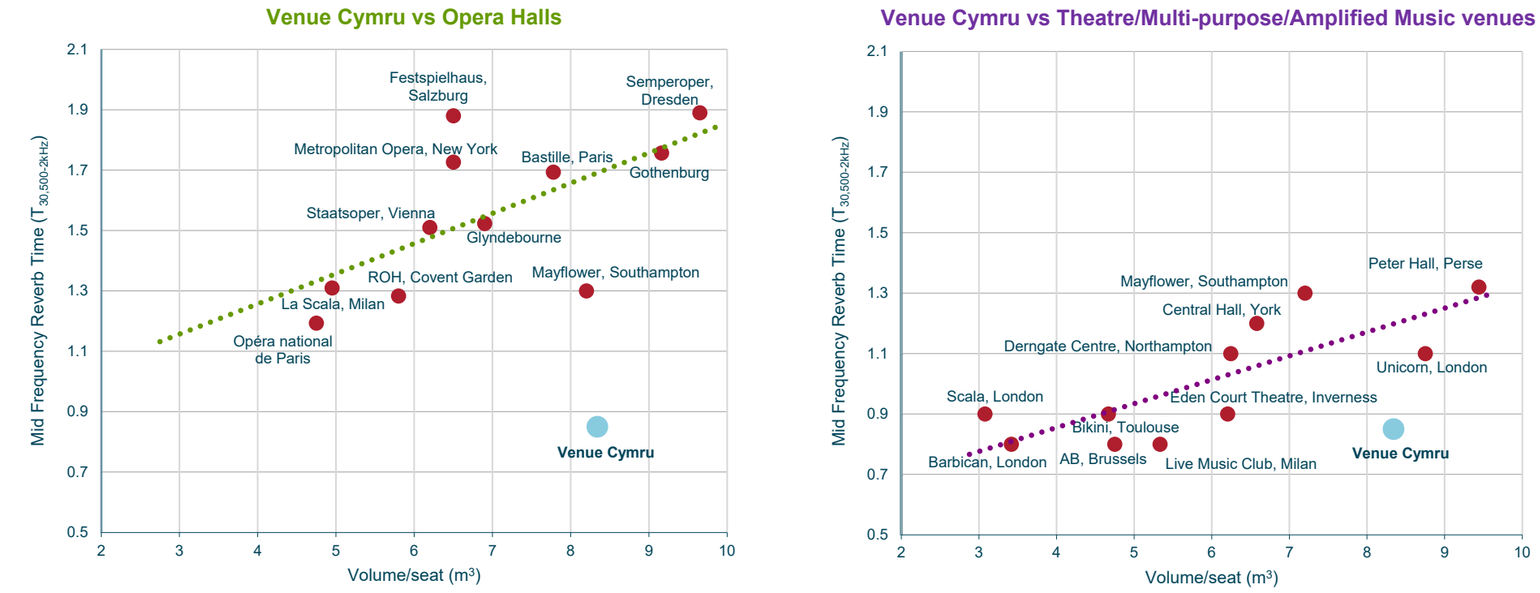

Figure 2: reverberation time of Venue Cymru compared to precedent venues

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a negative impact on the rooms suitability although will impact the reverberation time as discussed in the next section.

5.1.2 REVERBERATION TIME

The optimum reverberation time for a performance venue is largely dictated by the room's volume and its intended use. Rooms for unamplified music are expected to provide more reverberance to boost loudness and a sense of listener envelopment, whilst rooms for drama and amplified music are required to have shorter reverberation times to provide clarity and to control excessive loudness levels.

Figure 2 (on the previous page) shows the measured reverberation time (carried out during our visit in August 2020) compared to precedent opera halls and multi-purpose theatres/music venues. As can be seen, the reverberation time, although suitable when compared to theatres and amplified music venues, is significantly below what is normally expected for opera. The addition of extra seats is only going to reduce this further.

For multi-purpose venues, the target reverberation time is often a balancing act between its intended uses. It is our view that the reverberation time could be increased from its current state of 0.8s to between 1.1 and 1.3s. This is likely to lead to a noticeable improvement of the acoustics for unamplified music and speech whilst still remaining acceptable for the room's other uses. Increasing the rooms reverb time further to 1.4-1.7s would be better still, although variable acoustic finishes will be required to reduce the reverb time for theatrical and amplified events. This would provide optimum conditions for Venue Cymru's varied programme.

Even though this is our recommendation, it should be treated with caution. Any increase in reverberation time, although expected to be good for opera and unamplified speech/music, will be the opposite for amplified music and musical theatre. As amplified events make up the bulk of the venue's programme it is arguably an unjustifiable change. Additionally, it is our understanding that touring opera companies are largely satisfied with the venue and any change to the acoustic - even if it is objectively an improvement - could be unwelcome. Engagement with users, such as sound technicians and opera companies, is advisable at an early stage.

In addition, it is understood the room is very occasionally used for orchestral and choir performances, which are noted to be unsatisfactory in terms of acoustics. Considering the short reverb time this is unsurprising and increasing it will lead to improvements but be truly effective, the reverberation time would have to increase further still to between 1.7 and 2.2 seconds. The size, shape and layout of the room make this very difficult to achieve naturally without drastically altering the room's form, which would be to the detriment of the rest of the venue's programme.

Additionally, a long reverberation time with the room's current volume per person risks loud sections becoming uncomfortable. If this is a serious requirement, we recommend an electronic acoustic enhancement system to artificially increase the reverberation for such shows. In addition to this, an orchestra shell would be necessary to improve communication between performers plus enhance sound propagation to the audience. The cost and technical implications of all these measures, for what is a few shows a year, is not seen as highly practical.

5.1.3 ROOM ACOUSTIC FINISHES

The walls and ceiling of the auditorium are largely sound reflective which is something we would encourage, as we generally recommend that audience areas be maintained as reasonably lively. By not placing sound absorption within close proximity of listeners, the loudness of the performance can be maintained. The sense of community within an audience can also be affected by overly sound-absorptive audience areas – a factor that is equally applicable to opera and amplified musicals. Maintaining a lively audience area supplements the communication of applause, laughter, and other audible reactions, inspiring others to respond in sympathy.

The room's short reverberation time is largely attributable to the fact the audience area is currently fully carpeted. Normally, we would suggest multi-purpose halls have hard floors except for practical concerns of reducing footfall and audience movement noise in aisles and entryways.

If the carpet were to be removed, it is important the acoustic implications are fully understood at an early design stage. Acoustic modelling and testing should be carried out to understand the required levels of fixed and variable absorption to achieve the reverberation time goals. Any additional absorption should be largely placed at high level, such as on the ceiling or walls at technical level, to avoid reducing loudness in the audience areas.

5.1.4 BALCONY FRONTS AND CEILING REFLECTORS

The balcony fronts should remain sound reflective, as these will provide useful sound reflections to the audience and stage. Currently the angle of these is not providing efficient coverage to these areas and reworking the balcony fronts provides an opportunity to address this. Acoustic ray-tracing analysis should be used to inform their design.

The ceiling reflections should be retained as they are providing useful sound reinforcement to all areas of the audience. From initial analysis we see no benefit in these being reconfigured, but further investigation is to be encouraged.

Figure 3: Variable acoustic solutions. Retractable banner (above) and curtains (below)

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5.2 SOUND SEPERATION

As part of our visit in August 2020, we had a chance to observe the sound separation performance between the auditorium and surrounding spaces. We didn't note any serious concerns and thus did not expect significant upgrades to be required. That being said, it is advised that more formal acoustic testing should take place at an early design stage to discover if there are any improvement opportunities that a redevelopment could provide.

One of the redevelopment opportunities involves removing the retractable seating unit in the Stalls and replacing it with a fixed seating rake, with the space underneath the Stalls Balcony utilised as an extension to the foyer.

The sound separation performance of the new wall and ceiling separating the foyer from the auditorium is important to ensure smooth running of the venue. Fridges and noisy equipment in the back bar should not be audible in the auditorium, nor should the in-show activity in the foyer, i.e. clearing up glass, setting up interval drink etc., should not cause disturbance in the auditorium.

As a rule, heavier materials provide more acoustic performance, and it is because of this we recommend the dividing wall and seating rake above the foyer be constructed from dense blockwork or concrete. In addition, we recommend the ceiling and wall on the foyer side be lined with a plasterboard studwork that is independent of the masonry or supported with acoustically resilient connections. This will increase airborne sound performance as well as supressing flanking transmission through the building's structure.

The recommended build-ups are shown below

- Ceiling – to achieve a minimum of 65 dB Dnt,w
  - Concrete, nominally 150mm
  - Airgap, 50mm approx. with 50mm insulation
  - 70mm stud, independently supported or on spring hangers
  - 2 x 15mm plasterboard
  - **Total = 300mm approx. (excl. finishes)**
- Wall – to achieve a minimum of 65 dB Dnt,w
  - Concrete/high density blockwork, nominally 140mm
  - Airgap, 50mm approx. with 50mm insulation
  - 70mm stud, independently supported/resilient connections
  - 2 x 15mm plasterboard
  - **Total = 290mm approx. (excl. finishes)**

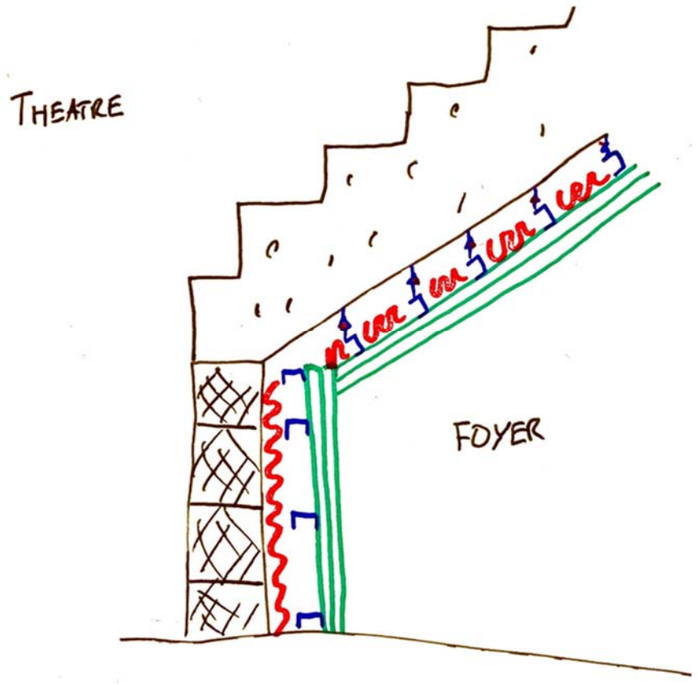

Figure 4: recommended build-ups between venue and new foyer (not to scale)

Sound absorption within the foyer is recommended to control noise build-up, which could lead to breach of sound separation, as well as to make the foyer a more comfortable environment (although it should remain a lively, buzzy, exciting places to be in). The ceiling of the foyer, therefore, should integrate some sound-absorbing finishes.

Any new entrances to the auditorium should be provided with sound and light lobbies to improve sound separation performance as well as to limit light and sound spill when opened during a performance. The doors should be of solid wood construction and have a minimum acoustic rating of 35 Rw. Sound absorption should be applied to the lobby ceiling and at least one wall to maximise performance.

5.3 BUILDING SERVICES NOISE

The performance of the auditorium's ventilation system is considered poor and is expected to require replacing as part of any renovation works.

Thermal comfort and efficiency will be the main drivers for this, although noise associated with plant equipment is an important consideration.

Maximum levels of acceptable continuous background noise are specified using noise criteria rating systems. These systems are used to describe and specify neutral-sounding sound spectra of a given perceived loudness. These criteria ratings systems can be used to meaningfully compare the loudness of sound at different frequencies. Sound spectra that are perceived as neutral sounding do not have equal decibel values at all frequencies, as the human hearing mechanism does not have equal acuity at all frequencies.

Many different noise criteria rating systems have been developed, each with their own intentions for use and application. These systems are referred to by two- or three-letter acronyms. We suggest using values from the Preferred Noise Criteria (PNC) system.

A low background noise level is expected in the auditorium. The current system, as measured during our visit in August 2020, achieves PNC-25 which is deemed suitable for amplified speech and music but is on the edge of acceptability for unamplified music. A replacement system provides an opportunity to improve this and should be aiming to provide a noise level of PNC-20.

Silencers will be required to control fan noise to the auditorium as well as some sound-absorbing material within ducts and plenums to reduce turbulence noise at the end of the service path.

Duct geometry, diffusers and grilles, and air velocities will each be selected to minimise noise due to air turbulence to achieve PNC-20.

As a guide to planning duct dimensions, we would provide the following supply air velocity criteria considering the noise rating criteria of PNC-20 in the auditorium:

- 1.5 m/s at diffuser
- 1.8 m/s for a 1.5m upstream branch duct or clear opening
- 3.0 m/s for a 1.5m to 3m upstream secondary duct
- 5.3 m/s for a 3m to 6m main duct

For extract air velocity, we would provide the following criteria:

- 1.8 m/s at grille
- 2.1 m/s for a 1.5m downstream branch duct or clear opening
- 3.0 m/s for a 1.5m to 3m downstream secondary duct
- 5.3 m/s for a 3m to 6m downstream main duct

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APPENDIX 3: AUDITORIUM STUDY

6 AUDITORIUM INVESTIGATIONS

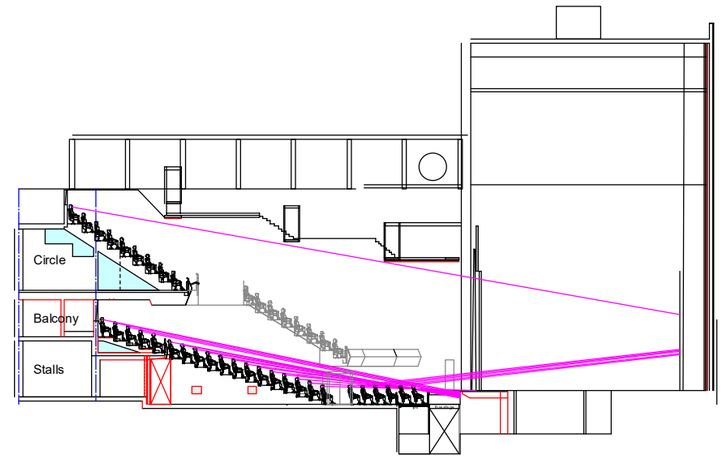
As part of a detailed study of the auditorium Charcoalblue investigates many options to help determine the most advantageous solution for improvement. Here are the options, considered first in section and then separately in plan.

6.1 SECTIONAL OPTIONS

We investigate five different sectional arrangements that consider how the seating might be raked once the retractable seating unit has been removed. In these we have assessed the following factors:

- A single tier v. split sections of the auditorium rake;
- Stepped tiers v. ramped shallow rake;
- Whether there is potential to overlap the Balcony and Stalls seating;
- The importance of a new foyer and bar extension under the overhanging Balcony or steep rake;
- Location of a new live sound mixing position and improved access (with fewer kills to implement it)
- Level access for wheelchair users and improved access to more seats within easy reach of a level entry.

SECTIONAL OPTION 0 - EXISTING

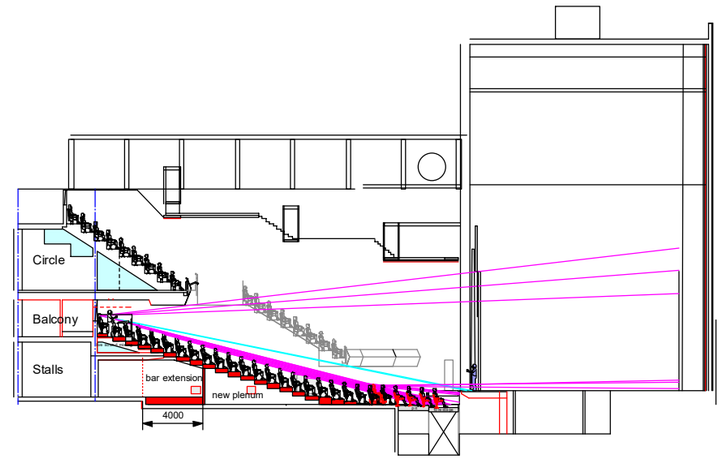


This section highlights the relatively poor sightlines from the front rows of seats on the flat (the pink lines that reach high towards the back of the stage.

Wheelchair positions are limited to just in front of the retractable seating.

Space under the retractable seating is not otherwise available for other use.

SECTIONAL OPTION 1 - STEEP CONTINUOUS RAKE



This option replaces the retractable seating unit with a continuous steep rake up to the fixed Balcony levels.

It offers the largest area of bar extension under the tiers and shows that sightlines might be improved towards the front by introducing shallower step heights to extend the rake forward.

Wheelchair positions would be pushed to the front of the stepped Stalls levels and at the back of the Balcony.

The live sound mix position would be at the rear of the Balcony where it would remain awkward to get heavy mixing desks into and out of position.

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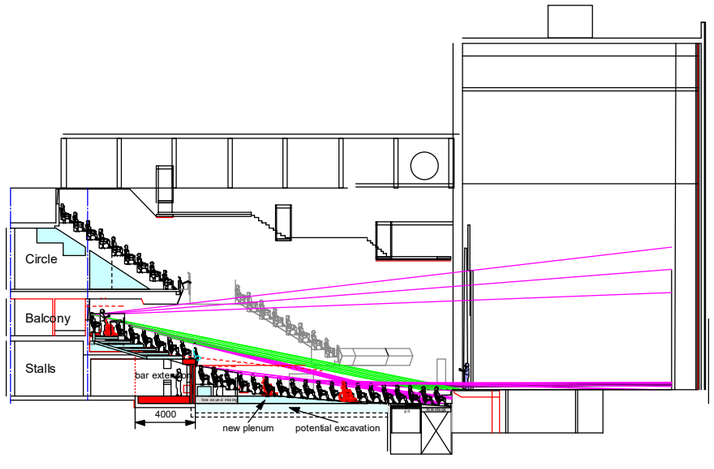
SECTIONAL OPTION 2 - EXTENDED BALCONY WITH SHALLOW STALLS



This offers extends the fixed Balcony forward by four rows to place a new balcony front midway between the Stalls and the Circle. This would aid the feeling of intimacy and rapport between the stage and auditorium.

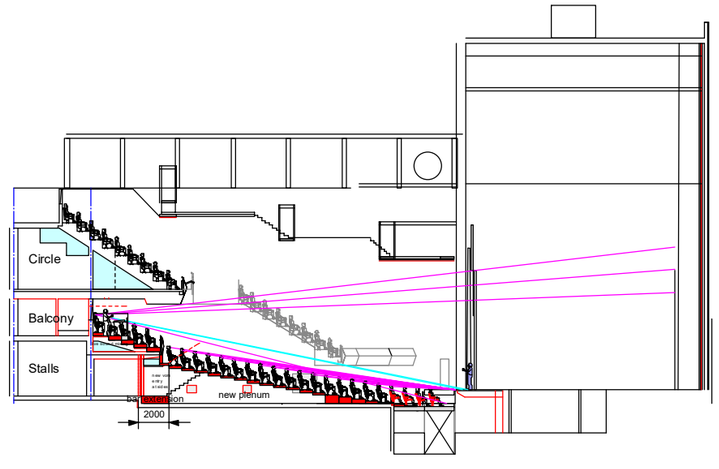
The shallower Stalls rake would also help with integration of new wheelchair positions at the front and rear whilst providing more seats within easy access of a level entry.

The Balcony and Stalls could be linked by staircases within the auditorium, but this feature would not be essential and would reduce the number of available seats.

The live sound mix position could be fitted at the rear of the Stalls with easy access from the bar area.

This option maintains the maximum bar extension.

SECTIONAL OPTION 3 - STEPPED RAKE

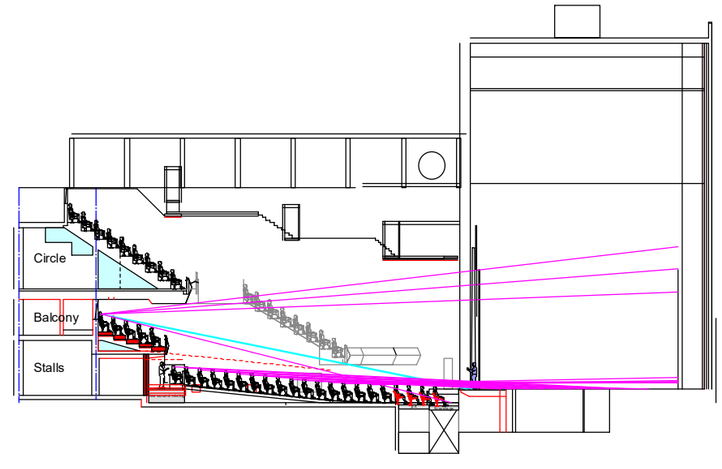


The stepped rake optimises sightlines.

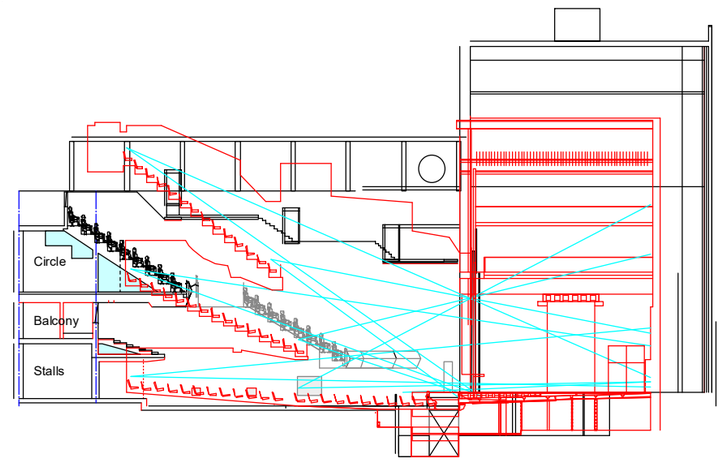
But at the cost of a smaller bar extension.

The stepped auditorium reduces options for wheelchairs and pushes these to the front and rear as in Option 1. The live sound mix position is again relegated to the rear of the Balcony.

SECTIONAL OPTION 4 - SHALLOW RAKE



A shallower rake would offer more options for integration of wheelchair positions, but sightlines would be reduced from the current standard to those similar to many other theatres with shallow raked auditoria. We reckon that because you can offer improved sightlines that you should do, and we might therefore not accept the impact of a very shallow raked Stalls.



For comparison, the very shallow rake of the New Wimbledon Theatre in London (red line overlay) shows that even the shallow rake at Venue Cymru would be favourable against this theatre.

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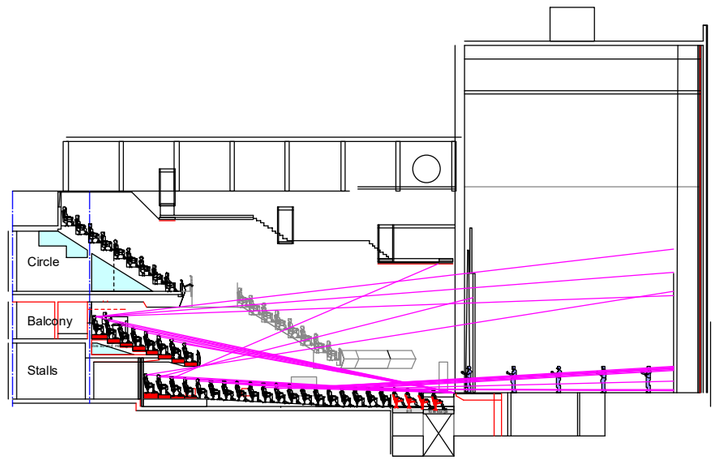
OPTION 5 - OVERLAPPING BALCONY AND STALLS



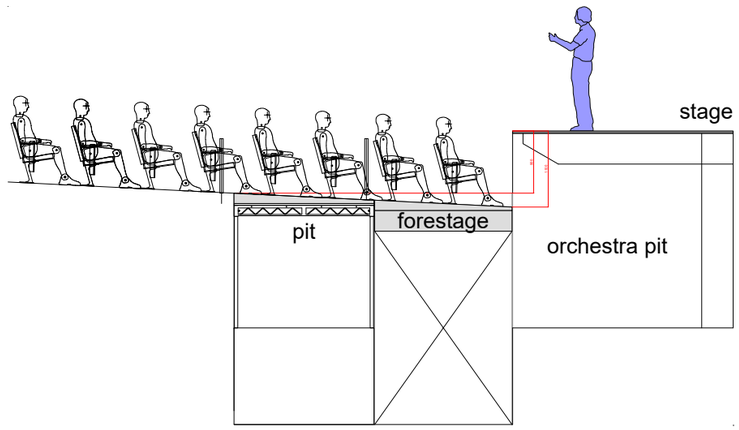
It was hoped that it would be possible to overlap the Balcony and Stalls in any new proposal. The benefit would have been an additional 4 or more rows within the overlap and a consequent increase in capacity.

Option 5 shows the Stalls rake of the New Wimbledon Theatre adopted but without the benefit of the higher stage riser. The result is that more seats (12 rows) would need to be on flat floor level at Venue Cymru with poorer sightlines overall. It would not be practical to raise the stage area although this would help re-balance the sightlines. Excavating the stalls would be a costly way to implement this option but might be considered in a more extensive reworking of the ventilation system.

As this also doesn't offer a bar extension so the option would not offer sufficient overall benefit.

However, it does identify the benefit of dropping the front rows of seats lower than the predominant Stalls floor level in all the sectional options.

INCREASING THE HEIGHT OF THE STAGE RISER



Lowering the forestage elevator and continuing the Stalls rake over the pit platforms and forestage would help to increase the apparent height of the stage to 1100mm. Lowering the front rows of seats would improve the sightlines for all seats further back in the Stalls.

This might be more easily implemented on the pit platforms which could be rebuilt with an integral rake.

It would be simpler to avoid having to add a wedge onto the forestage elevator and instead accept a step at the aisle point. However, this step might be unexpected, and the level change might need monitoring to avoid trips and falls.

The default stage height would be 900mm where the forward front rows of seats (when these are put on sale) would impact on sightlines further back.

6.2 PLAN OPTIONS

We investigated seven different plan arrangements that consider how the seating might be set out once the retractable seating unit has been removed. Many of these plans are not exclusive to just one of the sectional options so it helps to consider them independently and then to match them with relevant sections for refinement.

In these we have assessed the following factors:

- Centreline offset between rows for improved sightlines
- Straight rows v. faceted v. curved
- Reshaping of orchestra pit to match seating
- Requirements for additional entrances/exits (if the Stalls and Balcony were to be split) to provide sufficient escape capacity
- Up to 4 wheelchair positions at Balcony level and up to 12 positions at Stalls level (total = 15 wheelchair positions)
- Location of live sound mixing position and improved access (with fewer kills to implement it)
- Omission of seats outside extreme sightlines

Benchmarking seating widths is key to the capacity outcomes. We are aware that the original seating installed by Auditoria Services in 1984 was 500mm wide. We are also aware that this width was repeated when the auditorium was re-seated (by Audience Systems) in 2014.

At 500mm wide the seating is narrow compared with current recommendations (520mm is the recommended minimum width for seats with arms by ABTT Technical Standards for Places of Entertainment). Row-to-row spacing are almost consistent at 850mm (Circle, Stalls Retractable, Stalls Matrix/flat floor) and 860mm (Balcony). These tighter spacings require a thinner seat profile with potential for reduced comfort shaping in the pads which seems to be the case in the Stalls and Balcony seating.

Our proposals aim to show wider seats where possible, though we accept that eventual solutions may re-adopt a narrower width for increased capacity. We are also recommending an increase in pitch between rows: 875mm in the raked and stepped Stalls, and 860mm in the Balcony.

It is interesting that to fit in an extra row would squeeze rows too closely for comfort but a narrower seat type, as at present at 500mm wide, would increase capacity by one seat per row (total 27 seats extra).

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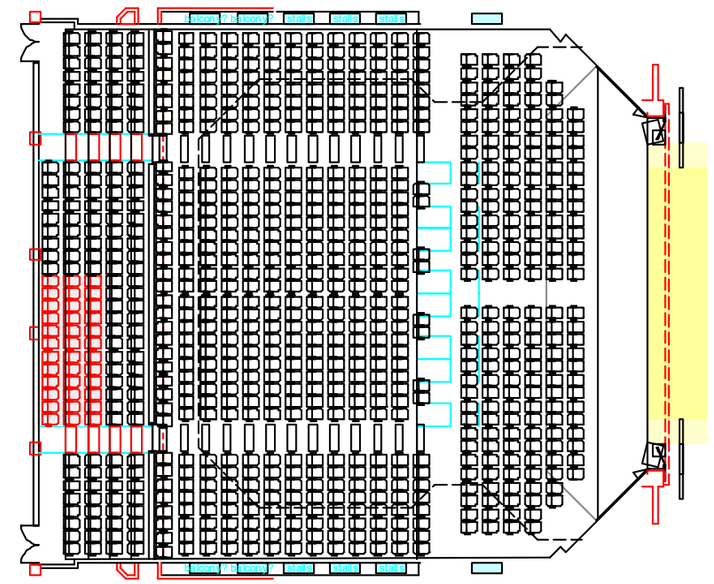
PLAN OPTION 0 - EXISTING



This plan shows the current situation in the Balcony and Stalls (these are combined into one plan as the two levels are linked by the retractable seating unit.

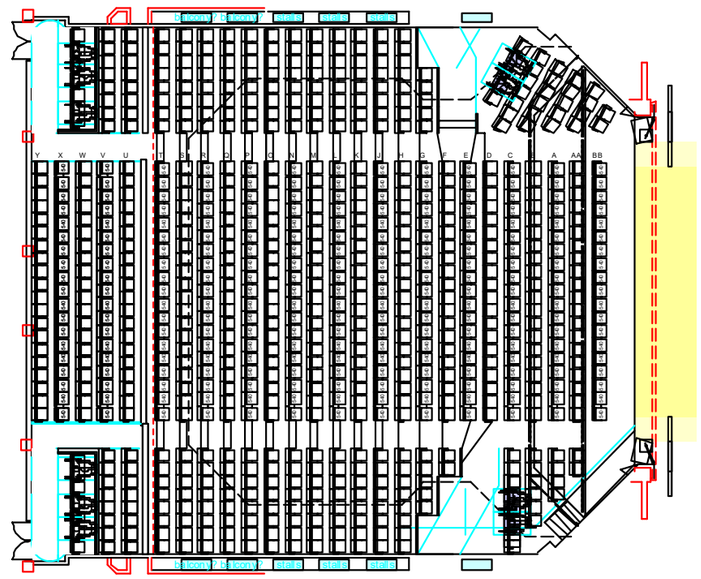
It is worth noting that the aisles are not compliant (too narrow), and the wheelchair positions are non-compliant and need more space around them than is currently provided.

The live sound mix position is at the rear of the Balcony and requires 36 seats to be removed for it to be set up. A simpler solution is being sought.

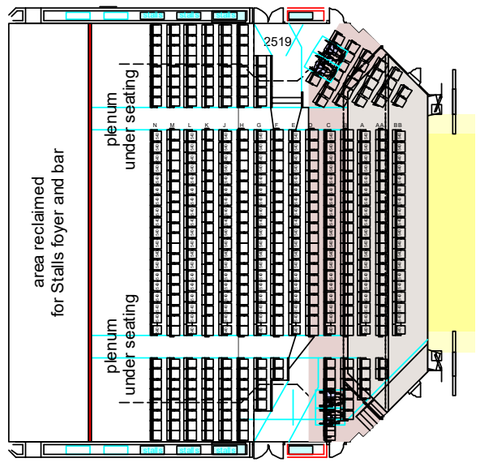
Currently the seast on the extreme sides of the auditorium have relatively poor sightlines to the depth of the stage. Further, touring shows expect to set speakers on the extreme ends of the forestage elevator which blight 12-14 seats on each side of the auditorium.

656 Seats in Total across both levels

PLAN OPTION A1 - CONTINUOUS STEEP RAKE

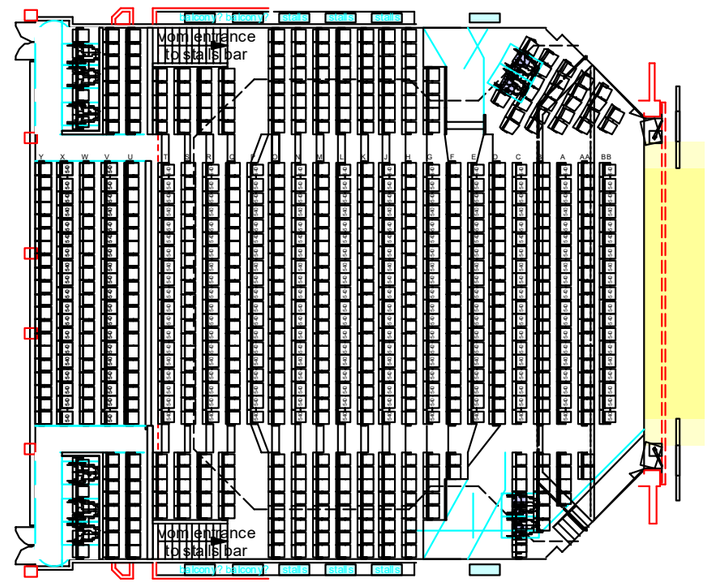


Parallel Rows (steep rake) offer the maximum seat count, but the entry points become awkward geometry when the rake is extended forward.



Area under the steep rake may be reclaimed for foyer/bar.

PLAN OPTION A2 - STEEP RAKE WITH VOM ENTRANCES



This plan shows that ‘voms’ could link the new Stalls bar more directly to a mid-Stalls entrance. This would fit either side of the bar.

For a shallow raked Stalls, the Balcony would become a separate level as investigated in the following options ...

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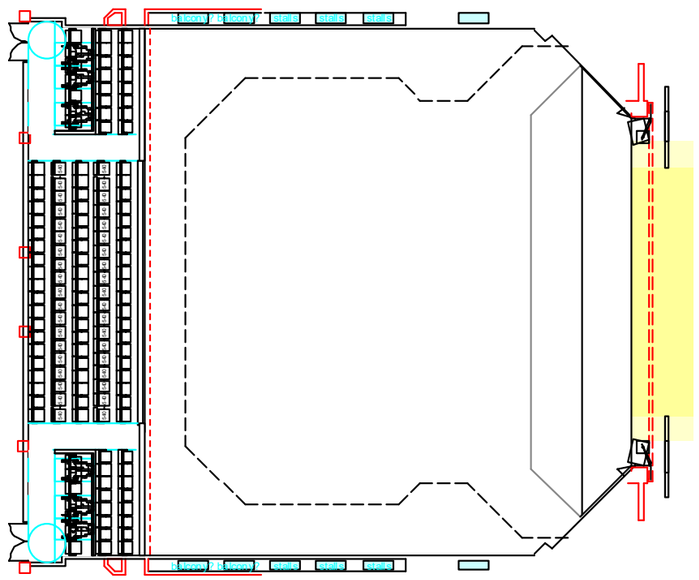
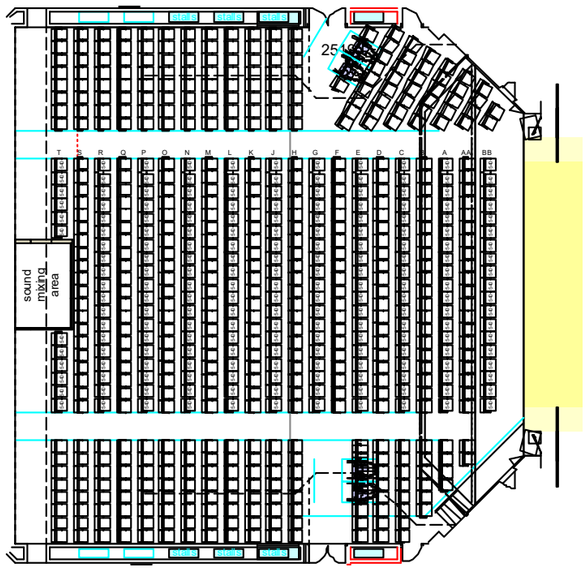
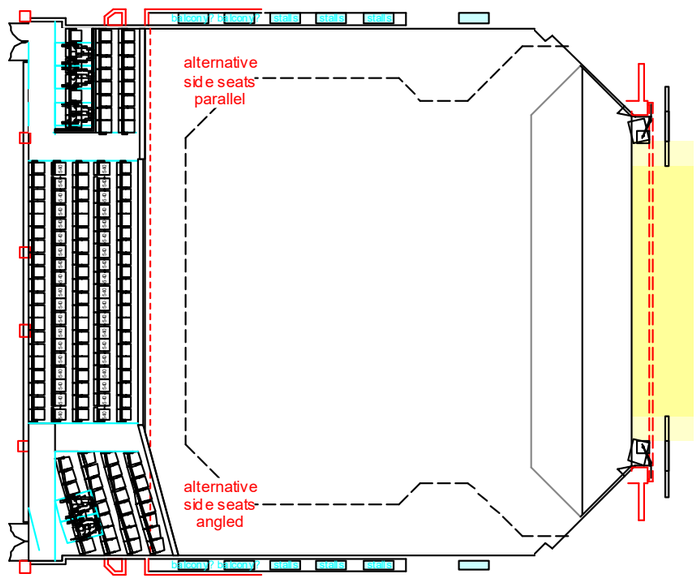
PLAN OPTION B1 - SHALLOW RAKE: PARALLEL ROWS

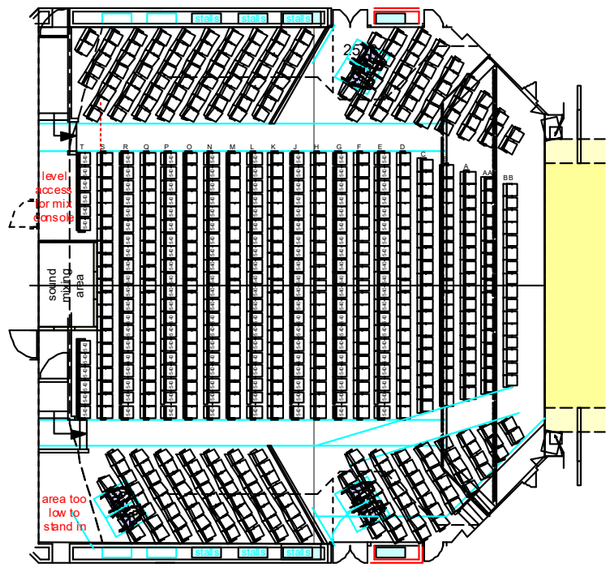




This option offers the maximum capacity, replicating as it does the current general arrangement of seating but on a shallow rake.

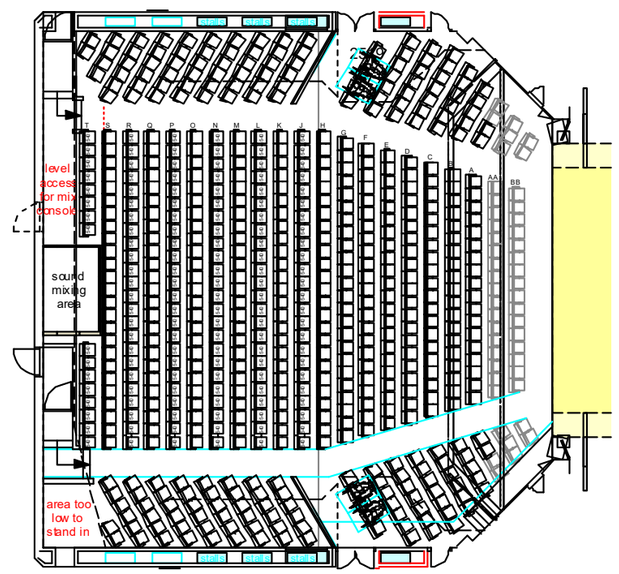
PLAN OPTION B2 - SHALLOW RAKE: ANGLED OUTER ROWS



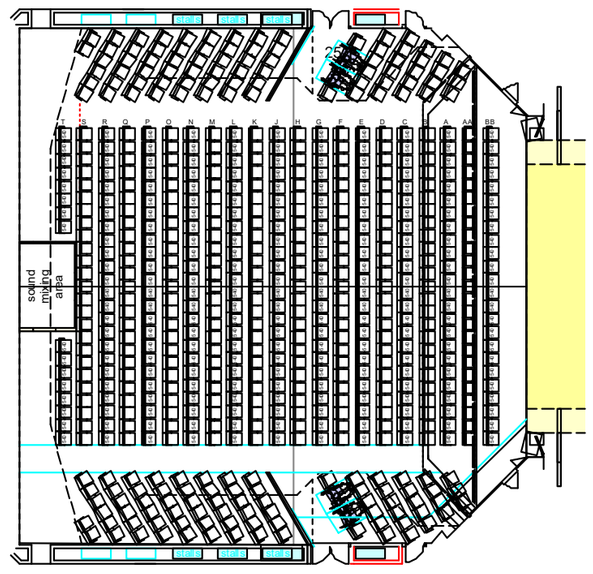


Angling the outer blocks of seats helps them relate to the stage more comfortably (less twisting in the seat).

PLAN OPTION B3 - SHALLOW RAKE: ANGLED OUTER ROWS



PLAN OPTION B4 - SHALLOW RAKE: ANGLED OUTER ROWS



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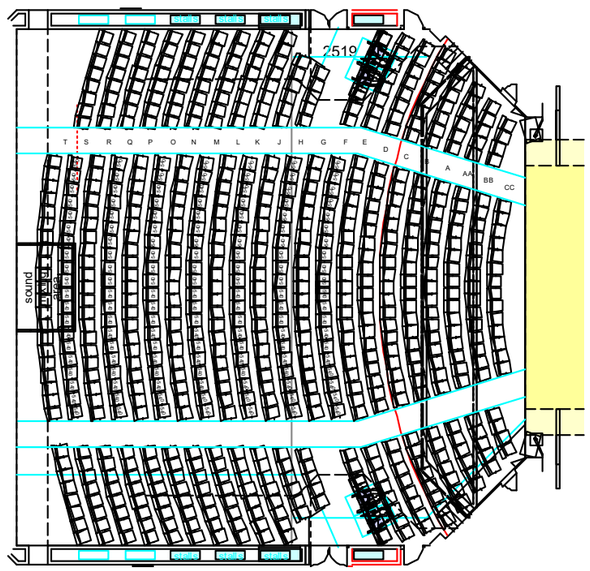
Options B3 and B4 show alternative arrangements to B2 with more seats in the centre block and fewer angled on the outer blocks. Strategically, this would place more seats in a well delineated top price band. In contrast, the narrower side blocks of six seats make incorporating wheelchair positions harder whereas a minimum of 8 seats can accommodate three wheelchair users and their companions.

Our challenge is to accommodate 12 wheelchair positions and companion seats at Stalls level. A new rear entrance to a shallow Stalls may permit wheelchairs to be placed behind the back row if ramps can be incorporated but additional places are also required further forward. It suggests that side entrances may be more accommodating and that we should introduce 4 stub cross-aisles to this effect with three wheelchair positions in front of each.

In the shallow format, there would be no additional bar space. The sightline test suggests that these shallow rakes would be no better than many equivalent theatres.

The consensus was that a shallow rake would not add sufficient value to the auditorium.

PLAN OPTION C - CURVED GEOMETRY



The conclusion of the first round of investigations was that curved geometry should be tested even though it did not fit comfortably with an auditorium based on orthogonal geometry and 45-degree angles.

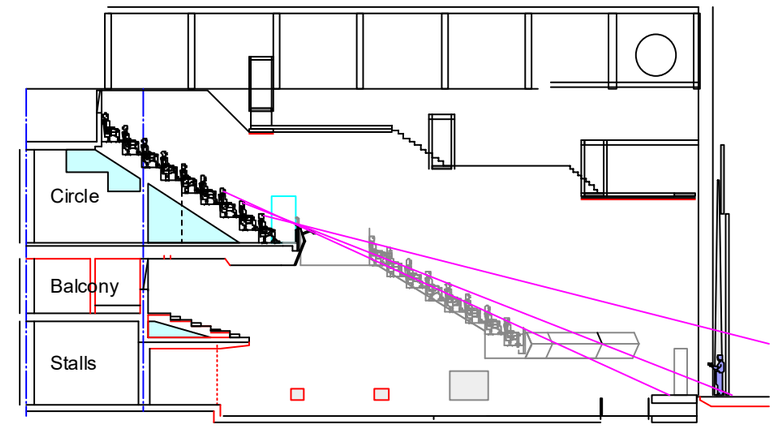
This Stalls plan offers a more traditional pattern of seating. It could be applied to both shallow and steep rake options. It doesn't match the angular geometry of room but once the outer walls are darkened and possibly new balcony fronts added to soften the angularity, the curves could transform the atmosphere in the room.

Curved rows are generally preferred to straight rows of seats as the peripheral vision is a means to transfer energy along a row of audience – a laugh, a sigh, any reaction is amplified when shared and this can heighten appreciation of a performance.

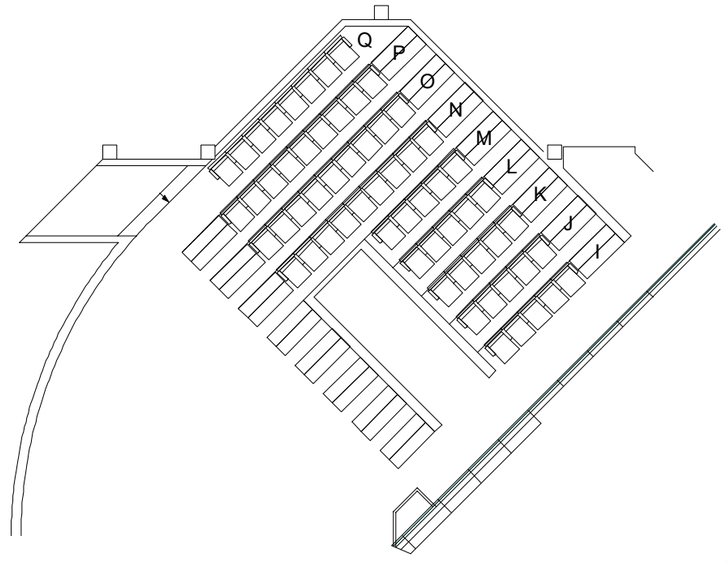
6.3 CIRCLE SEATING

Charcoalblue investigated several options for improvements to the seating in the Circle. The options for Circle tiers I to Q are recorded below.

CIRCLE OPTION 0 – EXISTING



Existing sightlines showing impact of the standard height rail on the front three rows.



Part plan of Circle showing affected rows

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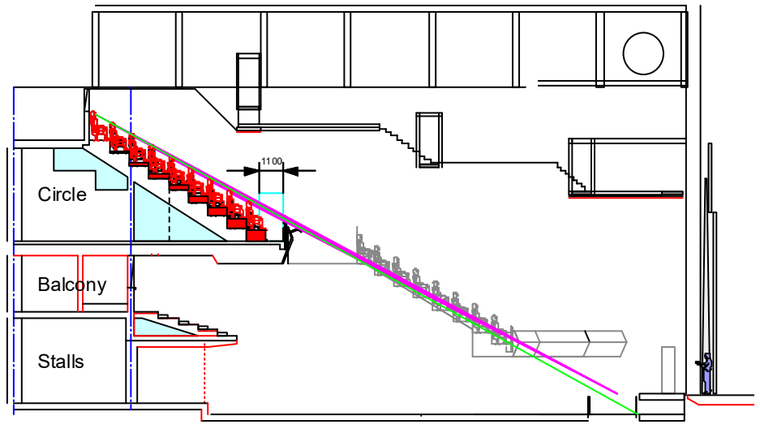
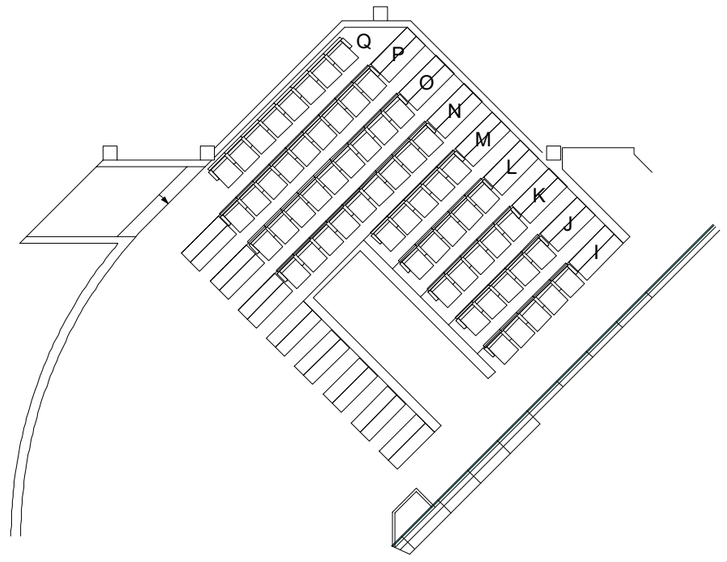
CIRCLE OPTION 1 – RAISING SIDE SEATS IN PLACE



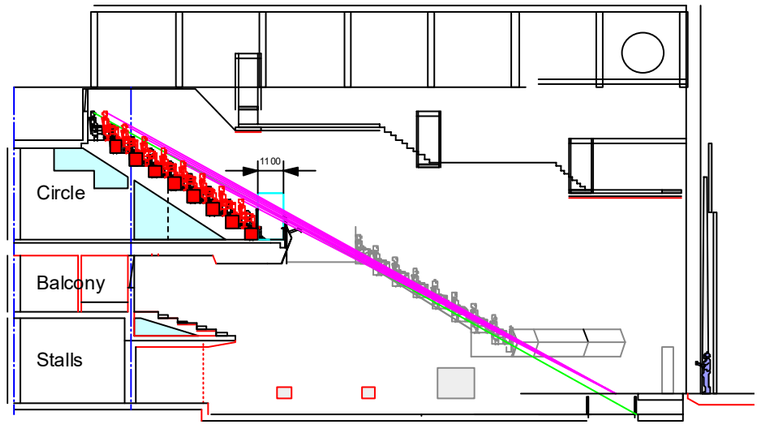
- Incremental raising improves sightlines over solid rail (for 6 rows)
- Raised rail still visible to most side seats
- Does not achieve clear cross-over (seats need to be moved back too)

- Solid red block shows where the tiers are built up and forward.

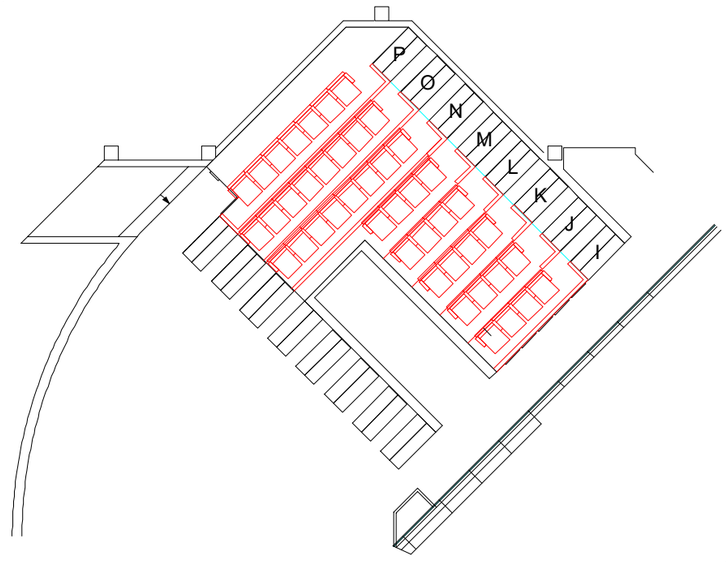


Part plan of Circle – no change

CIRCLE OPTION 2 – RAISING SIDE SEATS AND MOVING AWAY FROM STAGE

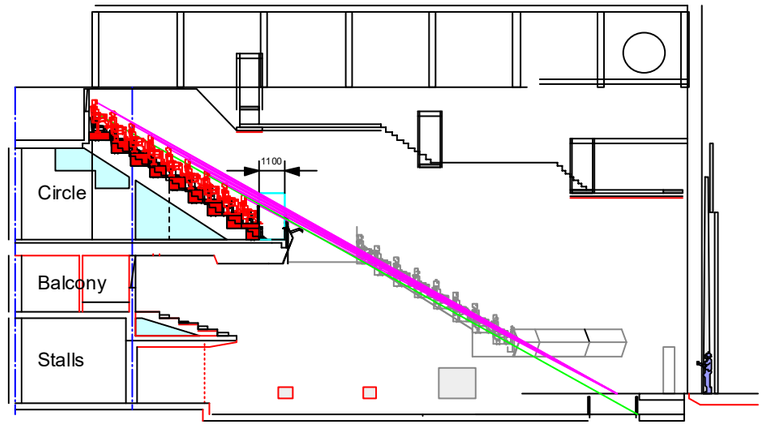


- Loses one row and ends seats (16 seats each side = 32 total)
- Full raising of row to next row improves sightlines over solid rail (for 6 rows)
- Raised rail still visible to half of sides seats
- Achieves clear cross-over

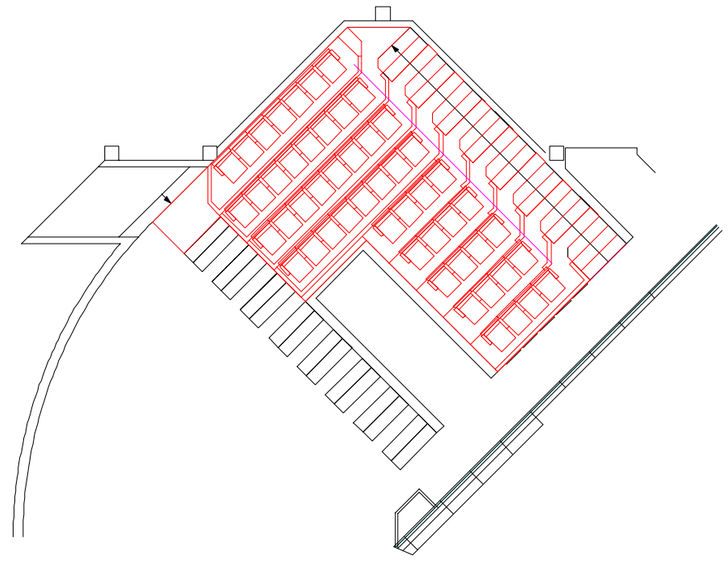


Part plan of Circle showing reconfigured levels and seating

CIRCLE OPTION 3A – RAISING SIDE SEATS AND SQUEEZING LEGROOM



- Loses ends seats only (9 seats each side = 18 total)
- Legroom reduced by 34mm
- Incremental raising improves sightlines over solid rail (for 6 rows)
- Raised rail visible to only front two rows
- Achieves clear cross-over
- Rear row of high crown seats



Part plan of Circle showing reconfigured levels and seating

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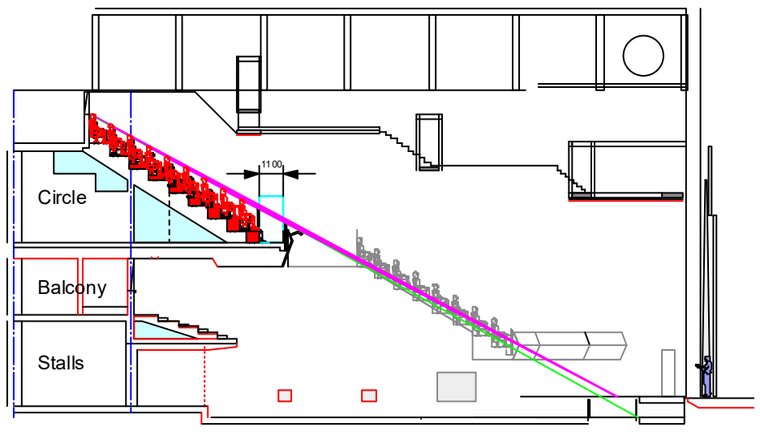
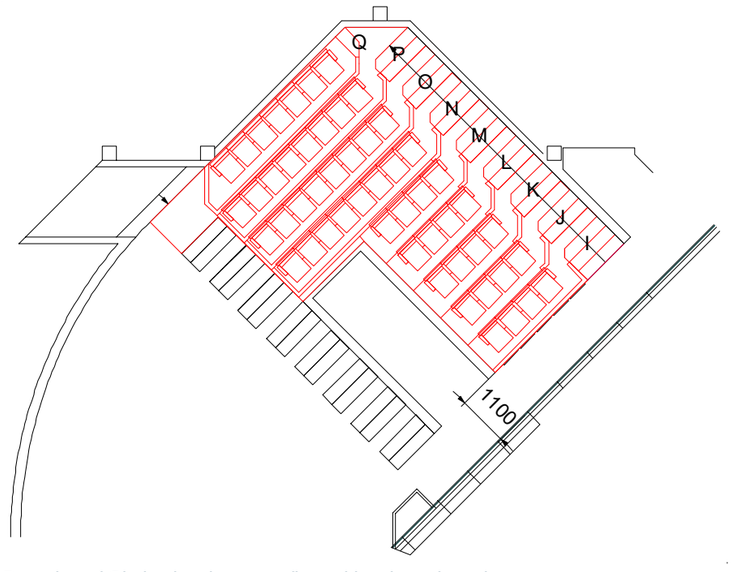
CIRCLE OPTION 3B – RAISING SIDE SEATS AND SQUEEZING LEGROOM



- Loses ends seats only (9 seats each side = 18 total)
- Legroom reduced by 34mm
- Incremental raising improves sightlines over solid rail (for 6 rows)
- Raised rail still visible to most side seats
- Achieves clear cross-over
- ***Avoids*** high crown seats on rear row

ENDS



Part plan of Circle showing reconfigured levels and seating

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