Creative Spaces Design Guide

PART 3H
TECHNICAL APPENDIX:
SMALL MULTI-USE THEATRE

CREATIVE VICTORIA ARUP

CITY OF MELBOURNE CITY OF SYDNEY

We acknowledge the Traditional Owners of Country throughout Victoria and their ongoing connection to this land and water. We pay our respects to their culture and their Elders – past, present and future.

In preparing these guides, we acknowledge that First Peoples self-determination is a human right as enshrined in the United Nations Declaration on the Rights of Indigenous Peoples.

We also acknowledge that past injustices and continuing inequalities experienced by First Peoples have limited, and continue to limit, their participation in all land and resource management[1], including development of creative spaces.

Creative spaces exist on land for which sovereignty has not been ceded and, as such, development, design and operation of creative spaces should involve consultation with First Peoples and Traditional Owners. Engagement and operation must be carried out in a culturally safe manner.

Any use of First Peoples design should follow the principles outlined in the International Indigenous Design Charter[2], which stipulates that First Peoples must have opportunity to meaningfully participate in and influence design and development processes that affect their Country and community.

Artist — Dixon Patten, Yorta Yorta and Gunnai
This artwork, commissioned in 2019 by the (then) Victorian Department of Jobs, Precincts and Regions is about developing the economy by working with community to create First People's employment opportunities, supporting inclusion and economic prosperity and thriving First Peoples' communities.

The symbolism used represents opportunities for First Peoples to achieve personal and economic prosperity and improved employment outcomes, the diversity of First Peoples' knowledge, skills and resources in community, and the connection to cultural practices and ceremonies.

Terminology:
First Peoples – Throughout this document the term Victorian First Peoples is used to refer to Traditional Owners of Victoria and all other Aboriginal and Torres Strait Islander peoples who reside in this state.

Culturally-safe Spaces[3] – Culturally-safe spaces are built environments, places, areas, groups, dialogues or bodies of work that positively and proactively acknowledge, accept and provide for the inclusion of the full spectrum of diversity of participants in that space. They are empowering places of mutually-beneficial exchange, personal and collective growth, and strength-based approaches.

For First Peoples, culturally safe spaces are places where imbalances of power, primacy and status are identified and structural adjustment is made to ensure equitable conditions are achieved and maintained. Culturally safe spaces are cognisant of, and proactively provide cultural safety at all levels of operation.

1. DELWP, see Traditional Owner and Aboriginal Community Engagement Principles on page 10 https://www.delwp.vic.gov.au/__data/assets/pdf_file/0031/508099/Traditional-Owner-and-Aboriginal-Community-Engagement-Framework-compressed-2.pdf

2. The International Indigenous Design Charter, see Guiding Principles on page 8 at https://indigenousdesigncharter.com.au/international-indigenous-design-charter/

3. More information can be found via the UTS Design Index. http://www.utsdesignindex.com/researchmethod/culturally-safe-spaces/ and the Victorian Government's cultural safety framework: https://www.dhhs.vic.gov.au/publications/aboriginal-and-torres-strait-islander-cultural-safety-framework

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Cover: "A Murder Story Retold in Three Symphonic Vignettes", East Sydney Community and Arts Centre, Darlinghurst
Credit: Jessica Lindsay
Prepared by Arup for Creative Victoria, Office of the Victorian Government Architect, City of Melbourne and City of Sydney.

Introduction

An abundant and diverse supply of creative space is essential to support a productive cultural sector. Due consideration for the operational, spatial, and technical requirements of these creative spaces can better support the functions and meet the needs of its users, operators and the community for the long-term.

Designing and delivering creative spaces that are fit for purpose will amplify its creative potential as well as increase operational efficiency, in turn reducing costs to the owner and/or operator.

Purpose of the technical appendices

The technical appendices to the Creative Spaces Design Guides have been developed to guide good decision making in the planning and delivery of creative space projects. They demonstrate best practice in effective, efficient and sustainable design of creative spaces, and not all aspects will be applicable or achievable for every project.

These appendices are technical in nature, relating to program, spatial requirements, structure, amenity and serviceability of space. Readers of these technical appendices should be mindful of the very specific technical focus of the documents and use them in conjunction with other guidance on the proposed programming, management and operation of the proposed creative space. In particular, these technical appendices should be read in conjunction with **Part 1: Making space for creativity** and **Part 2: Principles for creative spaces** of this document which provide a wider context within which creative spaces are typically conceived and delivered.

These technical appendices are a live document that may be updated from time to time. They do not capture the breadth of all the possible types of creative space. They prioritise spaces that were identified through consultation as being in high demand and low supply. Guidance on other types of spaces are intended to be added in future iterations.

How to use the technical appendices?

The technical appendices to the Creative Spaces Design Guides are intended to provide a preliminary technical brief prior to undertaking design work. These technical requirements include architectural, engineering and specialised design advice. The technical appendices:

— are aimed at providing 'best in class' outcomes and should be considered as a foundation for the development of detailed design briefs with project teams.
— are intended to be a practical resource to inform early planning and design conversations.
— should be used as a tool to facilitate early engagement with operators and user groups. Continued engagement throughout design and delivery is key to the development of fit-for-purpose creative spaces.
— are intended to support understanding and a shared language between stakeholders about the technical requirements for the type of creative space they wish to deliver.
— do NOT substitute specialist design, architectural and engineering advice as would be expected and required on any design and construction project.
— do NOT substitute early engagement with operators and end-users whose specific needs would need to inform project-specific design briefs.

Users of the technical appendices

The intended audience and users of these technical appendices might include (but not limited to):

— Private property developers incorporating creative space into a larger property development.
— Local and/or state government arts and culture agencies that are delivering or supporting the delivery of creative space.
— Arts and creative organisations that are planning to upgrade, deliver or occupy creative space.

Appendix structure

The first section titled **Key principles for designing creative spaces** provides guidance applicable equally across all space types and important considerations that need to be addressed alongside the technical framework of these appendices. These include:

— End-user and operational needs
— Project process
— Procurement
— Code compliance
— Departure guidance

The second section identifies the following technical requirements of a small multi-use theatre:

— Programmatic – key spaces and spatial relationships
— Spatial – key dimensions and spatial relationships
— Technical systems – specialised equipment relevant to functions of the spaces
— Universal design
— Sustainability
— Structural engineering
— Lighting
— Electrical engineering
— Acoustics
— Fire engineering
— Hydraulic engineering
— Mechanical engineering

A glossary section is included for reference.

Key principles for designing creative spaces

Creative spaces are places where people gather, inspire, connect, create and present their work. They are unique and respond to the needs of the environment in which they are located.

Embedding good design in a creative space

These spaces will be used by professional artists, producers, construction and technical production staff and the broader community. It is imperative that good design is at the core of every creative space delivered.

The Victorian Government Architect recognises the critical need for good design. The 'Good design - Issue 1' publication by the Office of the Victorian Government Architect identifies that:

"*Good design comes in many forms and is defined by much more than how something looks. It refines the purpose and aspiration of a project, improves how it works, creates additional benefits and elevates how people feel and behave in the final outcome. Good design creates inspiring places and greater, lasting financial value. And of course, good design also looks and feels good.*"

Incorporating good design in creative spaces includes designing for and understanding:

— User and operational needs
— Project processes
— Efficient procurement of goods and services
— Compliance with codes and standards
— Universal design
— Sustainability
— The local, national and international arts and culture ecosystem

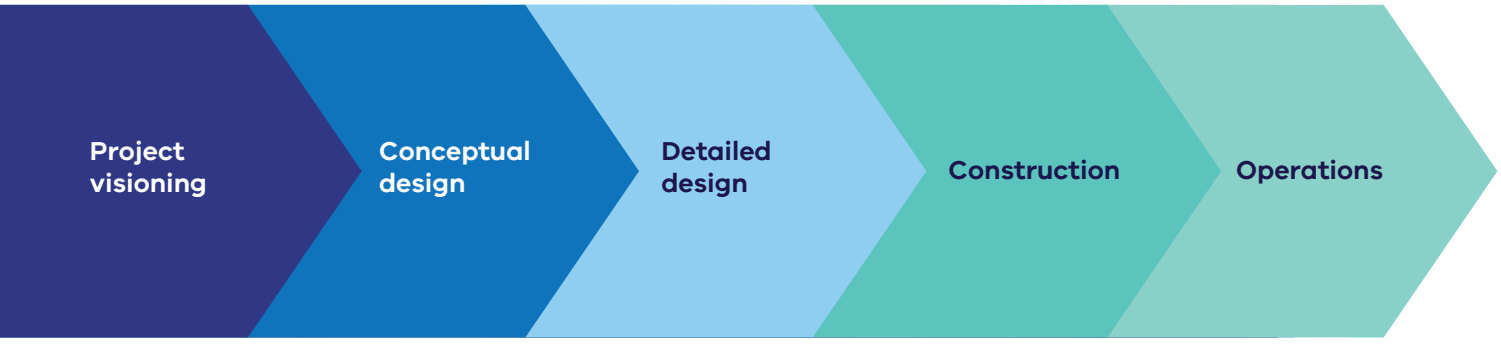
Operational and end-user needs

Early and ongoing engagement with operators, user groups and other stakeholders is a key component in the successful delivery of creative space projects. The establishment of critical success factors with primary stakeholders lays the foundation for the development of spatial, operational and management structures. The conception of a vision, operating models and target markets are all essential to designing creative spaces with a unique identity and place within the arts and cultural ecosystem.

Accordingly, defining operational and end-user needs is often the first step in a project delivery process.

Project process

These technical appendices provide the key requirements for best practice design. However, design itself does not guarantee good project outcomes. Design of creative spaces is part of a bigger 'process' of project delivery, and these technical appendices are a tool to be deployed throughout a project process that can provide differing points of value. The diagram below outlines one possible project process.



Ultimately, the success of the technical appendix will be realised through its application throughout a design and delivery process. The appendix is intended to be used as a reference at different phases of a project, as well as serving as a tool to facilitate collaborative discussions as project details unfold during design and construction. The table below presents some examples of how the technical appendix may be of value at each phase in the project process.

Project visioning - Project inception phase where site is selected, vision and direction of the project is established.

POTENTIAL USES	EXAMPLE OF USAGE
Assist a property developer to determine appropriate creative infrastructure aligned to a development vision	What are the spaces used for and what needs to be built? How does that align with your intended project outcomes?
Assist arts organisations to survey possible options for creative spaces	Your organisation is ready to find a new home – what technical and spatial requirements does the site need and how much might it cost?
Assist with site selection and due diligence by validating if sites can accommodate technical needs	Your arts organisation has found space that could be converted into creative space – does it have the clear height and services on site to support your needs?

Concept design - Project phase in which the creative space is designed fit for purpose to meet user and stakeholder needs.

POTENTIAL USES	EXAMPLE OF USAGE
Assist a property developer to determine appropriate creative infrastructure aligned to a development vision	The technical appendix establishes some primary design requirements to be incorporated into early design – has the design team made the right spatial, structural and services allowances?
A departure point for a design brief which recognises that the technical appendix is 'best practice' and can be de-scoped with the guidance of the consultant/design team	The preferred site and design of an arts organisation cannot achieve the guideline clear height for dance – what are the impacts of a reduced clear height and is this acceptable to the organisation?

Detailed design - Project phase in which technical documents including construction documentation is produced.

POTENTIAL USES	EXAMPLE OF USAGE
Detailed design and engineering requirements to be used as 'basis of design' for project design team	The technical appendix provides a clear set of functional and performance design criteria that needs to be delivered unless otherwise agreed – for example: can the appropriate background noise levels be met against the nominated criteria or has the design team agreed to relax them for this project?

Construction - Project phase in which the creative space is constructed on site.

POTENTIAL USES	EXAMPLE OF USAGE
Provide a reference point for collaborative discussion between stakeholders, designers and builders as projects are being delivered	The technical appendix is a common point of reference for a shared understanding of what is being built and why – for example: does the kitchen have all the facilities that the company requires?

Operation - Ongoing phase that includes operation and maintanence of the creative space.

POTENTIAL USES	EXAMPLE OF USAGE
Post-occupancy validation	Has the intended functionality and performance been delivered?
Real world implementation of technical appendix used to provide lessons learned for future refinement of the technical appendix	Feedback, such as if aspects of the guidance prove to be persistently difficult to practically achieve, can be recorded and submitted.

Procurement considerations

Procurement methodologies – for both design and delivery, should be structured in a way that ensures alignment with, and ability to deliver against, the vision articulated by project stakeholders. The many varied ways that the design and construction of building projects can be procured are beyond the scope of this technical appendix, and each project will require its own specific procurement methodology.

Below are some examples of strategies that might be included within the procurement process to ensure best alignment of the creative space with the vision articulated by project stakeholders:

— A private developer delivering a creative space as part of a construction consent condition might be required to put in place governance structures that ensure stakeholders are consulted and their requirements are demonstrably met.
— Consent authorities should provide incentives to developers to establish and maintain ongoing outcome-oriented relationships with creative arts community members.
— Arts organisations are recommended to engage with specialised consultants at the outset of a project to determine their specific needs, aligned with organisation mission and values, to form the basis of a project brief.
— Arts organisations should be provided with quality advice for the procurement of design and/ or construction services.

Compliance to codes and standards

Any creative space needs to be designed, built and certified in accordance with current relevant statutory regulations. Of particular note:

— The facility is to comply with the National Construction Code of Australia (NCC) and all relevant associated Australian Standards (AS).
— A building regulations consultant and an accessibility consultant should be engaged to provide comprehensive advice and compliance check throughout design and documentation.
— For a change-of-use and/or works within an existing building, the building regulations consultant is to assess the extent of upgrade required for compliance in line with Clause 62 and 64 of the Environmental Planning and Assessment (EP&A) Regulations (NSW) and Building Regulations 2018 (Victoria). This assessment should be carried out in the concept phase of a project (pre development application in NSW).
— In an existing building, input from a fire safety engineer may be necessary to assist in defining the extent of upgrade to meet the required level of safety and assist the consent authority to determine the requisite level of upgrade.
— Part H of the NCC will apply to Class 9b spaces. In Victoria, if the space is a 'Place of Public Entertainment' (as defined in the Building Act 1993 and prescribed in the Building Regulations 2018), then part VIC Part H102 will apply. In NSW, if the space is an 'Entertainment Venue' (as described in the EP&A Regulations), then part NSW H101 of the NCC will apply.

Departures from the technical advice in these appendices

These technical appendices articulate a set of functional and performance requirements that should be considered in the delivery of a creative space project. However, it is not always possible, or appropriate, to achieve best practice outcomes. The design should principally align with the capability and expectation of key users and stakeholders. Misalignment between design and user/stakeholder expectations may result in creative spaces:

— that are not fit-for-purpose
— that are operationally burdensome
— that don't align to their broader built environment

These technical appendices represent best practice and are intended to be a 'point of departure'. Stakeholders should be empowered to descope from these requirements where appropriate. It is crucial that users are advised by a design, architectural, engineering and consultant team who understands and can explain the implications of descoping these requirements.

DEPARTURE GUIDANCE

Throughout the technical appendix document, there are boxes formatted in this style. These boxes contain commentary on the potential implications of descoping against specific requirements. Please note that descoping can have broader and more/less significant impact than the example given. It is important to gain advice from a professional design and engineering team to help understand these decisions on a case-by-case and project specific basis.

Small multi-use theatre

A small multi-use theatre is flexible in nature and should be capable of presenting a wide array of artforms.

The multi-use theatre should be equipped to present professional work while minimising capital and operating costs. Capacity will generally cater for less than 200 patrons in flexible seating systems which allow multiple stage and seating configurations. In addition to operating as a performance venue, the space can be used as rehearsal space and more general public uses, for example dance or performance classes, play-reading, meditation, and yoga groups. The theatre has several support spaces situated within the front of house and back of house areas.

Usage profile
User-groups typically prefer to restrict access to the space for the duration of their booking. Engagement with the operator to understand expectations should consider this prior to design. For example, where a user is likely to book the theatre for a period of multiple weeks, they generally occupy the performance space and back of house areas in its entirety thus making it difficult for the space to be used by any other user.

Theatre spaces have a particular pattern of standard usage profiles:
- A production of a performance
  - The production will "bump-in" or "load in" for a period of days. Over this period production and creative teams will construct prefabricated sets and scenic elements, rig, focus and plot production lighting, video, and audio systems. Typically, this occurs from 8am to 11pm each day on weekdays and weekends.
  - The production will commence a period of technical and dress rehearsals for a number of days. Typically, this occurs from 9am to 11pm every day (weekdays and/or weekends).
  - The production will open to a public audience for a period of days to weeks. This is referred to as the productions season. The demand on the space reduces to a period of 1-2 hours prior and post a performance time. Typically, performances are held in the evening with occasional mid-morning or afternoon performances called matinees. If a production typically attracts an audience for a morning or afternoon performance the usage profile may change with a majority of day-time performances.
  - At the conclusion of the season, the production team will "bump out' or "load out" overnight or for a period of days to reset the theatre back to its standard configuration or empty state. This period can run over a full 24 hour period.
- A single user-group may hire the venue for a single day or a few days at a time for a small-scale event, corporate function or performance requiring minimal technical requirements.
- Sporadic rehearsals or classes requiring only a few hours of time per day and multiple user groups in a single day.

References:

Esme Timbery Creative Practice Lab © Arup

Lewis Center for the Arts, Princeton University © Arup

Programmatic requirements

Key programmatic requirements of a small multi-use theatre are outlined below:

Access requirements
User friendly and controllable access for user groups should be provided from the building exterior. Areas should be zoned to control access between Back of House (BOH) and FOH areas.

Stage and seating
The stage and seating have a direct relationship. Seating systems should be flexible and highly configurable to provide a high-quality space for small scale performances. Seating system storage should be planned in the development of seating and stage configurations.

Back of house (BOH)

Back of House (BOH) spaces are secure areas incorporating artist support, technical spaces and management. They include the following spaces:

Control positions for technical crew to operate the production systems. This could be a standalone room or temporary positions incorporated into the audience seating area, side or rear of the stage area or a combination of the above

Technical equipment rooms or rack rooms house power, data, audio and video distribution and centralised equipment associated with specialist systems

Dressing rooms providing desks with mirrors, costume rail and full-length mirror

Kitchen/Green room with a basic kitchen for performers to pre-heat meals and lounge area to gather before, during and after a performance

Laundry area to support costume maintenance including washing, drying and ironing

Amenities including dedicated toilets and shower

Storage areas

Loading zone that services the theatre to support multiple deliveries of scenic elements, technical equipment, food, and beverage. The load-in area or dock should be located immediately adjacent to the stage and/or backstage area. If the loading zone is to be shared by other occupants of the building its ability to handle surges in capacity should be carefully assessed

Step-free circulation and ***obstruction free access***, sized (at minimum) for a grand piano or elevated work platform from the building exterior

Sound and light locks (SLL's) separating the BOH areas from the theatre and FOH spaces

Wayfinding signage that is inclusive and legible (including text, pictogram, visual, tactile and audible options)

Front of house (FOH)

Front of house areas are common publicly accessible areas that support the function of the theatre by providing gathering spaces, information, ticketing purchasing and control. They include the following key spaces:

Foyer is the primary node point for audiences to gather and connect with all spaces they access. The foyer must have direct access to the outside and be the main entrance point for the audience into the main building,

Information/Box office area provides a location where staff can easily meet and assist audience members with ticket sales and information,

Bar and refreshment area within the foyer for use before and after a performance,

Storage areas adjacent to the foyer,

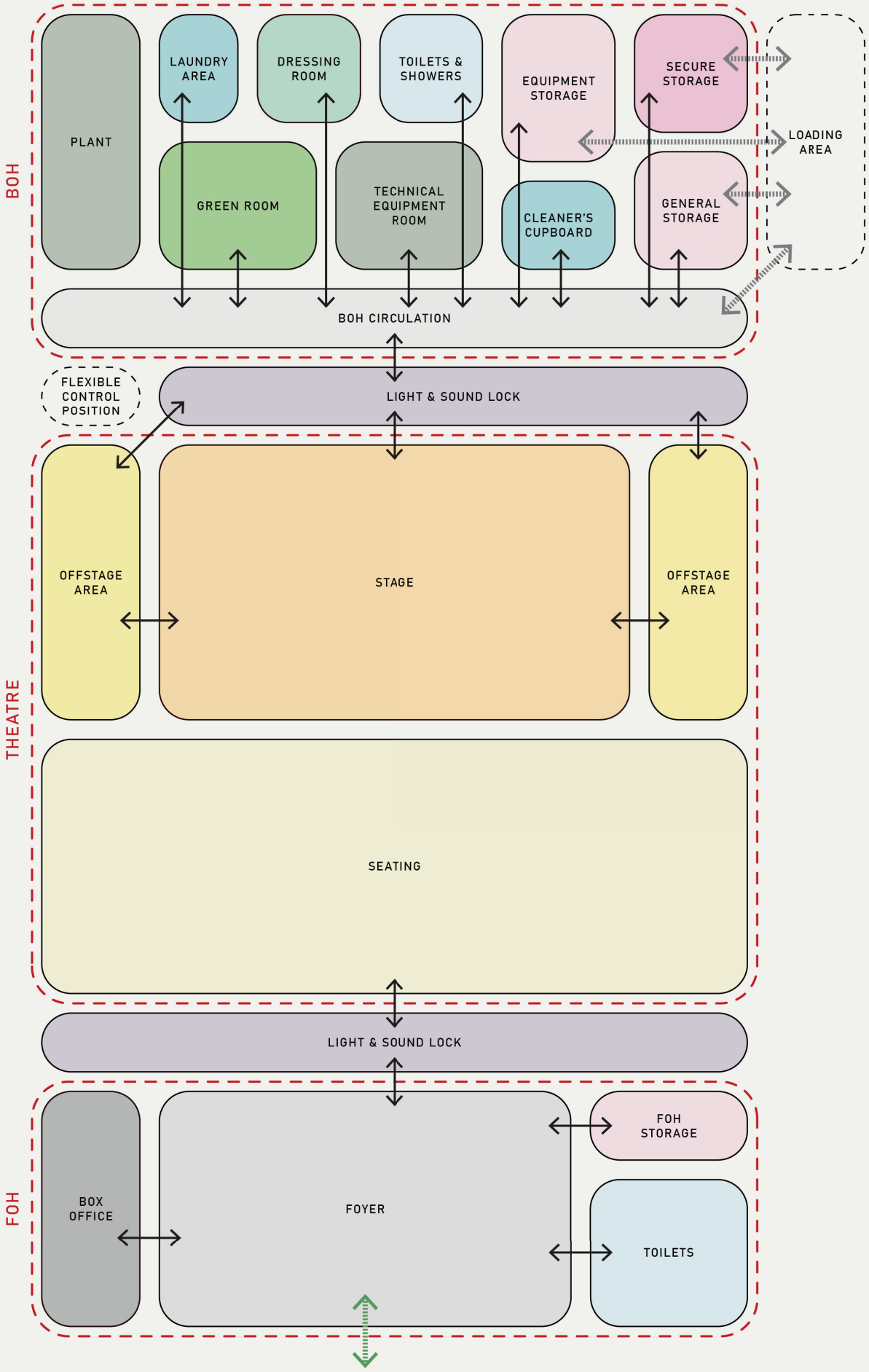
Toilets adjacent to the foyer,

Sound and light locks (SLL's) separating the theatre from the FOH areas,

Wayfinding signage that is inclusive and legible.

DEPARTURE GUIDANCE
Theatres are complex facilities with a wide range of spaces each with their own unique functional requirements. Whilst some of these can be consolidated into fewer spaces this can attract operational and building performance compromises. For instance, laundry facilities in dressing rooms can be disturbing; FOH storage can be shared with BOH storage but this will create operational inefficiencies; sound/light locks from BOH can be removed but require management to avoid disturbance from BOH activities to the stage.

Small Multi-use Theatre – Spatial adjacency diagram



Spatial requirements

The desired maximum seating allowance should be discussed with the end user and theatre consultant to find a balance between an intimate, adaptable performance space and adequate ticket sales. In addition to the maximum audience capacity, the theatre will need to accommodate an additional 30+ people, including cast, crew, technical and front of house staff.

Stage and seating – Design requirements

Early engagement with the operator and user groups to determine the usage is key to defining area requirements. The following area allowances have been provided as an early planning guide:

Stage/performance area: a minimum **10m wide x 10m deep** flat floor stage with a minimum offstage area of **2.5m wide x 10m deep** for performers and stage crew in multiple configurations. It is expected the location of the stage may shift in response to the seating arrangement

Stage height: minimum **5m AFFL** to the underside of the technical grid throughout, including over seating areas. A mezzanine arrangement could be considered along the rear/ sides of the space.

Technical grid: Infrastructure for rigging scenery, lighting, audio and video equipment

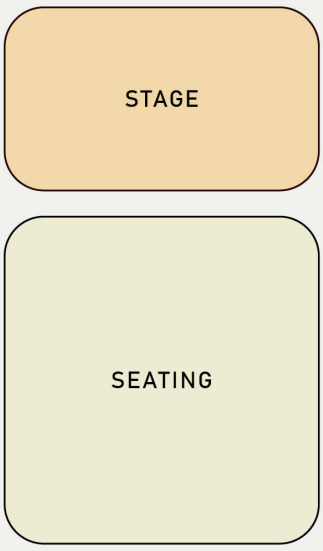
Services zone allowance should be considered above the technical grid (rigging Infrastructure)

Production Systems

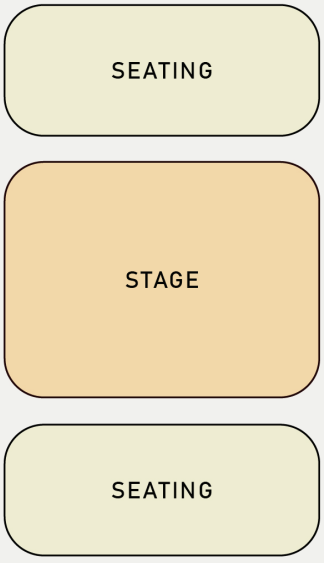
Seating systems that are highly configurable. The diagrams below indicate examples of typical configurations. Early planning should allow 1.5sqm per person.

It is important that all spaces above are designed to be inclusive, allowing opportunity to participate regardless of someone's personal identity or circumstances.

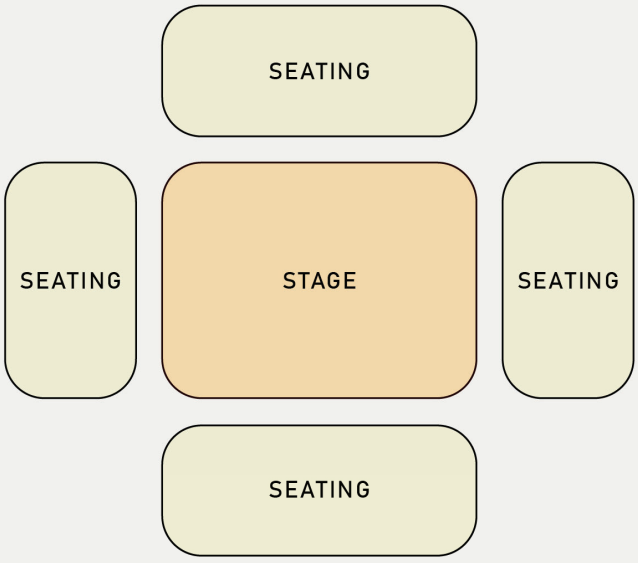
Examples of flexible seating configuration:



End stage - Seating layout



Transverse – Seating layout



In the Round – Seating layout

Stage floor

Construction and finish

Typical construction incorporates plywood sheets on joists finished with a black painted replaceable sacrificial floor that can be fixed into as needed by the users. Stage floor construction should consider floor traps for temporary cabling.

Load Requirements

The floor requires a minimum working load of 7.5kPa, but should be specified to safely support the load of the designated height access equipment, seating system, and other heavy items in consultation with the end-users during the design phase.

Additional items that are likely to be used in the space might include:

— A fully loaded chair trolley.
— A heavy road-case of technical equipment (nominal 120kg maximum distributed over four castors).
— A heavy trolley supporting multiple rolls of dance floor/Tarkett (nominal 300kg distributed over four castors).
— Heavy scenic elements such as stage decks and scenery.
— A height access machine, such as a small electric scissor lift, or more likely a 1-person upright lift.
— Retractable seating bank units (possibly in excess of 500kg distributed over multiple castors, etc.).

Wall and ceiling

Wall and ceiling finishes should be resilient, painted black and wherever possible with the capacity to be fixed into. Finishes, fittings and furniture should also accommodate a wide range of user needs - including good visual contrast of key surfaces and features, avoidance of finishes that will cause confusion (e.g. heavy patterns, glare, reflections)

Technical grid

The multi-use theatre should be fitted with overhead rigging infrastructure to support the temporary installation of production equipment and scenery. The technical grid should span the entire stage and seating zone to provide rigging capability in multiple configurations. This may be presented as a distribution of rigging points or a pipe grid system. Services zone should be nominated above the rigging infrastructure and integrated with production system cabling containment and facility panels. Please see Technical System and Structural design requirements.

Audience seating systems

The multi-use theatre should consider a seating system to efficiently transition between various seating and stage configurations. Careful assessment of audience sightlines and equally technical equipment sightlines in relation to stage and seating requirements must be carefully assessed.

A portable and/or retractable seating system should be considered. These systems provide load-rated platforms with code required safety elements (steps, handrails, aisles, etc.) that are relatively quick and easy to deploy with limited staff. Removable/ retractable seating systems, where used, should consider the space required for a wheelchair user or other users requiring more space, and should be factored into the unit size.

The storage of seating systems when not deployed should be carefully considered and integrated in the design development of seating configurations.

Selection of suitable theatre-style seating must be carefully considered and coordinated withing the overall seating system design. Selection of seats must consider architecture, comfort, sizing, code requirements, acoustic criteria, transport and storage, flexibility, cost.

Wheelchair seating spaces and accessible circulation pathway that comply with AS 1428.1 should be provided. Number of wheelchair seating spaces to be provided is set out in the NCC. Consideration should also be taken to other user types who may require additional space when seating such as assistant animal users, people with pushchairs and those with medical equipment or mobility aids such as crutches.

TOTAL NUMBER OF SEATING	NUMBER OF WHEELCHAIR SEATING SPACES	GROUPING AND LOCATION
Up to 150	3 spaces	1 single space and 1 group of 2 spaces
151 to 800	3 spaces; plus 1 additional space for each additional 50 seats or part thereof in excess of 150 seats	Not less than 1 single space; and not less than 1 group of 2 spaces; and not more than 5 spaces in any other group.

The NCC specifies theatre auditorium seating.

Location of a space for a sign language interpreter within a well-lit purpose built booth should also be considered, in order to allow audience to see both interpretation and performance, without obstructing views of other people in the audience. To facilitate sign language and lip reading, lighting on the faces and hands of presenters and people signing should be provided at an angle of 45° to 50° from horizontal at ceiling level to facilitate reading of the presenter's lips and the signer's lips and hands. A suitable contrasting backdrop should be provided, to assist in reading the presenter's lips and hands.

There should also be provision of captioning as well, integrated within the stage, with high quality sightlines. Non-integrated captioning and/ or video relay of sign language interpretation can also be provided. Some users may find this difficult to follow if it is outside the field of vision.

Back of house areas (BOH) – Design requirements

The Back of House (BOH) space should remain separated, secure, and controllable at all times. User friendly access for cast and crew should be provided while still ensuring security within the building and between the BOH and FOH areas.

Early engagement with the operator and user groups to determine the usage is key to defining area requirements. The following area allowances have been provided as an early planning guide:

Dressing rooms: **4 sqm per person**

Toilets: **as per NCC**

Showers: **as per NCC**

Kitchen: **10 sqm**

General storage: **15 sqm**

Technical equipment storage: **20 sqm**

Secure storage: **10 sqm**

Cleaners cupboard: **2 sqm**

Control room: **20 sqm**

Technical equipment room (rack room): **15 sqm**

Laundry Area: **5 sqm**

All spatial requirements listed above denote Net Internal Area.

It is important that all spaces above are designed to be inclusive, allowing opportunity to participate regardless of someone's personal identity or circumstances.

Dressing rooms
A minimum of two dressing rooms should be provided capable of accommodating a minimum of four people. Each dressing room should allow a clear space of no less than 4sqm for each occupant and a minimum clear height of 2.4m.

Dressing rooms should be equipped with clothing racks, full length mirror, table with mirror, lockers for storing clothing and personal belongings. Lockers should be well ventilated, accessible, and secure. There should also be a clear space of at least 1800mm between rows of lockers facing each other and at least 900mm between lockers and a seat or wall. Dressing room layout should comply with accessibility standards and best practice, the NCC and the AS 1428 suite of Standards.

Toilets
The ratio of male and female toilets to the number of occupants, and the specifications for toilets should comply with accessibility standards and best practice, the NCC and the AS 1428 suite of Standards. A minimum clear height of 2.4m AFFL should be maintained. It is recommended that both gendered and gender-neutral facilities be provided to accommodate cultural preferences and non-binary gender identity.

Showers
Provide a minimum of two shower cubicles. Showers should have a floor area of not less than 1.8 sqm. Showers should comply with accessibility standards and best practice, the NCC and the AS 1428 suite of Standards. A minimum clear height of 2.4m AFFL should be maintained. Consideration should also be given to providing gender neutral showers for non-binary gender identification.

Kitchen
A Kitchen is intended only for basic meal prep and reheating of pre-prepared meals. The kitchen should also allow for food rinsing, utensil washing and the sanitary disposal of associated wastewater. There is no need to provide oven and stove unless specified by the operator or user groups.

A minimum clear height of 2.4m AFFL should be maintained in the kitchen. It is noted that there should be dual height surface tops in kitchenette areas allowing users of various heights (e.g. very tall or short stature, and people who may be seated, such as wheelchair users) to access facilities safely and independently. For seated users, 760mm height countertops from FFL, or adjustable units, are recommended.

Basic kitchen provisions to include: a large fridge, microwave, sink and instantaneous hot water boiler for efficient tea and coffee preparation. A reasonable amount of bench space and storage should be provided. A dishwasher may be considered.

The kitchen can also be fitted with a respite space for providing users with a quiet area which can be used for breaks, religious requirements (e.g. praying), or as a sensory break (e.g. for neurodivergent people).

Storage requirements
General storage must be provided within or adjacent to the theatre, and may be used for:
— Height access machinery and/or ladder storage,
— Loose furniture, especially loose seating and temporary production desks,
— A location to store the seating system when not in use.

Technical equipment storage must be provided within or adjacent to the theatre, and may be used for:
— Lighting equipment,
— Audio equipment,
— Video equipment,
— Staging equipment,
— Loose cabling.

Secure storage must be provided adjacent to the theatre and within the BOH areas and dressing rooms for:
— High-value technical equipment and tools,
— Critical show props,
— Personal items of cast and crew.

A cleaner's cupboard should be provided adjacent to the theatre and the BOH area:
— Fitted with a mop sink,
— Space to hang wet mops,
— A limited amount of storage for general cleaning products (dustpan and brush, bin liners, cleaning fluids, etc.).

DEPARTURE GUIDANCE
Storage is a commonly overlooked facility in creative spaces design, sometimes sacrificed to allow area for other functional requirements. The saying 'you can never have too much storage' is true and failure to do so can have an impact on the safety and operation of a facility.

Control room
One primary control room should be provided with a clear line of sight to the stage in one or more of the standard seating configurations. In addition, infrastructure should be provided to support temporary control positions for each nominated seating and stage configuration.

Technical equipment room (rack room)
Technical Equipment Room or Rack Room should be provided to house power, data, audio, and video distribution. It should be easily accessible from control rooms and back of house circulation without disrupting the performance.

Laundry area
The laundry area is to support costume maintenance. It should provide a washing machine, dryer, workspace for minor repairs and ironing.

Loading zone and circulation
The loading zone that services the theatre is required to support multiple deliveries of scenic elements, technical equipment, food, and beverage. The load-in area or dock should ideally sit immediately adjacent to the stage and/or backstage area. If the loading zone is to be shared by other occupants of the building its ability to handle surges in capacity needs to be carefully assessed.

The loading zone should be sized to accept a medium rigid flatbed truck, a large van and/or a 3-tonne Pantech. Dock levellers and/or an overhead crane should be considered depending on loading area arrangement.
Dock design should ensure vehicles accessing the dock do not impede traffic or pedestrian flow. If forklift or similar loading plant is to be used, space around the parked truck to allow manoeuvring when loading/unloading should be included.

The loading circulation path from the loading zone to the theatre and FOH area needs to be carefully designed. It should be step free to allow heavy over-sized wheeled loads to be easily transported to and from the theatre. Direction changes and turning circles and clearances must be assessed.

If there is a building level change between the dock and the theatre a goods lift must be incorporated into the building design, sized to accommodate typically large and heavy loads associated with the theatre.

Loading zone exhaust ventilation should be provided in line with AS1668.2 code requirements. If the loading dock is within the building and close to other occupied areas, appropriate consideration should be made to reduce risk of nearby occupants.

Front of house areas (FOH) – Design requirements

Early engagement with the operator and user groups to determine the usage is key to defining area requirements. The following area allowances have been provided as an early planning guide:

Foyer: **1 sqm** per person

Toilets: **as per NCC**

Bar and refreshment area: **20 sqm**

Box office and information area: **5 sqm**

Storage area: **10 sqm**

Sound and light locks separating the theatre from the FOH spaces

Wayfinding signage that is inclusive and legible

All spatial requirements listed above denote Net Internal Area

Foyer

The foyer is the primary node point for audiences to gather and connect with all spaces they access. The foyer must have direct access to the outside and be the main entrance point for the audience into the main building.

DEPARTURE GUIDANCE

A foyer space with an allowance of 1**sqm** per person is a starting point for design and will evolve as the design process develops. Inadequate foyer space can result in poor patron experience and loss of food and beverage revenue generating opportunities.

Toilets

The ratio of male and female toilets to the number of occupants, and the specifications for toilets should comply with accessibility standards and best practice, the NCC and the AS 1428 suite of Standards. However, good practice for theatres would increase the number of female toilets by 50-100% to accommodate transient loads associated with intermissions. It is recommended that both gendered and gender-neutral facilities be provided to accommodate cultural preferences and non-binary gender identity.

Bar and refreshment area

The bar and refreshment area should have sufficient space to accommodate performance interval queues without obstructing circulation routes around the Foyer. Shelf or table space should be provided to allow pre-ordered drinks to be prepared for the interval.

Box office/information area

The box office area provides a location where staff can easily meet and assist audience members with ticket sales and information. It should be clearly visible, located in the foyer close to the main audience entry point.

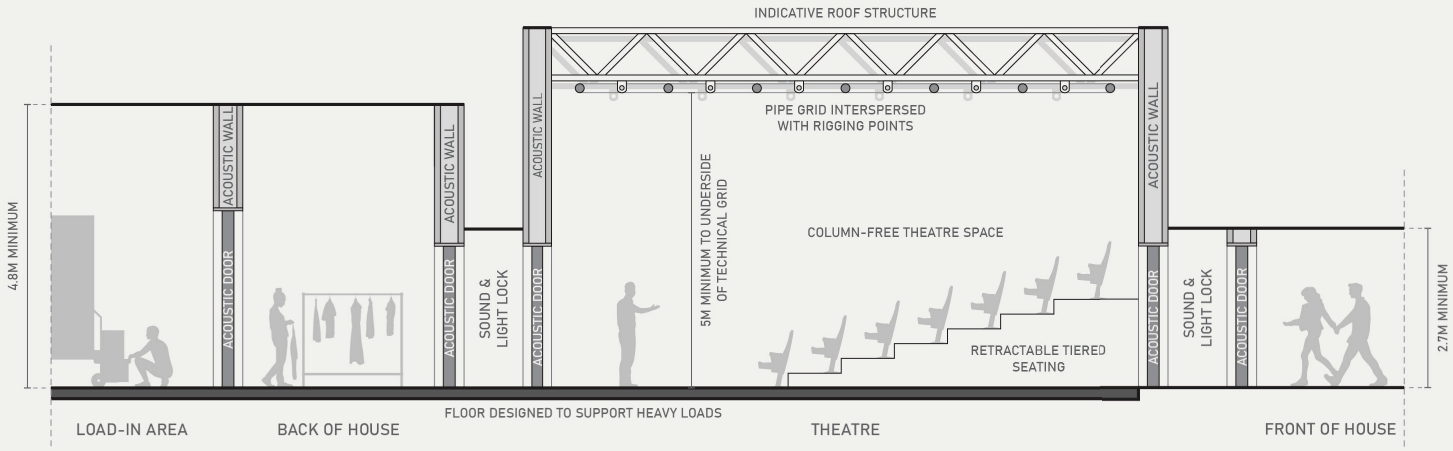
Storage requirements

General storage must be provided within a suitably accessible location throughout the foyer. It may be used for portable barriers, merchandise, cleaning equipment, and similar resources to support front of house operations.

DEPARTURE GUIDANCE

All amenities listed are expected for both professional and non-professional user groups. If loading or circulation requirements cannot be met, this may result in operational inefficiencies and complexities that render the space not fit-for purpose and thus less desirable for users.

Multi-use theatre – Sectional diagram



Technical system design requirements

Early engagement with the operator and user groups to determine the usage is key to defining technical system requirements. The overall design and capacity of the infrastructure or systems should be determined during design.

Technical grid
Overhead rigging infrastructure should be provided above the whole theatre space to support the rigging of production equipment such as lighting fixtures, video projectors, LED walls, loudspeakers, curtains, and scenic elements brought in for a particular production. These systems will be reconfigured regularly as per each individual user's requirements. The overhead rigging infrastructure should include a pipe grid and consider rigging strong points for additional capacity and flexibility.

Pipe grid
A pipe grid suspended from the structure above to allow for efficient rigging of permanent and temporary lighting or equipment. Key design requirements include:
— arrangement of 48.4mm OD steel pipe,
— nominal 1.5m - 2m spacing in two directions,
— capable of supporting (at minimum):
  - 50 kg per linear metre
  - 100 kg point loads

Rigging strong points
Rigging strong points to host a series of hoisting equipment (e.g. chain-motor or chain block) that is subsequently connected to either suspended objects or a production truss arrangement. The truss can be used to support a range of production equipment for example lighting fixtures, video projectors, LED walls, loudspeakers, curtains and scenic elements. Key design requirements for rigging points are outlined below:
— Rigging points may be presented as lugs fitted directly to building trusses or ceiling slabs.
— Rigging points should be capable of individually supporting up to 500kg. Simultaneous loading of multiple points to support a distributed load will be required pending detailed design.

Pipe Grid Example © Arup

Building structure
Preferably, any building structure within the theatre space should expose steel members (such as universal beams and steel trusses) that can provide temporary rigging support for point loads via temporary means (such as beam clamps and spansets).

Please refer to **Structural Design Requirements**.

Production lighting
The production lighting system should enable the suspension of temporary lighting fixtures and associated temporary cabling to operate or control the fixtures via a system of dimmable and non-dimmable channels to create a distinctive look for each performance. The overall design and capacity of the infrastructure or systems is to be determined during the design phase in consultation with the operator, end-users and theatre consultant. Minimum requirements outlined below

Stage lighting power and control
— Stage Lighting Dimmers: 72 x 2.4KW
— Stage Lighting Non-Dim Circuits: 24 x 10A non dim
— DMX Universes: 2

Stage lighting outlets and data network
The number and distribution of lighting power outlets should be determined in consultation with the operator, end user and theatre consultant early in the design phase. For initial planning purposes a minimum of 120 patch circuits distributed evenly throughout the technical grid and 20 patch circuits distributed at floor stage level returning to the technical equipment room (rack room) should be provided.

An ethernet based DMX lighting control network should be distributed from lighting control positions, dimmer room, technical grid, stage left, stage right, upstage wall and auditorium returning to the technical equipment (rack room). Distribution should be determined in consultation with the operator, end user and theatre consultant early in the design phase.

Integration with architectural lighting
Production lighting systems should integrate and have control over architectural lighting including house and aisle lighting.

A white and blue work light system controllable from control positions and stage should be provided. Please refer to lighting design requirements for further detail.

Production audio
The sound reinforcement system will include infrastructure overhead and at floor level to support temporary loudspeaker installation and control. Connections to the audio playback system will be managed via multi-core audio cables linked to wall and floor facility panels. The cabling infrastructure should be located at nominated control positions, technical grid, stage left, stage right, upstage wall and auditorium and return to the technical equipment room (rack room). Distribution should be determined in consultation with the operator, end user and theatre consultant early in the design phase.

Production video
The production video system should include infrastructure overhead and at floor level to support temporary video installation and control. The cabling infrastructure should be located at nominated control positions, technical grid, stage left, stage right, upstage wall and auditorium. Connections to analogue or digital switching device to distribute and process the video signal from video cameras will be managed via cable linked to the wall and floor facility panels and return to the technical equipment room (rack room). Distribution should be determined in consultation with the operator, end user and theatre consultant early in the design phase.

Production communications
The production communication system should include infrastructure to support a minimum of two channel industry standard communication system. Infrastructure should be provided at nominated control positions and evenly distributed at stage level. Distribution should be determined in consultation with the operator, end user and theatre consultant early in the design phase.

Production infrastructure
Facility panels will be required, mounted to various ceiling, rigging infrastructure, wall, and floor locations to interconnect the Production Lighting, Audio and Video signal and power cabling. Facility panels provide an identifiable connection point for analogue and/or digital signal cables between various systems and locations within the room. The cabling will merge at a central point within the Technical Equipment Room or Rack Room that houses power, data, audio, and video distribution. Distribution should be determined in consultation with the operator, end user and theatre consultant early in the design phase.

Paging systems infrastructure
Paging systems should allow areas to link or act separately as needed including:
— Front of house paging, electronic signage and interactive systems for visitor information, orientation and latecomers video monitors with control from stage management and front-of-house staff,
— Back-of-house paging, audio and video show relay for staff, technicians and performer coordination. The system should be zoned to allow announcements from the stage manager to artists and technical crew in all back of house areas including dressing rooms and green room and to front of house foyer areas.

Overhead access
Production equipment (e.g. loudspeakers, lighting fixtures, scenic elements, etc.) rigged above the performance area could be accessed via:
— A suitable platform ladder,
— Lightweight portable scaffold tower, or
— Height access machinery, such as a vertical lift or scissor lift.

Height access requirements should be assessed in consultation with the end-users during the design phase to determine the method of height access required. The assessment will need to consider: the operational impact, the risk profile, user needs and use-cases, frequency of use, adequate floor loading criteria, storage areas, access paths, etc. to inform a successful design.

DEPARTURE GUIDANCE
The technical provisions listed are fundamental to the successful operation of a Small-multi-use theatre space. Early engagement with the operator and user groups to determine the usage is key to defining technical system requirements. The overall design and capacity of the infrastructure or systems should be determined during design. Under-scoping technical systems can result in operational inefficiencies, loss of creative potential and impact reputation. Over-scoping can result in a building with unrealised technical capacity, or worse, a building that cannot be maintained and supported.

It will also be important to consider technical spaces in relation to universal design. This may include rethinking technical roles and their associated spaces, and automating / remotely controlling activities (which may reduce some of the historic need for heavy lifting and work at height). For example, for an accessible lighting grid, consider moving-head lights to minimise the work that needs to be done at height, and automate or motorise as many features as possible. On the grid itself, consider whether wheelchair access can be provided with wider, level routes.

Consideration of partially sighted people, and deaf people who lip read or use sign language, will also be important as part of an universal technical space design. Consideration will need to be given to the legibility of visual information, whilst maintaining the ambience; this may include designing technology interfaces that can help to communicate information to staff / performers that allow adjustment to personal requirements; or a suitable minimum lux level that will balance needs in the back of house areas.

Additional code compliance requirements

— The design and operation of the entertainment venue is to be in accordance with schedule 3a of the EP&A regulations.
— For NSW projects, Part NSW H101 of the NCC will apply. For Victorian projects, Part Vic H102 will apply.
— If a multi-use theatre was proposed in an existing building, the extent of building and services upgrades required for compliance should be considered at the concept phase of a project (pre-development application in NSW). Input from a BCA consultant will be required. Input from a fire safety engineer may be of benefit, to define the extent of upgrades on a performance-basis.

Universal design considerations

Universal design acknowledges human diversity and difference through design that is user-centred and responsive to people's needs, enabling people to participate equally, confidently and independently.

Creative spaces should work for everyone, but too often they fall short of this ambition. For a creative space to be inclusive, it must reflect and respond to the widest range of people's requirements, enhance visitor and user experience providing equal opportunities to access the space and use its facilities/services.

The key principles and goals of universal design are outlined below.:

- **Equitable use:** creating welcoming and accommodating spaces that offer equality in experience for different users, regardless of personal circumstance or identity
- **Flexibility in use:** creating spaces that can offer choice in use and adapt to future changes and requirements and reasonable adjustments based on user needs.
- **Simple and intuitive:** creating spaces that are intuitive to use
- **Appropriate size and space:** providing appropriate size and space for approach, circulation and use
- **Perceptible information:** effectively communicating information to all users, considering the needs of users and the constraints that the environment may place on communication

Universal design should be considered at every stage of the project lifecycle. By considering this earlier in the design phase, expensive late-stage alterations can be avoided, and the cost of management and maintenance can be lowered.

For universal design to be integrated into a creative space, compliance is required with the following codes:

The access provisions of the NCC
The DDA Access To Premises Standard
The local council's DCP relating to Access for People with a Disability
AS 1428 suite of Standards
AS 2890.6 for car parking

It is recommended that universal design considerations extend beyond compliance with codes and should respond to other areas including but not limited to:

- Provision of different sanitary facilities (i.e. accessible, ambulant accessible, gendered and non-gendered facilities)
- Provision of reflection and prayer rooms; these areas should be designed to be calm avoiding bold patterns which can be confusing for some neurodiverse users
- Equitable circulation around spaces by providing circulation paths of at least 1500mm (1800mm preferred) clear of obstructions from furniture or any door swings
- Step free vertical transportation across exhibition spaces
- Inclusive wayfinding consider all users with a particular focus on blind or partially sighted users, those where English may not be a first language, wayfinding should be simple and intuitive allowing all to navigate spaces successfully.
- Egress for all – considerations for an evacuation strategy that allows everyone to evacuate in a safe and equitable manner
- Inclusive presentation of information providing options for visual, audible and tactile means

Sustainability considerations

Every industry is able to influence emissions and its own sustainability performance.

Sustainability and climate change are increasingly front of mind for the general public and inform and impact consumer decisions. Effective sustainability approaches should apply systems thinking by considering the project holistically from its conception (e.g. "do we need to create something new, or will repurposing something we already have suffice?") to its end-of-life.

Sustainability considerations for a small multi-use theatre are arranged within key themes below:

Greenhouse gas emissions
Victoria has a goal of being net zero by 2050. Small multi-use theatres should aim to reduce greenhouse gas emissions to support this goal by:

- Understanding and quantifying Scope 1, 2 and 3 greenhouse gas emissions for the space over its lifetime, including a clear definition of the emissions reporting boundary for the space in line with Climate Active or other credible guidance.
- Developing emissions reductions goals that are in line with or more ambitious than Victoria's emissions reduction targets.

Energy usage
Reducing energy usage and selecting a low emissions source of energy can significantly reduce greenhouse gas emissions. Potential sustainability and energy efficiency actions include:

— Using energy efficient appliances with an Energy Rating label, economy mode
— Obtaining an energy rating for the space or meet energy rating requirements if rating is not available (NABERS Tenancy Energy Rating, Green Star)
— Exceeding National Construction Code Section J Energy Efficiency requirements
— Monitoring energy usage through use of on-site energy metering where possible
— Minimising natural gas usage, replacing gas with electricity for cooking and heating wherever possible
— Ensure energy efficiency through design, including:
  - Use of programmable Building Management Systems
  - Insulation to reduce heating and cooling loads
  - Passive lighting and temperature control
  - Specification of LEDs
  - Specification of solar hot water and electricity panels.

If space is to be leased within a broader commercial building context, ensure landlord has an energy rating for the base building:

— NABERS Base Building or NABERS Whole Building targeting 4.5-stars (without green power) for existing buildings and 5-stars (without green power) for new buildings, and/or
— Green Star Buildings v1 rating (minimum targets for new and existing building may be informed by Property Council of Australia guidance) and/or
— A reasonable equivalent rating

Evaluate the applicability of using data centres, cloud storage and other means as an alternative to in-house comms. or IT rooms. Where these options are deemed feasible, evaluate their operational energy approach using the energy hierarchy below.

Energy source
Strategic energy procurement for the operation of creative spaces should be considered by applying the energy hierarchy outlined below when selecting a provider. Selection of energy source can contribute to ratings such as NABERS and Green Star and should be considered in concert with energy efficiency measures.

Energy hierarchy

HIERARCHY	ENERGY MEASURE
1	**Sustainable energy production** — Renewable energy from sun, wind, waves, tides or rainfall, geothermal — Bio-energy from combustion of biomass — Includes off-site renewable energy generation, Power Purchase Agreements (PPAs) and other renewable energy options from energy suppliers
2	**Low carbon generation** energy sources or generation that makes use of carbon capture and storage to reduce emissions from generation
3	**Offsetting** emissions from energy usage using certified additional emissions offsets

Water management
Reduction of water usage overall and use of non-potable water sources where possible contribute to better sustainability performance and may contribute to sustainability ratings for the space.

Water management in small multi-use theatres should consider:
— Use of efficient fixtures and fittings with a WELS rating
— Monitoring water usage through on-site metering
— Obtaining a water efficiency rating for the space or meet water rating requirements if rating is not available (NABERS Water, Green Star)
— Ensuring water efficiency through design, including use of recycled water, reticulated wastewater, rainwater capture

If space is to be leased within a broader commercial building context, ensure landlord has a water rating for the base building:
— NABERS Office Water 4-star for new buildings, and/or
— A Green Star Buildings v1 rating that includes achievement against Water Use credit, and/or
— A reasonable equivalent rating

Waste management
Waste is a source of greenhouse gas emissions and its disposal can result in costs for small multi-use theatres. Management of waste can reduce both emissions and costs, as well as improve operational efficiency. Waste includes single use items, food waste, waste associated with the fit out of the space and waste associated with the processes undertaken in the space (e.g. in the assembly space, workshops or studios).

Waste management in small multi-use theatres should consider:
— Application of circular economy principles in line with the Victorian DELWP's Recycling Victoria A new economy Plan:
  • Design to last, repair and recycle
  • Use products to create more value
  • Recycle more resources
  • Reduce harm from waste and pollution
— Obtaining a waste rating for the space or meet waste rating requirements if rating is not available (NABERS Waste)
— Setting targets to reduce waste production overall, from both construction and operation of the small multi-use theatre. This can be achieved through achievement of or alignment with Green Star Buildings v1 Operational Waste and Upfront Carbon Emissions credits
— Minimising hazardous waste (i.e. waste that has the potential to harm humans or the environment) in the construction and operation of the space, and provide adequate and safe storage and disposal options for hazardous waste where use of hazardous materials is unavoidable.
— Setting targets to maximise diversion of waste from landfill and aligning with Victoria's target of 80% diversion by 2030.
  Strategies may include the following and should be captured in an Operational Waste Management Plan:
  • Having separate collection for multiple waste streams, including organics waste, and adequate space to accommodate these waste streams
  • Having specific waste recycling or disposal options identified for non-standard materials used in the creation and production of artwork or sets
  • Educate staff on waste sorting
  • Providing signage and nudge mechanisms for staff, visitors and clients to promote waste sorting.
— Implementing a sustainable procurement policy that guides procurement decisions during operation with the aim of reducing waste overall, reducing hazardous waste, increasing reuse and recyclability, and integrating circular economy and whole of life principles into procurement evaluation.

If space is to be leased within a broader building context, ensure landlord has a waste rating for the base building:
— NABERS Waste, and/or
— A Green Star Buildings v1 rating that includes achievement against Operational Waste credit, and/or
— A reasonable equivalent rating

Prop and set resources
Building temporary scenery and providing props and wardrobe can be very resource-intensive and can generate excessive waste and greenhouse gases. A strategic approach to planning shows can result in operational efficiency and a reduction in the emissions and waste associated with each production.

— Set and theatre materials:
— Prioritise modularity and reusability for set construction, including walls, signage, hanging materials, floor coverings and lighting to minimise waste generated and the need for virgin materials. Where possible, share set constructions and materials over multiple shows to maximise reuse.
— Ensure that the theatre's technical grid is adaptable to a diversity of uses.
— Select set and costume materials for durability, reusability and recyclability, and ensure that adequate disposal options are available for materials that cannot be reused. Allow for the achievement of landfill diversion targets outlined above.
— Select materials for reduced environmental impact, aligning with materials selection criteria outlined in Green Star Buildings v1 Exposure to Toxins credit.

Structural design requirements

Key structural design requirements are outlined below:

The Load allowances for the multi-use theatre and adjacent spaces should consider the use of space and comply with AS1170.1:2000.

In the permanent condition, the theatre floor space should be specifically designed for:
— Uniformly designed load (UDL), 5 kPa generally, 7.5kPa in stage area
— Concentrated point load, 3.6 kN generally, 4.5kN in stage area

Additional allowances should also be made for the self-weight of the retractable seating (if applicable), including stacking arrangement and concentrated point loads. These point loads should be limited to the concentrated loads specified above and should be obtained from the proprietary seating specification.

Special consideration for the allowance of concentrated point loads should be made for scenery and production equipment. Some heavy items that are likely to be used in the space might include:
— A fully loaded chair trolley
— A heavy road-case of technical equipment
— A heavy trolley supporting multiple rolls of dance floor/Tarkett
— Heavy scenic elements such as stage decks, flattage, etc.
— Retractable seating (as mentioned above)
— Concentrated loads from temporary platform/stage legs

The theatre should also have the capacity to support concentrated and uniformly distributed loads for temporary equipment (e.g. elevated work platforms (EWPs), to facilitate access to the overhead structure for operation and maintenance as well as installation of heavy scenery. The loading capacity of the travel paths for the temporary equipment should also be considered in the design and floors should be designed to facilitate these temporary loads. The equipment and the procedure implemented for overhead operation should also be carefully selected to ensure the floor is not damaged.

Overhead rigging suggested allowances
The theatre should be fitted with overhead rigging infrastructure to support the installation of production equipment or scenery. Overhead rigging infrastructure may also be used for hanging temporary AV and presentation equipment (projection screens, loudspeakers, theatrical lighting, curtains, etc.) Overhead infrastructure may take the form of rigging points or a pipe grid. Catwalks may also be required over the theatre at high-level for circulation and access. Sides of catwalks facing the stage area require pipes which lighting fixtures may be mounted to. Loads should be considered in balustrade design loading.

Suggested allowances:
Rigging points
— Nominal 3m - 6m centres with a 5kN load capacity per point.
— A defined limit to the number of rigging points that are coincidently loaded should be discussed and agreed with the end user to avoid excessive loading requirements for the overhead structure.
— Rigging to structure is only to occur at agreed rigging point locations.

Pipe grid
— Typically, 2kN point load at 2m grid, or 0.5 kPa UDL

Catwalks
— 2 .8 kPa LL allowance for people + additional 1kN/m for theatre equipment.

Overhead rigging infrastructure should be supported from the floor or roof structure above the rehearsal room. This floor/roof should be designed considering the hanging loads from the rigging equipment, including any dynamic load factors associated with the equipment loads which are provided by the product manufacturer. Any items supported from the rigging system that are sensitive to vibration (e.g. lighting, sound) or have specific performance requirements, should be specified for consideration in the design of overhead rigging support structure.

The overhead rigging is frequently supported using chain hoists, clamps and other rigging hardware (as described in technical systems requirements). Exposed steel members (such as universal beams) are an effective support for rigging points. The possibilities for clamping to beams may be limited if fire treatment is required on the beam. These steel members can be secondary members attached to the primary structure, or direct attachment to the primary structure may be appropriate.

DEPARTURE GUIDANCE
A building that does not have adequate floor or ceiling/roof loading capacity could significantly impact the functionality of spaces; ceiling/roof loading should allow for the rigging equipment and/or connections for aerial performances; floors should allow loads such as large set constructions; floor should also allow for the concentrated loads of elevated work platforms to allow access to rigging points.

Vibration performance criteria:
The impact of rhythmic activities such as dancing, both on stage and in the audience, whether seated or standing, should be considered in the design of the theatre and adjacent spaces. Large repeating loads due to dancing or other types of high energy movement are applied to the structure which can generate structural vibration that may cause complaints or concern to the occupants. Due to the architectural constraints of the space, namely the column free structural arrangement, suspended floors can have relatively low frequencies. This means that people can move (dance, stomp, jump etc) at the same frequency as the structure, causing large movements. There may be areas in the structure where the theatre is adjacent to or supports spaces with more sensitive usages increasing the potential to transfer structural vibrations between floors and spaces. Careful consideration into whether vibrations within the theatre and transferred vibrations into other spaces through the building will cause concern to occupants. Expected vibrations levels can be predicted using published loading and acceptability criteria from international codes and standards, including AISC Design Guide 11 and ISructE.

Lighting design requirements

Key lighting design requirements are outlined below:

Numerous lighting systems will be required within the theatre, including:

- General work light
- House lights
- Aisle lights, step lights, and row identifiers
- Backstage blue lighting system
- Emergency lighting
- Production lighting systems (separate/ standalone from the architectural lighting systems)

Lighting design considerations

— All work lighting, house lighting and blue lighting to be efficient LED DALI dimmable.
— The colour temperature of the work lighting and house lighting fixtures should be 4000K or 3000K and consistent throughout.
— The Colour Rendering Index (CRI) of the work lighting and house lighting luminaires should be 90 or higher.
— House and aisle light systems should be flexible, to ensure that required coverage can be met when the theatre is operated in a non-standard configuration.
— If a projection box is included in the theatre, care is needed to limit spill light to/from the projection box.
— Aisle lighting should be at each step and produce a contrast between step and riser. Aisle lights, step lights and row identifiers should be concealed from the stage and audience so not to produce glare. The aisle lights should illuminate steps in a way that does not distract in a darkened room.
— Backstage blue lighting should be provided in the wings/ backstage areas. A monochromatic blue hue should be used to provide light during a performance while minimisng the likelihood of being seen by the audience.

Lighting control

— Architectural lighting systems such as house lights will need to interface with the Production lighting control system. Local overrides and interconnections will be required such that a lighting technician can take control of the house lights during performance mode. Panic buttons, etc. should need to be provided for in case of emergency.
— Lighting control panels should be provided BOH, at theatre entry and at the theatre control box, with care taken to minimise spill light from the lighting control panel.

Lighting design compliance

— The theatre work lights should have good general lighting throughout. The average horizontal illuminance level should meet 320 lux average. This is indicated in AS1680.2.4 (Industrial tasks and processes), Table E1 – moderate visual tasks. The uniformity of the space should meet 0.3 as a minimum.
— The theatre house lighting should provide good general lighting throughout auditorium. The average horizontal illuminance level should meet 240 lux average with ability to dim. This is indicated in AS1680.2.3 (Specific applications – education and training facilities), Table D1.

Emergency lighting and exit signs

— AS2293 and NCC Section E4 compliance emergency lighting and exit signs should be provided throughout as required.
— Consideration should be given to incorporate integrated emergency lighting into the general lighting within the space.
— Exit signs should have capability of operating with minimum brightness allowable to eliminate glare and light spill during a black out.

Electrical design requirements

Key electrical design requirements are outlined below:

Electrical requirements

— Incoming power supply to the small multi use theatre space and the power supply authority power metering requirements to be developed based on the incoming power supply to the building and as per local power supply authority requirements.
— A dedicated distribution board must be provided for the theatre with separately metered power and lighting as required by NCC, for ESD purposes and for subleasing (if required)
— A separate clean earth distribution board complete with a technical earth connection directly from the building main earth bar to be provided within the theatre to connect all specialist audio and video equipment and outlets.
— General power outlets to be provided for the user ports and cleaners' outlets as required.
— Separately metered power supply to be provided for the bar space as required.
— Power provisions to be provided for foyer, AV racks, toilets and loading docks as required.
— Power provisions to be provided for all mechanical and hydraulic services equipment and to be coordinated with mechanical and hydraulic services installations.
— Cable reticulation to be coordinated with acoustic requirements of the floor/wall build up. To maintain the required acoustic performance based on the installation requirements, rigid conduits or flexible conduits or steel conduits to be used.

The theatre will require:

Minimum 200A per phase for stage lighting dimmers
Minimum 100A per phase at stage level
7 of 40A 415V 3PN+E Wilco outlets located at the nominated lighting patch bay location
1 of 40A 415V 3PN+E Wilco outlet in the BOH area adjacent to the stage
10A DGPO's distributed along the perimeter of the venue, and any mezzanine
Technical earth/clean power system for typical audio circuits
Separate distribution board for the Bar. (min.100A 415V supply)
BOH will require:
Power provisions for office space for two people
Power provisions for the small backstage kitchenette
Power provisions for laundry area

DEPARTURE GUIDANCE

As well as ensuring adequate electrical supplies, the distribution of power supplies is critical to success for a theatre space. Electrical supplies should be 'clean' and free from noise generated by inductive loads; design of earthing systems should avoid potential for 'earth loops' which can cause hum in sensitive equipment; power should be distributed liberally with outlets mounted to every wall and associated with all potential equipment locations.

Communications requirements

Incoming communication services requirements to be developed based on the building/space requirements. Minimum 10pair Cat 5 cabling connection to be installed from the building distributor to the floor distributor together with minimum 6 core single mode fibre optic connection.

The theatre will require:

A dedicated AV rack and switch
Data outlets distributed throughout the venue
A production lighting patch system between the pipe grid overhead and a nominated patch bay location
Specialty technical system interconnections between typical control location and stage/back-stage
Building wide comms, paging and relay systems
Internet connection to the AV rack/ switch
WI-FI network connection provisions

Back stage will require:

Data provisions for office space for 2 people
Wi-Fi network connection provisions

Electrical design standards and System Criteria

SYSTEM	STANDARDS	CRITERIA
Supply conditions	Supply Authority service rules	— 400V 3-Phase nominal — 50Hz
Main switchboard	AS/NZS 61439 AS/NZS 3000	— 25% spare space or one spare space (whichever is greatest) for each frame size excluding main switch(es) — Main busbars 125% initial load
Distribution boards	AS/NZS 61439 AS/NZS 3000	— Form 2 unless stated otherwise — 30% spare space or minimum 18 poles (whichever is greatest) for each frame size excluding local main control) — Local main control required — Fault interrupt capacity of circuit breakers minimum 6kA — Provide fault current limiters or use higher fault interrupt capacity circuit breakers as required — Internal DBs: IP52 min. — External DBs: IP56 min.
Consumers mains	AS/NZS 3000 AS/NZS 3008.1	— Voltage drop: max. 2%. — Max. demand: + 25% capacity (current carrying and voltage drop) — Fire rate where required to AS3000 — At least 100% neutral; provide oversize neutral where harmonic currents are expected to be high
Submains	AS/NZS 3000 AS/NZS 3008.1	— Voltage drop: 1% — Max. demand: + 20% (current carrying and voltage drop) — Fire rate where required for Fire and Life Safety Services — At least 100% neutral; provide oversize neutral where harmonic currents are expected to be high
Final subcircuits	AS/NZS 3000 AS/NZS 3008.1	— Voltage drop: max. 2% — Power 2.5mm² minimum — Lighting 2.5mm² minimum — Max. 80% utilisation to AS 3000
Lighting	AS/NZS 1680	— Use long life, energy saving lamps such as LEDs; use tungsten and tungsten halogen only to approval — Allow overall depreciation factor of 0.8 for clean, air conditioned areas, 0.7 for clean, non-air conditioned areas and 0.6 for dirty areas
Communications	AS/NZS 11801	— Provide Cat 6 UTP cabling — Contain Cat 6 cable route length to <90m — Cross power cables only at 90° — The maximum fill of a cable tray should not exceed 50%
Electrical metering and EMS system	NCC Section J6 Supply authority standards	— Meters and CTs should comply with NCC and supply authority standards

Acoustic design requirements

The acoustic outcomes will be influenced by the site location, internal design, and interface with surrounding development. The key design considerations and requirements are outlined below:

Acoustic design considerations
The acoustic outcomes will be influenced by the site location, internal design, and interface with surrounding development. The key design factors include:

— Environmental noise and vibration emission
— Internal design noise and vibration levels
— Low background noise levels, related to environmental noise and vibration intrusion and building services noise and vibration control
— Internal acoustic separation, including spatial planning and physical isolation, and
— Room acoustics.

DEPARTURE GUIDANCE
The criticality of good acoustic design needs to be emphasised as vital to the success of a theatre space. Building envelope design should avoid noise ingress from external noise and vibration sources; internal partitions often require heavy-weight/high performance construction so that performance sounds from the theatre space cannot be heard through foyer or BOH doors; internal finishes (both absorptive and diffusing) need to result in 'flat' room response to aid critical listening.

Design criteria and management requirements

SYSTEM	CRITERIA AND REQUIREMENTS
Environmental noise and vibration emission	— Minimum requirements will be according to council consent requirements and will be dependent on surrounding or adjoining development. — The design must be based on the full operating hours of the space and maximum noise and vibration levels potentially generated by the use. — The acoustic design requirements will be heavily influenced by the proximity and sensitivity of nearby or adjoining receivers. Site location will be critical to minimising design requirements and maximising operational flexibility.
Internal background noise and vibration levels	— Criteria relate to the noise and vibration in the space excluding occupant activity. — Internal background noise levels, from both environmental noise intrusion and internal plant and equipment should not exceed: — Performance space: NR 25. — Other areas: Not to exceed the lower bound design sound level range in AS/NZS 2107:2016 by more than 5 dB. — Internal background vibration not to exceed the maximum levels in British Standard BS 6472:2008
Internal acoustic separation, including spatial planning and physical isolation	— Acoustic separation will be required between performance space and adjoining ancillary spaces, such as back-of-house and foyer. The primary objective of internal partitions is to minimise disruption of external activities on performance. — Sound locks at entries to performance space are recommended.
Room acoustics	— Design recommendations based on use for dance, drama, and amplified/world music: — Reverberation time not to exceed Curve 1 in Appendix A of AS/NZS2107:2016. Reverberation time at 125 Hz not to exceed mid-frequency RT by more than 0.2 seconds. — Vocal intelligibility: minimum D50 of 0.5. — Loudness G = 0 to 10. — Room volume 4-5 m3 per person. — Background noise not to exceed NR 25. — Note that a higher RT would be required for non-amplified along with variable acoustic treatment. Target criteria would be dependent on desired musical style and therefore expert advice is recommended for such usage.

Fire safety design requirements

The design of a theatre can often benefit from a performance based fire safety strategy, carried out by a Fire Safety Engineer. Designing in accordance with the prescriptive NCC requirements, whilst possible, may prove restrictive to the space. A performance based design, considering the fire safety strategy as a whole, can often lead to a more usable (less restrictive) outcome that considers the operational needs of a theatre.

— Fire exits and egress routes are to be sized and located in accordance with the prescriptive requirements of the NCC or be considered as part of a fire safety strategy by a fire safety engineer. Where temporary equipment or props are expected, management provisions are to be implemented to prevent blocking of the exits and egress routes.
— The theatre compartmentation strategy is to meet the prescriptive requirements of the NCC or be considered as part of a fire safety strategy by a fire safety engineer. Latching requirements for fire rated doors may create unwanted noise during performances and is to be considered by the design team where proposed within close proximity to a performance space. If a sound lock/lobby is not provided and auditorium doors are required to achieve both acoustic and fire rating performance this should be identified early, as such doors typically have longer lead times for procurement than standard fire doors.
— The stage and seating arrangement is to be identified in the early stages of design. This applies to both permanent and temporary arrangements. The layout or parameters of temporary staging or seating layouts will need to form part of the approvals documentation to ensure that NCC requirements are maintained during temporary event layouts.
— Fire safety systems are to be provided in accordance with the requirements of the NCC or considered as part of a fire safety strategy by a fire safety engineer. The design of fire safety systems is to consider the presence of any temporary staging, seating, or possible stage props in relation to fire systems coverage. If retractable seating is proposed, it is to be confirmed in the early stages of design if compliant sprinkler coverage can be achieved. If full coverage cannot be achieved, a performance solution will be required to meet the performance requirements of the NCC.
— Audibility of the occupant warning system is to be considered. Competing sound systems are to shut down in accordance with AS1670.1-2018 clause 3.22.3. The placement of occupant warning speakers is to consider any sound-proofing measures within the facility. Visual warning devices are to be located in areas where portable sound systems may be used.
— Linings are required to meet the fire hazard property requirements outlined in C1.10 of the NCC. This requirement is to be considered in conjunction with any acoustic or sound proofing linings.
— Where the use of theatrical smoke is to be allowed for, the possibility of false alarms due to a smoke detection system is to be considered. Isolation of a smoke detection system is non-compliant in NSW (as clarified by NSW Department of Planning) and would need to be supported via a performance solution which outlines an alternative strategy for detection of a fire and meets the Performance Requirements of the NCC. In Victoria, it is to be confirmed by the project building surveyor as to whether a non-compliance exists, but is to be a consideration of the design regardless. The impact of isolation the detection system would need to consider occupant evacuation and initiation of active fire safety systems such as smoke exhaust that are required to be operated by smoke detection.
— If a smoke exhaust system is required, smoke is to be exhausted at high level and make-up air introduced at low level. It is recommended that a smoke exhaust system is designed on a performance basis with consideration to the wider fire safety strategy and theatre operational needs (e.g. consideration of any sprinkler shortfalls, proposed detection isolations, compartmentation strategy).

Hydraulic design requirements

Key hydraulic services provisions should be considered as part of the design are outlined below.

— Domestic water and sanitary drainage are to be provided to any kitchens, toilets and cleaners sinks which are part of the space.
— Where the space forms part of a building, domestic water services should be metered separately from the base building supply to allow landlord billing of water use.
— Mechanical condensate should drain to the sanitary system via a trapped tundish.
— Domestic hot water should be generated local to the space and consider the frequency of use. Where spaces are used infrequently, instantaneous electric hot water generation is preferred to avoid energy associated with heat losses. Where the space is used daily, electric storage may be more appropriate.
— Hydraulic services should not be located in the theatre space to avoid risk of damage to equipment from water leaks and the associated acoustic nuisance from live services. Where this is not possible, they should be acoustically treated and located in a way to avoid impact on the theatre space during routine maintenance or repair.

Hydraulic design criteria
The hydraulic services design is to be based on the following design criteria.

SYSTEM	STANDARDS	DESIGN CRITERIA
Domestic hot and cold water	BCA 2019 Amdt. 1 AS/NZS 3500.1 – 2018 AS/NZS 3500.4 - 2018	— Cold water average supply temp: 14°C — Hot water storage: 60°C to 65°C. — Hot water distribution: 55°C to 60°C — Amenities (visitor and non visitor): 43°C — Utility rooms (kitchens, cleaners sinks): 50 to 55°C — Max. velocity: 2.4m/s externally and in ground — Max. velocity: 1.5m/s in risers, BOH spaces — Max. velocity: 0.8m/s in acoustically sensitive spaces — Min. operating pressure: 200kPa — Max. operating pressure: 500kPa
Sanitary plumbing and drainage	BCA 2019 Amdt. 1 AS/NZS 3500.2 – 2018 Sydney Water Trade Waste Guidelines	— Min. grade: 2.5% for 40-65mm, 1.65% for 80-100mm and 1% for 150mm pipelines — Sanitary stacks design capacity: 22% to 33% full — Drainage design capacity: max. 70% full — Velocity: 0.75m/s to 1.2m/s
Building rainwater drainage	BCA 2019 Amdt. 1 AS/NZS 3500.3 – 2018 Australian Rainfall and Runoff Guidelines City of Sydney requirements	— Min. grade: 2.5% for 40-65mm, 1.65% for 80-100mm and 1% for 150mm pipelines — Sanitary stacks design capacity: 22% to 33% full — Drainage design capacity: max. 70% full — Velocity: 0.75m/s to 1.2m/s — Siphonic drainage velocities TBC by hydraulic calculation; insulation where required to limit noise in noise sensitive areas

Mechanical design requirements

Key mechanical design considerations and requirements are outlined below.

General mechanical requirements

— Separate mechanical systems should be provided to serve the theatre, backstage area, tech crew control area (if required), dressing rooms, green room and office areas. Each system should be activated as required to avoid unnecessary energy usage. Operation of these systems should be either programmed (for the larger spaces) or based on occupancy sensing (for small offices, dressing rooms etc.).
— For mechanical sizing, internal gains within the dressing rooms, green room and theatre space should be based on increased metabolic rates to reflect high activity level from performance.
— Relevant ASHRAE and CIBSE external design criteria should be used. Consideration should be given to future climate change and resultant elevated ambient design temperatures.
— Increased outside air (50% above code minimum is recommended) in normal operation
— CO_2 sensors should increase the outside air proportion to the space in response to high CO_2 levels. Mechanical equipment should be sized to maintain internal temperatures and deliver increased outside air at high ambient temperatures.
— Wall-mounted temperature and CO_2 sensors should be installed at 1500mm AFFL inside the space and in areas that will be representative of the conditions inside the space.
— Mechanical system should be variable volume and respond to temperature and CO_2 levels within the space.
— If system supplies >1000 l/s, economy mode should be provided in line with NCC 2019 Section J requirements. Economy mode should be offered with smaller units to achieve energy reductions.
— For spaces with a floor-to-ceiling height of 4-6m, minimum air change rate of 6 air changes per hour should be achieved.
— For spaces with >6m floor-to-ceiling height, minimum air change rate of 8 air changes per hour should be achieved.
— When determining airflow and mechanical equipment sizing, consideration should be given to up-lighting vs. downlighting so that the mechanical system is not oversized (a proportion of high-level lighting and equipment load will not land in the space so does not require direct air conditioning).

DEPARTURE GUIDANCE

Early and ongoing engagement with operators and user groups or a consultant with relevant experience to advise on their behalf is required in the development of technical systems. A lack of provision may deem the space not fit-for-purpose. Theatre spaces can produce significant changes in thermal load once performers begin their performances which often involve physical movements. Mechanical systems can include mix-mode systems but need to take into account ranges of comfort for the performers, audience and staff as well as accommodate rapid changes in thermal load.

Theatre

The mechanical systems should ensure a comfortable environment for the production team to work, and for audiences who attend.

Heat loads in theatres can be quite dynamic (e.g. significant technical systems that generate a lot of heat operating intensely for the duration of a show, post-interval performance commencement) and mechanical systems should be designed to respond to this.

— The mechanical systems serving the theatre should maintain an environment within the following specified values during times of use:
  - Temperature: 20°C to 23°C, with ability to widen temperature criteria depending on space use to save energy
  - Humidity: 40% to 60% (note: this will not be directly controlled but will naturally fall into this range as a result of the air conditioning)
— Mechanical system should be designed to meet acoustic requirements of the space. Coordinate mechanical systems with acoustic consultant to meet specific noise criteria for the theatre.
— All ductwork should be above rigging zone OR can be wall mounted as long as it is not covered by drapes, does not clash with other services/uses and airflow can be delivered to performers on stage and occupants seated in theatre.
— Ensure access to ductwork is maintainable taking into account lighting and equipment rigging within the space.
— Consideration should be given to performance of diffusers in heating mode, especially for spaces with high floor-to-ceilings (more than 3.2m).
— If extensive lighting and equipment is used, make allowance for mechanical system to offset expected maximum lighting and equipment loads.
—
— Make provision for a purge mode for return air to bypass AHU and discharge directly to atmosphere (in the event of use of smoke machines or similar).
— Air supply should be 'low velocity' to reduce noise, avoid drafts and avoid moving drapes/curtains.
— Diffusers should be high induction to reduce drafts in space.
— Tech crew control area should be provided with outside air 50% above AS1668.2 code requirements and, if within an enclosed room, a dedicated air conditioning unit.

Other areas

— Ventilation of toilets and change rooms should be in line with AS1668.2 requirements (change rooms may be conditioned by a small FCU/PAC if desired to provide additional comfort for occupants). It is recommended extract ventilation is 200% of code minimum to ensure odours are effectively removed from the space.
— Bar area and any kitchenette should have dedicated exhaust and be appropriately sized to capture fumes from small-scale food reheat, dishwasher, microwave and other heat-emitting appliances. Provide sufficient ventilation based on size and usage of the bar/kitchenette.
— Cleaners store (if required) should be exhausted directly to outside in line with AS1668.2 requirements.

Fire engineering/ smoke control

— If smoke exhaust is required, all components should be compliant with AS1668.1 requirements and Spec E2.2b of the NCC, except where deviated by a Performance Base Fire Engineering strategy developed by a Fire Safety Engineer.

Design criteria

EXTERNAL DESIGN CRITERIA	ASHRAE OR CIBSE CURRENT GUIDANCE
General Ventilation	AS 1668.2:2012
Smoke Control Ventilation	AS 1668.1:2015
Battery Ventilation	AS 2676.1:2020
Refrigerant	AS 5149:2016

In addition, the design should be compliant with the following codes and standards:

— 2019 National Construction Code/ Building Code of Australia (BCA),
— Building Permit conditions
— AS1668.1 (2015) – Fire and Smoke Control in Multi-Compartment Buildings (Amendment 1),
— AS1668.2 (2012) – Mechanical Ventilation in Buildings (Amendment 1 and 2)
— AS1668.4 (2012) – Natural Ventilation of Buildings
— AS 1940 (2004) – The Storage and Handling of Combustible Liquids
— AS/NZS 2107 (2000) – Recommended Design Sound Levels and Reverberation Times for Building Interiors
— AS 3000 – Electrical Installations
— AS 3500 – National Plumbing and Drainage Code
— AS 3666 (2011) – Air-handling and Water Systems of Buildings – Microbial Control
— AS 4254.1 (2012) – Ductwork for Air-Handling Systems in Buildings – Flexible Duct
— AS 4254.1 (2012) – Ductwork for Air-Handling Systems in Buildings – Rigid Duct
— AS/NZS 5601.1 (2013) – Gas Installations – General Installations
— All other applicable Australian Standards
— WorkCover requirements
— OH&S Regulations
— Safe Work Australia

— Electricity Supply Authority requirements
— Fire brigade requirements
— Australian Gas Authority requirements
— All local council regulations,
— Fire engineering report

Pipework velocity and pressure drop
The following values should not be exceeded:
— Pipework pressure drop: 300 Pa/m,
— Pipework velocity:

DIAMETER (MM)	VELOCITY (M/S)
25	1
50	1.1
100	1.25
150	1.5
200	2
250	2.2
300	2.5

Ductwork velocity and pressure drop
The following values should not be exceeded:
— Ductwork velocity: Variable Volume Systems (final velocity to be agreed with acoustic consultant depending on acoustic requirements of the space)
  - Risers and plant rooms: 7.0 m/s
  - In ceiling secondary ductwork: 5.0 m/s
  - In ceiling tertiary ductwork: 3.5 m/s
  - Flexible ductwork: 2.5 m/s
  - General duct discharges: 6.0 m/s
  - Louvres: 2.5 m/s face velocity

— Ductwork pressure drop
  - General ductwork: 0.8 Pa/m
  - Transfer ducts: 12 Pa
  - Riser take-offs: Kt £ 0.89
  - Bends: Kt £ 0.25
  - Rectangular contractions: Kt £ 0.19

Where the total pressure loss through the fitting is defined as Pt = Kt × Pv
— Pt = Total pressure loss through fitting (Pa)
— Kt = Loss coefficient
— Pv = Velocity pressure (Pa)

Mechanical equipment and accessories pressure drops
The following values should not be exceeded:
— Sound attenuators: 50 Pa
— Louvres: 20 Pa
— Cooling coils (airside): 150 Pa
— Cooling coils (waterside): 35 kPa

Glossary

Access To Premises Standard
The Disability (Access to Premises – Buildings) Standards 2010 (Premises Standards) is legislation under the Disability Discrimination Act 1992. The purpose of the Disability Standards for Access to Premises is to make sure: people with disability and their family members, carers and friends, have equal access to public buildings; and building certifiers, developers and managers fulfil their responsibilities to people with disability under the Disability Discrimination Act 1992.

AFFL
Above Finish Floor Level

AISC
American Institute of Steel Construction

Amdt
Amendment

amp
Ampere

AS
Australian Standards are published documents setting out specifications and procedures designed to ensure products, services and systems are safe, reliable and consistently perform the way they are intended to. They establish a minimum set of requirements which define quality and safety criteria. Standards Australia develops internationally aligned Australian Standards.

AS/NZS
Australian/New Zealand Standards. Joint standards developed by Standards Australia and Standards New Zealand

ASHRAE
American Society of Heating, Refrigerating and Air-Conditioning Engineers

AV
Audio Visual

back of house (BOH)
A term used to refer to the support spaces for the stage, most often immediately adjacent to the stage. This includes dressing rooms, storage rooms, loading dock. This term can also be used to refer to the rear of the auditorium.

BCA
Prior to the creation of the NCC, building was regulated by the Building Code of Australia (BCA), and had been since 1992. The BCA was the first collection of nationally-consistent building regulations. The BCA was superseded by NCC.

catwalk
A steel structure over the stage, audience area, or both, used by stage personnel to cross from one side of the house to the other, often used to support lighting instruments.

CISBE
Chartered Institution of Building Services Engineers

CNC
Computer Numerical Control router

control room
The dedicated zone or room from which the lighting, sound and AV equipment is operated during a performance.

CT
Current Transformer

DB
Distribution Board

dB(A)
The unit generally used for measuring environmental, traffic or industrial noise is the A-weighted sound pressure level in decibels, denoted dB(A). The weighting is based on the frequency response of the human ear and has been found to correlate well with human subjective reactions to various sounds. It is worth noting that an increase or decrease of approximately 10 dB corresponds to a subjective doubling or halving of the loudness of a noise, and a change of 2 to 3 dB is subjectively barely perceptible.

DCP
Development Control Plans. DCPs provide detailed planning and design guidelines to support the planning controls in the Local Environmental Plan.

DDA
Disability Discrimination Act

decibel
Measure of loudness of sound (pressure) level. For convenience, this is calculated on a logarithmic measurement scale.

DGPO
Double General Power Outlets

DMX
Digital Multiplex, a standard for digital communication networks that are commonly used to control stage lighting and effects

DSP
Digital Signal Processor

DX
Direct Expansion
EP&A Regulations
Environmental Planning and Assessment Regulation. The EP&A Regulation contains key operational provisions of any local or state planning system.

ESD
Environmentally Sustainable Design

FCU/PAC
Fan Coil Unit/Packaged Air Conditioning Unit

fire curtain
A non-flammable, vertical travel curtain immediately behind the proscenium, contained in the smoke pocket, used to protect the audience from possible smoke and fire originating from the stage. It is typically rated for 30 minutes of protection.

frequency
The subjective equivalent of frequency in music is pitch. Higher frequency sounds have a higher pitch. The unit of frequency is the Hertz (Hz). Human hearing ranges approximately from 20 Hz to 20 kHz. For design purposes, the octave bands between 63 Hz to 8 kHz are generally used.

front of house (FOH)
A term typically used to collectively refer to the support areas immediately adjacent to the auditorium. This includes the lobbies, restrooms, cloak check, gift shop and box office.

GPO
General Power Outlets

Green Star
A Green Star rating provides independent verification that a building or community project is sustainable. Undertaking voluntary Green Star certification demonstrates leadership, innovation, environmental stewardship and social responsibility.

Hz
Hertz

IP
Ingress Protection rating

ISructE
Institution of Structural Engineers

l/s
Litres per Second

LED
Light Emitting Diode

loudness
Loudness provides for an exciting and dramatic aural experience and allows the musical director maximum dynamic range. The loudness of sound varies throughout an auditorium, and is equated to the distance from the stage to a listener.

m
Metres

m/s
Metres per Second

NABERS
National Australian Built Environment Rating System (NABERS). NABERS is a simple, reliable sustainability rating for the built environment. This helps building owners to understand their building's performance versus other similar buildings, providing a benchmark for progress.

National Construction Code (NCC)
The National Construction Code is Australia's primary set of technical design and construction provisions for buildings. As a performance-based code, it sets the minimum required level for the safety, health, amenity, accessibility and sustainability of certain buildings. The Australian Building Codes Board, on behalf of the Australian Government and each State and Territory government, produces and maintains the National Construction Code.

Noise Criteria (NC)
The Noise Criteria (NC) curves are commonly used to define building services noise limits. The NC value of a noise is obtained by plotting the octave band spectrum on the set of standard curves. The highest value curve which is reached by the spectrum is the NC value. Shown below is a plant noise spectrum that is equivalent to NC 40.

OH&S regulations
The Occupational Health and Safety (OH&S) Regulations build on the OHS Act. They set out how to fulfil duties and obligations, and particular processes that support the Occupational Health and Safety Act.

Preferred Noise Criteria (PNC)
A set of curves, similar in principle to NC curves, but considered to correlate better to subjective acceptability in very low noise areas such as music auditoria.

reverberation
The principal, subjective acoustic quality perceived by the majority of listeners in an auditorium is reverberation. This is most commonly experienced at the end of stop chords as the sustained sound that rings in the space. Reverberance assists the sustain of musical instruments and the blending of the orchestra sections. It also contributes to the feeling of envelopment, i.e. that the sound comes from all around you.

RMS Compressor
Root Mean Squared compressor

sqm
Square metre

typical noise levels
Some typical noise levels are given below:

NOISE LEVEL DB(A)	EXAMPLE
130	Threshold of pain
120	Jet aircraft take-off at 100m
110	Chain saw at 1m
100	Inside disco
90	Heavy trucks at 5m
80	Sidewalk of busy street
70	Loud radio (in typical domestic room)
60	Office or restaurant
50	Domestic fan heater at 1m
40	Living room
30	Movie Theatre
20	Remote countryside on still night
10	Sound insulated test chamber
0	Threshold of hearing

UDL
Uniformly Designed Load, a force that is applied evenly over the distance of a support

UTP
Unshielded Twisted Pair Cabling

WELS
Water Efficiency Labelling and Standards (WELS). WELS is Australia's water efficiency labelling scheme that requires certain products to be registered and labelled with their water efficiency.

wings
Areas on stage left and right of the proscenium opening edge not in direct view of the audience. The wings are used as a space for actors or scenery waiting to go on stage.

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