

# Creative Spaces Design Guide

PART 3B  
TECHNICAL  
APPENDIX:  
**DIGITAL GAMES  
STUDIO**



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<sup>1</sup>, 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<sup>2</sup>, 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<sup>3</sup>** – 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](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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Creative Spaces Design Guide  
PART 3B: TECHNICAL APPENDIX  
DIGITAL GAMES STUDIO

# 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 digital games studio:**

- Programmatic – key spaces and spatial relationships
- Spatial – key dimensions and spatial relationships
- Technical Systems – specialised equipment suited 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.

Project  
visioning

Conceptual  
design

Detailed  
design

Construction

Operations

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 maintenance 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 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 descopeing 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 descopeing against specific requirements. Please note that descopeing 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.



# Digital games studio

Digital games studios are used by professional companies and digital media artists for the creation and development of digital video games. This may include virtual and/or augmented reality technology.

## Usage profile

A digital games studio has a range of usage profiles:

- Occupation by a single user-group for an extended period of time, such as a tenancy
- Occupation by multiple user-groups or individuals in a shared lease agreement

Digital games studios are used across all hours of the day, so 24/7 access is required.



## References:

Riot Games' PC Cafe © Riot Games

Lobby at Riot Games' West Los Angeles headquarters © Riot Games



# Programmatic requirements

A digital games studio should provide users with a clean, private and comfortable office space fitted with the appropriate infrastructure for the production of digital games. The studio should provide essential ancillary spaces, such as collaboration and breakout spaces, review pods, storage areas and general amenities.

Digital games studios should be designed to be industry leading in sustainable design, energy efficient operation, and provision of equality of access beyond the code requirements of AS 1428.2.

A digital games studio should include the following areas:

---

**Diverse range of working spaces**, including an open plan office space and private office rooms

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**Review pods** for game testing

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**Diverse range of meeting rooms**, including large board room and smaller rooms for private discussions

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**Collaboration space** for informal discussions, testing VR technology and other group idea generation activities

---

**IT and comms. room** for servers

---

Office amenity spaces including **print room, mail room, wellness room, kitchen, and breakout areas**

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**End of trip facilities**, including secure bicycle parking, toilets, showers, changing rooms and lockers

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**Storage areas** connected to the open plan working area

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**Loading area** for incoming furniture or technical equipment

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**Step-free circulation and obstruction free access**, sized at minimum for an elevated work platform from the building exterior

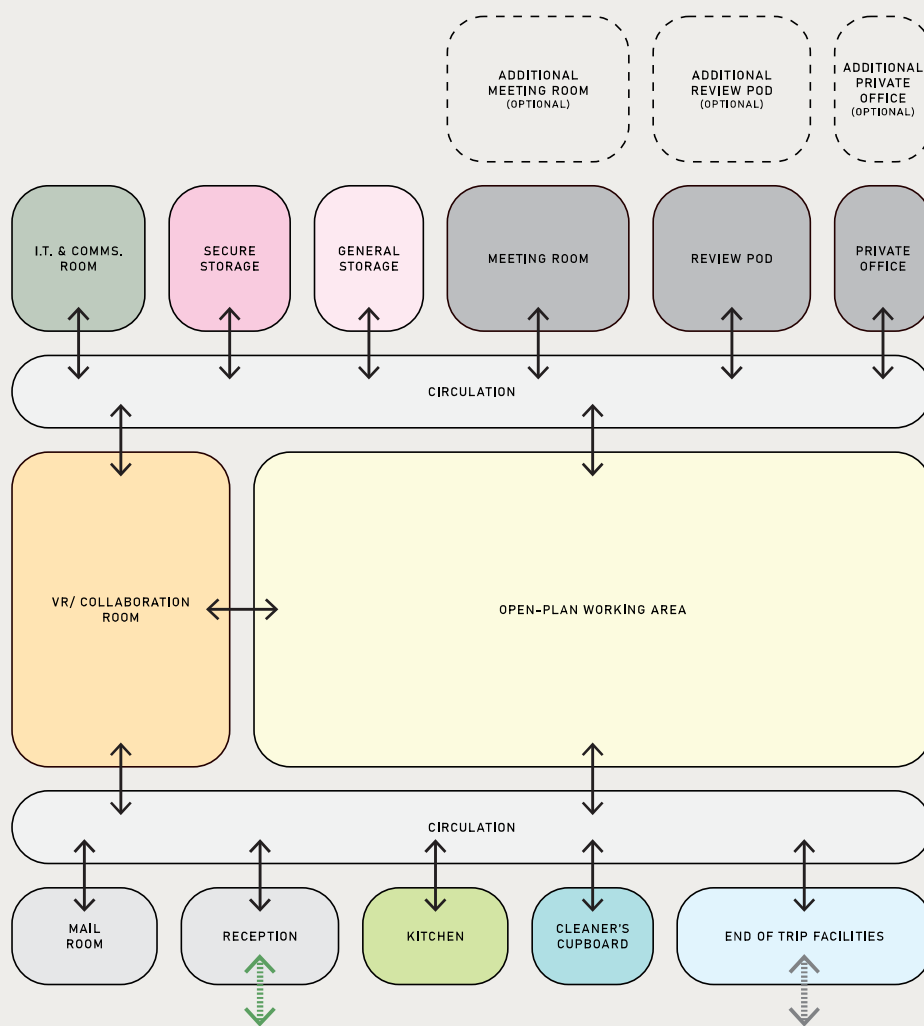
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**Inclusive and legible wayfinding signage**, including text, pictogram, visual, tactile and audible options

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Digital games studio –  
Spatial adjacency diagram





# Spatial requirements

A digital games studio should support the day-to-day operation of a small digital games company or a number of single artists who share the space. It should be designed to inspire creativity and idea generation.

These digital games studio spaces should be aesthetically designed to have a unique charm and character that appeals to the creative community. Where possible, internal layout, finishes and decor can be designed in close collaboration with local artists.

A digital games studio should have secure, straightforward and controllable access for user groups, such as an electronic keypad entry, or similar, through the reception. All spaces in the digital games studio must be designed to be inclusive and allow opportunity to participate for all, regardless of personal identity or circumstances.

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:

Open plan creative office space: **10 sqm per person**

Private office, review pods and meeting rooms:

- Small: **9 sqm**
- Medium: **18 sqm**
- Large: **30 sqm**

Collaboration/VR room: **50 sqm**

IT and Comms. room: **10 sqm** for two comms. racks

Print room: **6 sqm**

Wellness room: **6 sqm**

End of trip facilities: **as per NCC**

Kitchen and breakout areas: **15 sqm**

Secure locker storage: provide at a ratio of **1.4 per workspace**

General storage: **15 sqm**

Cleaner's cupboard: **2 sqm**

Ceilings for office areas, review pods, collaboration space, meeting room: **2.7m clear height**

Ceilings for amenities: **2.4m clear height**

All area requirements listed above denote minimum Net Internal Area.

## Open plan working area and focus zones

The open plan working area in a digital games studio should consider multiple users. This open plan working area should be supported by:

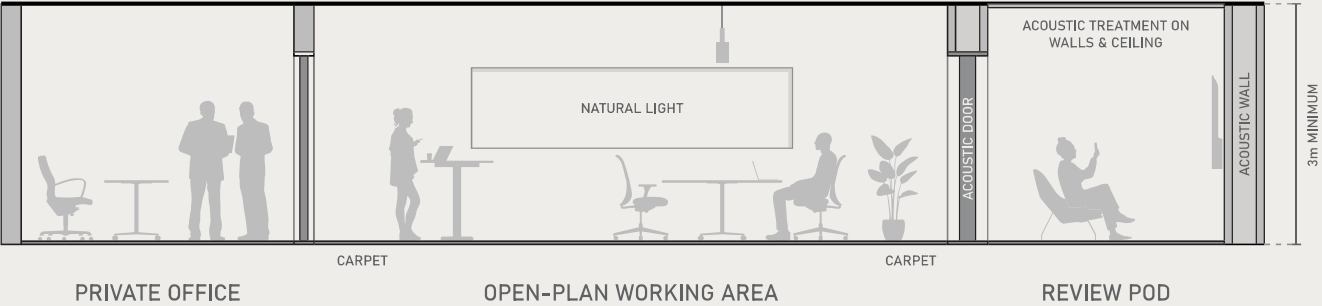
- Quieter areas that minimise distractions
- Informal meeting areas for collaborative working
- Meeting rooms that can also double as focus zones and collaborative working areas

The open plan working area should have Wi-fi connectivity and be fitted with ergonomic and mobile workspaces including provision for desks with adjustable heights. Natural light is important along with provision for heating and cooling to create a welcoming and comfortable work environment. Services design should be flexible to allow for multiple arrangements of task lighting, power, hi-speed internet and data points. Floor and wall mounted distribution boxes should enable flexible seating arrangements. Individual secure storage should be provided in open plan working areas shared by multiple creatives

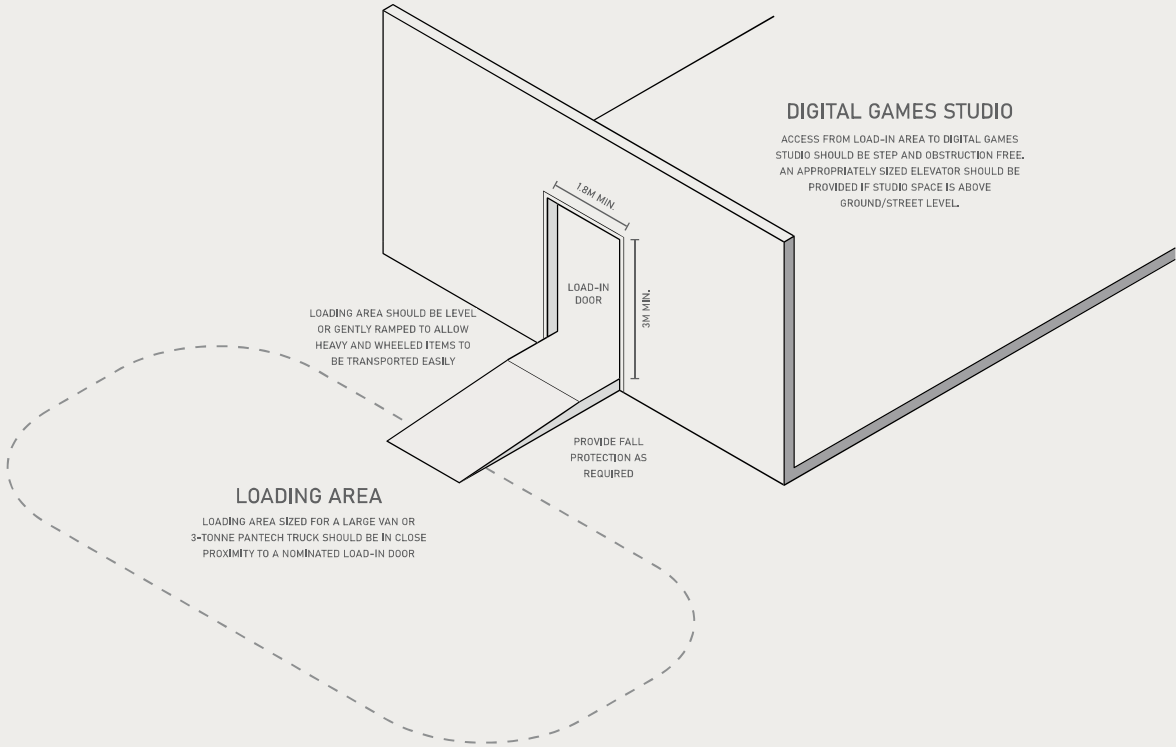
### DEPARTURE GUIDANCE

If the open plan working area is shared by multiple creative users, provision should be made to allow for confidentiality of information between these different user groups. The open plan working area should be divided into smaller enclosed office rooms using partitions if required.

Digital games studio –  
Sectional diagram



Digital games studio –  
Loading diagram



The entire digital games studio should be compliant to allow disabled access and primary circulation routes throughout the space should be 1.5m wide. Walls should be designed to support flat panel displays and have sufficient space to allow for extensive concealed cabling. Finishes should allow for absorption and diffusion of sound to create an acoustically pleasing working space. Care should be provided to acoustically separate quiet meeting rooms, review pods and private work areas from the open work area.

Finishes, fittings, and furniture should include good visual contrast of key surfaces and features and should avoid confusion (e.g. heavy patterns, glare, reflections). Fittings and furniture selected should accommodate users with varying accessibility requirements.

#### **VR/collaboration room**

The VR/collaboration space will support the open plan working area by providing an informal setting for group meetings, discussions, workshops, and other collaborative activities. The collaboration space can also be used as a dedicated VR testing area. The room should be fitted with appropriate audio-visual equipment and technology.

These spaces should be acoustically separated from the open plan working area to prevent noise transfer. Walls should be designed to support flat panel displays and have sufficient space to allow for extensive concealed cabling. Controllable natural light can be provided through windows fitted with black out curtains. Consider providing lightweight, reconfigurable, and mobile furniture that allow the space to be easily rearranged into different configurations for different activities.

#### **Film Studio (Optional)**

The digital games studio can also include a film studio that is fitted with Cyclorama, green screen and curtain tracks. If fitted with these technical systems, the digital games studio can support the use of film technologies to create digital games. This can include mapping of movements on live bodies, etc. Refer to technical appendix: Small scale TV and Film studio for detailed requirements if inclusion of Film studio is desired by the end-user and the operator.

#### **Meeting rooms and private office spaces**

Meeting rooms should be provided in varying sizes to suit different needs of the creative users. They can be:

- Small meeting rooms: for up to 4 people
- Medium sized meeting rooms for up to 8 people
- Large meeting rooms (or board room) for up to 15 people

Meeting rooms that require access for invited public and/or invited clientele should be grouped together and be directly connected to the reception/entrance area to prevent guests from travelling through secure working areas.

Meeting rooms should be fitted with controllable privacy screens, digital screens, Wi-Fi connectivity and video conferencing facilities. All walls, floor and ceiling build-ups should be significant to meet acoustic requirements with provision for finishes that allow for absorption and diffusion. Acoustic door seals should be provided between meeting rooms, adjoining open floor work areas and other noisy breakout spaces. Consider providing lightweight, reconfigurable and mobile furniture (especially in the board room) that allows the space to be efficiently rearranged into different configurations for different activities.

Meeting rooms can also double as private office spaces. Private office spaces can be used to produce confidential work or can be rented out to a single tenant who are not interested in renting the open plan working area. A digital games studio can have one or more dedicated private offices as per their individual stakeholder and user needs.

### Review pods

The review pods are used for game testing and requires complete visual and acoustic privacy from all other spaces. The pods should be fitted with appropriate equipment and technology to play, test and review games under development. A digital games studio can have one or more review pods as per their individual stakeholder and user needs. These pods can be provided in varying sizes to suit different needs. They can be:

- Small review pods for up to 4 people
- Medium review pods for up to 8 people
- Large review pods for up to 15 people

The room size and shaping, equipment location and finishes will require close co-ordination with the acoustic consultant, audio-visual consultant and services engineers. All walls, floor and ceiling build-ups are likely to be significant to meet acoustic requirements. Allowances should be made for sound attenuating walls, curtains, and a combination of absorbing and diffusing finishes to create an ideal listening environment. A sound lock may be required between the review pod and other spaces. Walls should be designed to support flat panel displays and have sufficient space to allow for extensive concealed cabling.

### IT and comms. room

The IT room houses the servers required for the digital technologies used in the digital games studio. The digital games studio should be equipped with high-speed internet and a high amount of digital storage. Power backup systems can also be considered. The IT and comms. room should be appropriately sized for this high demand.

This room will also require additional mechanical cooling and ventilation exhaust. Access into the room must be restricted only to IT maintenance staff. Visual privacy is required from all other spaces. Lighting should be designed to provide best illumination to the comms. racks.

### Mail room

The mail room provides a space to sort and process incoming and outgoing mail/post addressed to users of the digital games studio. The mail room should ideally be near the reception area and be directly connected to the loading area.

### Wellness room

The wellness room is a private room that offers a vital break from other users of the digital games studio space. This room can accommodate a diverse range of uses, such as for prayer and nursing. This room should be fitted with fridge, sink and a small microwave. The room should be designed with high acoustic treatments, relaxing lighting, and comfortable fittings to offer a retreat from the workday.

### End of trip facilities

The end of trip facility should be designed for universal access and located within 100m of a main entrance to the building. They should include secure bicycle parking, toilets, showers and changing facilities.

— **Toilets:** The National Construction Code of Australia (NCC) sets out the ratio of male and female toilets to the number of occupants, and the specifications for toilets. Accessible toilets should also be provided for people with a disability compliant with the NCC and the AS 1428 suite of Standards. It is recommended that both gendered and gender-neutral facilities be provided for toilets, showers and changing facilities, accommodating both cultural preferences, as well as non-binary gender identity.

— **Showers:** Each shower should have a floor area of not less than 1.8sqm. 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. Number of showers provided should comply with NCC requirements to suit the required occupancy of the creative office space.

— **Changing facilities:** Changing facilities should be provided with a clear space of no less than 1.5sqm for each occupant. Change rooms should be equipped with 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 1800 mm between rows of lockers facing each other and at least 900 mm between lockers and a seat or wall.

A minimum clear height of 2.4m AFFL should be maintained in the toilets, showers and changing facilities.



### Kitchen and breakout room

A kitchen is intended only for basic meal prep and reheating of pre-prepared meals. The kitchen should allow for food rinsing, utensil washing and the sanitary disposal of associated wastewater. There is no need to provide oven and stove to unless specified by the operator or user groups. A minimum clear height of 2.4m AFFL should be maintained in the kitchen. Basic kitchen provisions should include: a large fridge, microwave, sink and instantaneous hot water boiler for efficient tea and coffee preparation. A dishwasher may be considered.

Adjacent to the kitchen, a reasonable amount of bench space, dining tables, seating and storage should be provided for breakout.

It is noted that there should be dual height surface tops in kitchen areas to allow 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.

### Storage requirements

General storage areas adjacent to or within the digital games studio should be provided and capable of storing:

- Loose furniture such as folding tables and chairs

Secure storage adjacent to or within the digital games studio should be provided, to safely store:

- High-value items belonging to users of the studio space
- Some users may need to store mobility or medical equipment, so sufficiently large storage areas should be provided for these items

A cleaner's cupboard should be provided adjacent to or within the digital games studio and should provide the following:

- Mop sink
- Area to hang brooms and wet mops
- Cupboard to store general cleaning products securely and safely (dustpan and brush, bin liners, cleaning fluids, vacuum cleaner, etc.)

#### DEPARTURE GUIDANCE

Storage space is often the most overlooked allowance in the design of creative spaces, sometimes sacrificed to increase space for other functional requirements. The saying "you can never have too much storage" is true and failure to provide adequate storage can have a negative impact on the safety, efficiency and operation of a facility.

### Loading area and circulation requirements

The loading and unloading of equipment into the digital games studio and/or the building in which the studio space is housed should be carefully considered. The building's load-in door should be a minimum of 1.8m wide by 3m high to allow for large items and equipment destined for the digital games studio. The load-in area should be level or gently ramped to allow heavy and wheeled items to be safely transported. Ramped routes should have handrails on both sides.

Circulation paths from the load-in area to the digital games studio should be step and obstruction free and have legible way-finding signage. Doorways and accessways should be a minimum 1.8m. An appropriately sized elevator should be provided if the studio space is situated above ground/street level.

A dedicated loading dock is not required to support this type of space, but a loading area sized for a large van or 3-tonne Pantech truck should be in close proximity to a nominated 'load-in door'.

# Technical system design requirements

## Key technical system considerations and requirements are outlined below.

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 at the start of the design process.

### **Review pods**

The review pods should include provision to support various AV systems. Reinforced segments of walls to support the installation of flat panel displays should be included and coordinated with cabling pathways and facility panels for AV systems (audio, video and network). Program loudspeakers and other sound reinforcement elements may be fixed to or installed to the walls and ceiling.

### **Production infrastructure**

Facility panels will be required, mounted to the ceiling and walls to interconnect various AV systems across the digital studio space. Facility panels provide an identifiable connection point for analogue and/or digital signal cables between various systems and locations within the room.

# Universal design considerations

Universal design acknowledges human diversity and difference. Universal design is user-centred, responsive to people's needs and enables 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, adapt to future changes and requirements and allow 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 by 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:

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The access provisions of the current National Construction Code (NCC)

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The DDA Access To Premises Standard

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The local council's DCP relating to Access for People with a Disability

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AS 1428 suite of Standards

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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, designed to be calm and which avoid bold patterns that 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 door swings
- Inclusive presentation of information including options for visual, audible and tactile means
- Egress for all: considerations for an evacuation strategy that allows everyone to evacuate in a safe and equitable manner
- Provision of 30pt LRV contrast between key surfaces (doors/walls, walls/floors)
- Level of customisation to workspaces such as height adjustable desks and localised light dimmers
- Workstation ergonomics: consider ways to encourage workers to practice good posture when game designing and take regular breaks (providing inclusive break spaces will help to encourage this)

# Sustainability considerations

## Every industry can influence emissions and their sustainability performance.

Sustainability and climate change are increasingly at front of mind for the general public and inform consumer decisions. Effective sustainability approaches should entail the application of systems thinking, 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 digital games studio are arranged within key themes below:

### Greenhouse gas emissions

Victoria has a goal of being net zero by 2050. Digital games studios 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 sustainable energy strategies include:

- Using energy efficient appliances with an Energy Rating label and 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
- Evaluating applicability of 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.
- Ensuring 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

### 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         | <b>Sustainable energy production</b> <ul style="list-style-type: none"><li>— Renewable energy from sun, wind, waves, tides or rainfall, geothermal</li><li>— Bio-energy from combustion of biomass</li><li>— Includes off-site renewable energy generation, Power Purchase Agreements (PPAs) and other renewable energy options from energy suppliers</li></ul> |
|           | <b>Low carbon generation</b><br>energy sources or generation that makes use of carbon capture and storage to reduce emissions from generation   |
| 2         |   |
| 3         | <b>Offsetting</b> 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 digital games studios 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 digital games studios. 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 office fit out.

Waste management in digital games studios 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 creative office space. 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 such as technical equipment
- Educating 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

# Structural design requirements

Key structural design considerations and requirements are outlined below:

### Future flexibility

As defined in universal design considerations, flexibility of use of space is integral to the design of the creative office space. Creating spaces that offer choice in use and adaptability to future changes should be a key consideration in the structural design. This includes considering:

- Designing for higher floor loadings to allow for change of use without future structural strengthening of the floor
- Geometry of structure including column layout, beam layout and slab set-downs to allow for changes to office layout
- Additional penetrations to allow for change of use and services reticulation without future structural implications

### Floor Loading

Load allowances for the digital games studio should consider the intended use and future flexibility of the space and comply with structural design actions specified in AS1170.1:2002. Specific loading areas are to be assessed on a case-by-case basis to meet the relevant Australian standards. However, as a guideline, refer to the table below.

### Structural system and column grid

Specific to new construction projects, careful consideration into the structural system and column grid should be made to balance structural efficiency and flexibility of the digital games studio.

A column-free space in the digital games studio may be required to maximise flexibility. Longer spanning structural systems will require additional structural depth to the floor structure above (and potentially below). Greater floor-to-floor height may be required to accommodate the additional structural depth.

The preferred framing system (e.g. flat plate, band beams, composite structure etc) and construction type

(e.g. concrete, steel, timber, etc.) should be determined on a project by project basis considering floor to floor heights, proposed grid, services coordination and construction constraints.

### Allowance for services penetrations

Penetrations required through horizontal and vertical structural elements for services ducts, cables and pipes should be coordinated on a case by case basis and will be dependent on the structural system of the building. Careful consideration into floor to floor heights is required to ensure services reticulation at high level can pass under the floor structure above.

General guidance for penetrations through structural elements are noted below.

- Penetrations both vertical and horizontal should avoid beams; this includes partial penetrations for floor boxes
- Floor penetrations should be limited around columns to avoid punching shear
- Large floor penetrations (for services, inter-tenancy stair or atrium, etc.) may require additional trimming structure

### Floor loading guidelines

| USE OF SPACE                   | PERMANENT SUPERIMPOSED DEAD LOAD (kPa) | IMPOSED LOAD                     |                        |
|--------------------------------|--|----------------------------------|------------------------|
|                                |  | UNIFORMLY DISTRIBUTED LOAD (kPa) | CONCENTRATED LOAD (kN) |
| Digital games studio (general) | 2.0                                    | 3.0                              | 2.7                    |
| IT and comms.                  | 2.0                                    | 5.0                              | 4.5                    |
| Storage (general)              | 2.0                                    | 5.0                              | 4.5                    |

Notes:

1. These loads are provided as a guide and should be reviewed on a case by case basis and in accordance with relevant Australian Standards.
2. Superimposed dead loads are provided as a guide for a typical office space with lightweight partitions, finishes and typical services. Further allowances should be made if heavier finishes, partitions, etc. are desired in the space.

Amenities areas will require multiple floor penetrations with limited layout flexibility. These should be carefully considered and coordinated with the floor structure at an early stage in the design.

An allowance for future penetrations should also be considered and allowed for where possible.

**Acoustic separation**

If acoustic or vibrational separation between the structure and the digital games studio spaces is required, it may be necessary to provide an isolated slab. The isolated slab thickness may vary depending on substructure and requirements specified by the acoustic engineer. Allowance should be made in the superimposed dead load for this secondary slab, if required. Acoustic isolation pads or bearings between the primary structure and isolated slab should be specified, considering both acoustic frequency and load rating required to support the secondary slab. Detailing of digital games studio partition walls and their fixings into the primary structure will also need to allow for full vibration isolation.

Refer to the acoustic design requirements section for further details.

**Serviceability requirements**

The Engineer should carry out design checks for all relevant service conditions in accordance with the governing Australian Standards to ensure the structure will adequately perform for its intended function and purpose.

**Footfall vibration performance criteria**

The design of the structural floor should consider the vibration induced by typical foot traffic through the space. The aim of conducting a footfall analysis is to capture the dynamic performance of the floor plate when subject to an average walking frequency of an average person.

— **Walking frequency:** It is important to consider the spatial arrangement of the floor plate as this helps to determine the walking speed and the number of steps that will be input into the vibration analysis. Walking frequency is dependent on the expected length over which a person could walk without interruptions. For example, long straight corridors could experience many uninterrupted steps compared to an office space with regular obstacles such as desks and seats. Future flexibility of the office space should also be considered when analysing the vibration of the structure due to footfall.

For design purposes, the following walking frequencies are proposed:

- **Corridors and circulation zones:** 2.5 Hz
- **Stairs:** 2.5–4 Hz
- **Studio:** 2–2.5 Hz

— **Damping:** Due to the extent of fit-out, 1–2% damping is deemed appropriate.

— **Response Factors (RF):**

Vibration criteria for floors with people walking are typically quoted in terms of a response factor or multiplier on the threshold of human perception. The level of excitation of the structural floor should be within the acceptable limits for the specific function of the space. The accepted level of response should be defined and agreed with the client, but compliance with ISO 10137 2007 (basis of design of structures) can be used as a preliminary guidance.

Maximum response factors summarised below are a good guidance for preliminary design.

| AREA         | MAXIMUM RF |
|--------------|------------|
| Working area | RF = 6     |

It should be considered in the design that more sensitive areas may suffer excessive vibration caused by vigorous walking in adjacent walkway or corridor areas. For example, more stringent criteria may be required in seated areas of the office space as the perception of vibration is heightened when seated.

# Lighting design requirements

Key lighting design considerations and requirements are outlined below:

## **Lighting design considerations**

- All work lighting and house lighting to be efficient LED DALI dimmable.
- Colour temperature of lighting fixtures to be 4000K or 3000K and consistent throughout
- Colour Rendering Index (CRI) of luminaires to be 90 or higher
- Uniform lighting levels to be maintained throughout the space
- Lighting system must declared flicker within the specification to ensure flicker free broadcasting
- All luminaires must be supplied with electronic ballasts that provide smooth, flicker free dimming capability

## **Lighting controls**

- All lighting should be dimmable, with smooth fading from 0-100%
- Combination of automatic and local control or override should be provided
- Room lighting should be coordinated and controllable from the Building Management System

## **Emergency Lighting and Exit signs**

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



# Electrical design requirements

Key electrical design considerations and requirements are outlined below:

### Electrical requirements

- Incoming power supply to the digital games studio 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
- Dedicated distribution board must be provided for the digital games Studio space with separately metered power and lighting as required by NCC, for ESD purposes and for subleasing (if required)
- Separate clean earth distribution board complete with a technical earth connection directly from the building main earth bar to be provided within or adjacent to the studio to connect all specialist equipment and outlets
- General power outlets to be provided for the user ports and cleaners' outlets as required
- Distributed power and data (both wall mounted and floor boxes to respond to multiple seating configurations
- Power provisions to be provided for office space, meeting rooms and the like as required
- Redundant/back up power supply provisions to be provided for specialist equipment and ICT services 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
- 24/7 access through electronic security
- Fit out with necessary technical equipment and infrastructure and connected to services including three-phase power and high-speed internet
- Power provisions for multiple patch panel displays

DEPARTURE GUIDANCE

As well as ensuring adequate electrical supplies, the distribution of power supplies is critical to success for digital game studio. 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 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 to be provided within the digital games studio space (Fast Network Fibre to the Premises (FTTP)/

- tenancy).
- The digital games studio will require:
- High-speed internet with separate appropriately sized communication rooms
  - A dedicated AV/comms. rack, switch and large digital storage capability
  - Data outlets distributed throughout the venue
  - Data provisions for LED wall allowance to be considered
  - Building wide comms., paging and relay systems
  - Internet connection to the AV/ comms. rack / switch
  - Wi-Fi network connection provisions
  - Higher density data points (ceiling / floor walls ) than standard office fitout
  - Hard wire connections
  - Network points for each desk

## Electrical design standards and system criteria

| ITEM                               | STANDARDS                                    | CRITERIA   |
|------------------------------------|--|--|
| Supply conditions                  | Supply Authority service rules               | <ul style="list-style-type: none"> <li>— 400V 3-Phase nominal</li> <li>— 50Hz</li> </ul>   |
| Main switchboard                   | AS/NZS 61439<br>AS/NZS 3000                  | <ul style="list-style-type: none"> <li>— 25% spare space or one spare space (whichever is greatest) for each frame size excluding main switch(es)</li> <li>— Main busbars 125% initial load</li> </ul>   |
| Distribution boards                | AS/NZS 61439<br>AS/NZS 3000                  | <ul style="list-style-type: none"> <li>— Form 2 unless stated otherwise</li> <li>— 30% spare space or minimum 18 poles (whichever is greatest) for each frame size excluding local main control)</li> <li>— Local main control required</li> <li>— Fault interrupt capacity of circuit breakers minimum 6kA</li> <li>— Provide fault current limiters or use higher fault interrupt capacity circuit breakers as required</li> <li>— Internal DBs: IP52 minimum</li> <li>— External DBs: IP56 minimum</li> </ul> |
| Consumers mains                    | AS/NZS 3000<br>AS/NZS 3008.1                 | <ul style="list-style-type: none"> <li>— Voltage drop: max. 2%</li> <li>— Max. demand + 25% capacity (current carrying and voltage drop).</li> <li>— Fire rate where required to AS3000</li> <li>— At least 100% neutral; provide oversize neutral where harmonic currents are expected to be high</li> </ul>  |
| Submains                           | AS/NZS 3000<br>AS/NZS 3008.1                 | <ul style="list-style-type: none"> <li>— Voltage drop: 1%.</li> <li>— Max. demand + 20% (current carrying and voltage drop)</li> <li>— Fire rate where required for Fire and Life Safety Services</li> <li>— At least 100% neutral; provide oversize neutral where harmonic currents are expected to be high</li> </ul>  |
| Final subcircuits                  | AS/NZS 3000<br>AS/NZS 3008.1                 | <ul style="list-style-type: none"> <li>— Voltage drop: max. 2%</li> <li>— Power: 2.5 mm<sup>2</sup> min.</li> <li>— Lighting: 2.5 mm<sup>2</sup> min.</li> <li>— Max. 80% utilisation to AS 3000</li> </ul>  |
| Lighting                           | AS/NZS 1680                                  | <ul style="list-style-type: none"> <li>— Use long life, energy saving lamps such as LEDs; use tungsten and tungsten halogen only to approval</li> <li>— 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</li> </ul>   |
| Communications                     | AS/NZS 11801                                 | <ul style="list-style-type: none"> <li>— Provide Cat 6 UTP cabling</li> <li>— Contain Cat 6 cable route length to &lt;90m</li> <li>— Cross power cables only at 90°</li> <li>— The maximum fill of a cable tray should not exceed 50%</li> </ul>   |
| Electrical metering and EMS system | NCC Section J6<br>Supply authority standards | <ul style="list-style-type: none"> <li>— Meters and CTs should comply with NCC and supply authority standards</li> </ul>   |

# Acoustic design requirements

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

- Environmental noise and vibration emission
- Internal design noise and vibration levels
- Environmental noise intrusion,
- Building services noise and vibration control
- Internal acoustic separation, including spatial planning and physical isolation
- Room acoustics (e.g. reverberation, etc.)

## DEPARTURE GUIDANCE

Noise separation between quiet working areas and areas with noisy activities should be considered in the layout of the floor plan and in designing partitions between spaces. Quiet spaces should be grouped together and separated from louder spaces using circulation spaces where possible. Specialist room acoustics design of critical listening spaces may also be required.

## Design criteria and management requirements

| ITEM  | CRITERIA AND REQUIREMENTS   |
|---|---|
| Environmental noise and vibration emission                                      | <ul style="list-style-type: none"> <li>— Minimum requirements will be according to council consent requirements and will be dependent on surrounding or adjoining development.</li> <li>— The design must be based on the full operating hours of the space and maximum noise and vibration levels potentially generated by the use.</li> <li>— 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.</li> </ul>  |
| Internal background noise and vibration levels                                  | <ul style="list-style-type: none"> <li>— Criteria relate to the noise and vibration in the space excluding occupant activity.</li> <li>— Internal background noise levels, from both environmental noise intrusion and internal plant and equipment should not exceed the lower bound design sound level range in AS/NZS 2107:2016 by more than 5dB. This would typically be assessed with any operable windows closed.</li> <li>— Internal background vibration not to exceed the maximum levels in British Standard BS 6472:2008.</li> </ul>  |
| Internal acoustic separation, including spatial planning and physical isolation | <ul style="list-style-type: none"> <li>— Vibration and structure borne noise from equipment and activities within the digital studios, such as sound amplification systems, must be factored into the building design and siting.</li> <li>— Noise control and privacy should be considered for internal partitions.</li> <li>— Where a space is used for game sound/music listening/testing with loudspeakers, sound isolation design should be based on the operational sound levels and internal noise level targets in both the space and adjacent spaces.</li> </ul>   |
| Room acoustics  | <ul style="list-style-type: none"> <li>— Reverberation targets should be in accordance with AS/NZS2107:2016.</li> <li>— Where a space is used for game sound/music listening/testing with loudspeakers, additional acoustic design may be required to meet specialised room acoustic criteria, which may involve sound absorption, specialised room geometry or diffusers.</li> <li>— For the open plan office space and VR/Collaboration space, reverberation should be minimised for noise control, occupant comfort and space functional requirements.</li> <li>— For meeting rooms and spaces where critical speech occurs, sound absorptive wall panels should be considered to control the echoes.</li> <li>— Where constant movement is part of the functional use of the space, such as motion tracking, AR, motion game tests, etc, soft floor covering is recommended to reduce the noise generation, impact sound and footfall vibration.</li> </ul> |

# Fire safety design requirements

## Key fire safety design considerations and requirements are outlined below:

- Fire safety design requirements from the base building are to be incorporated in addition to requirements triggered by the new space.
- Fire exits and egress routes are to be in accordance with the requirements of the NCC. Where temporary equipment or props are expected, management provisions are to be implemented to prevent blocking of the exits and egress routes.
- Fire safety systems (e.g. fire sprinklers, hydrants, hose reels, fire detection and alarm systems, portable fire extinguishers and blankets) are to be provided in accordance with the requirements of the NCC.
- Gas suppression in the server room and fire rating the UPS is to be considered for property protection.
- 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 if provided.
- It will be important to consider how inclusive the evacuation strategy is, including plans for people who may require step-free routes (e.g. use of evacuation lifts for older people, disabled people, etc.) or who require particular features to help with the evacuation (e.g. audible alarms for blind and partially sighted people, visual alarms for D/deaf and hard of hearing people, etc.).

# Hydraulic design requirements

## Key hydraulic design considerations and requirements are outlined below:

- Domestic water and sanitary drainage is to be provided to any kitchenettes, showers and amenities, and cleaners sinks which are part of the space.
- Where the space forms part of a shared building, domestic water services should be metered separately from the base building supply to allow landlord billing of water use.
- As the kitchen is not producing hot food a trade waste grease arrestor is not required.
- 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, heat pumps or a combination of both may be more appropriate.

- Reticulation of wet hydraulic services should be avoided in any spaces likely to store sensitive equipment and IT rooms. Where this is not possible, leak detection or leak management should be considered with the stakeholders to avoid risk of water damage.
- Reticulation of hydraulic services should be avoided in review pods, meeting rooms and testing spaces. Where this is not possible acoustic treatment should be considered and pipework located in a way to avoid impact on the space during routine maintenance or repair.

In addition, the design should meet all requirements of national and local Statutory Authorities and should be in accordance with the following:

- Relevant Australian Standards
- BCA/National Construction Code (NCC) 2019 Amdt 1
- Plumbing Code of Australia
- EPA regulations
- Worksafe regulations
- BCA/Building Surveyor requirements
- Manufacturer's guidelines
- AGA and Jemena requirements (where gas is provided)
- Water supply and drainage authority requirements
- Fire Rescue NSW regulations and any fire engineering
- Electrical supply authorities
- Applicable ESD requirements
- Applicable acoustic requirements

## Hydraulic design criteria

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

| SYSTEM                                | STANDARDS   | DESIGN CRITERIA   |
|---------------------------------------|---|---|
| Domestic hot, cold and recycled water | NCC<br>AS/NZS 3500.1<br>AS/NZS 3500.4<br>AS/NZS 2500.3  | <ul style="list-style-type: none"> <li>— Cold water average supply temp: 14°C</li> <li>— Hot water storage: 60°C to 65°C</li> <li>— Hot water distribution: 55°C to 60°C</li> <li>— Amenities (visitor and non visitor): 43°C</li> <li>— Utility rooms (bin stores, kitchens, non ablution areas etc.): 55°C to 60°C</li> <li>— Max. velocity: 2.4m/s externally and in ground</li> <li>— Max. velocity: 1.5m/s in risers, BOH spaces</li> <li>— Max. velocity: 0.8m/s in acoustically sensitive spaces</li> <li>— Min. operating pressure: 250kPa</li> <li>— Max. operating pressure 500kPa</li> </ul> |
| Sanitary plumbing and drainage        | NCC<br>AS/NZS 3500.2  | <ul style="list-style-type: none"> <li>— Min. grade: 2.5% for 40–65mm, 1.65% for 80–100mm and 1% for 150mm pipelines.</li> <li>— Sanitary stacks design capacity: 22% to 33% full</li> <li>— Drainage design capacity: max. 70 % full</li> <li>— Velocity: 0.75m/s to 1.2m/s</li> </ul>   |
| Building rainwater drainage           | NCC<br>AS/NZS 3500.3<br>Australian Rainfall and Runoff Guidelines<br>Local council requirements | <ul style="list-style-type: none"> <li>— Flat roofs, box gutters: 5min 1% AEP</li> <li>— Eaves gutters: 5min 5% AEP</li> <li>— Climate change allowance: +10%</li> <li>— Full capacity overflows to be provided to all building rainwater drainage catchment areas</li> <li>— Velocity: 0.75m/s to 1.2m/s</li> <li>— Siphonic drainage velocities TBC by hydraulic calculation; insulation where required to limit noise in noise sensitive areas</li> </ul>  |



# Mechanical design requirements

## Key mechanical design considerations and requirements are outlined below:

### **General mechanical requirements**

- For mechanical sizing, internal gains within the space should be based on metabolic rates to reflect activity level within each space.
- 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
- 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.
- Openable windows should be incorporated for passive temperature control where possible to allow for natural ventilation in low-load scenarios when the external temperature is acceptable.
- When determining airflow and mechanical equipment sizing, consideration should be given to uplighting 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).
- Mechanical system should be designed to meet acoustic requirements of the space.

### **Working areas, meeting rooms, collaboration space**

- The mechanical systems should ensure a comfortable environment for users, who will be occupying offices and meeting rooms for

extended periods of time.

- The mechanical systems should maintain an environment within the following specified values during times of use:
  - Temperature: 21°C to 24°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)
- CO<sub>2</sub> sensors should increase the outside air proportion to the space in response to high CO<sub>2</sub> levels. The mechanical equipment should be sized to maintain internal temperatures and deliver increased outside air at high ambient temperatures.
- Mechanical system should be variable volume, responding to temperature and CO<sub>2</sub> levels within the space (wall-mounted temperature and CO<sub>2</sub> sensors should be installed at 1500mm AFFL inside the space). Sensors should be installed in areas that will be representative of the conditions inside the space
- If extensive lighting and equipment is used, make allowance for mechanical system to offset expected maximum lighting and equipment loads
- Air supply should be 'low velocity' to reduce noise, avoid drafts and avoid moving objects/loose paper within the space
- Diffusers to be high induction to reduce drafts in space
- Consider sub-metering the HVAC systems for hired office spaces – this will allow tenants to pay for the power they use in relation to their own air conditioning of the hired space

### **Review Pod**

- In addition to the above, the review pod should be acoustically sensitive and the design of the

mechanical system should be closely coordinated with the acoustic consultant to avoid break-in and break-out noise during game testing.

### **Collaboration space**

- The collaboration space should be more informal and may have ability for more extensive natural ventilation and/or widened set points to decrease office energy usage

### **Kitchenette**

- Provide sufficient exhaust ventilation to offset small heat gains from food preparation and dishwasher; as the kitchen is not a full-scale commercial kitchen, no dedicated kitchen exhaust is required

### **Storage spaces, IT rooms**

- Storage rooms which house high value equipment may require humidity control, requirements to be confirmed by major stakeholders, operators and user groups. Humidity and temperature sensors may be required for redundancy to ensure minimal deviation in room conditions. Rooms requiring close control of conditions should be located internally and not against the facade or adjacent to unconditioned spaces. They should be served by dedicated units and utilise code minimum outside air to reduce temperature deviations (refer to AS1668.2).
- Appropriate grilles and access panels (if required) should be incorporated within high value storage areas such that the security of the area is maintained.
- Major stakeholders to confirm plant redundancy requirements, temperature and RH conditions and maximum temperature/RH fluctuations allowed within the storage rooms. Refer to AICCM (Australian Institute for the

Conservation of Cultural Material) guidance as a baseline. Suggesting starting point is as follows:

- Short term fluctuations of no greater than 4°C for ≤24 hours duration within the total temperature range of 15-25°C
- RH to be maintained 45-55% for the majority of the time for Sydney's temperate climate. Short term, ±5% fluctuations ≤24 hours duration into the outer limits of the total RH ranges (i.e. can swing 40-60% RH for ≤24 hours)
- AV/rack rooms/equipment should be provided with sufficient cooling and/or ventilation to offset the loads and maintain the equipment at manufacturers' recommended temperatures.
- Main stakeholders are to advise significant equipment loads in line with their technical requirements
- Rooms should be provided with outside air in line with AS1668.2, or battery ventilation in line with AS2676 if housing any type of batteries.
- If actively cooled by an air conditioning unit, the unit should be dedicated and be provisioned in a duty/standby arrangement if required by the owner/operator of the space
- If the unit is a direct expansion (DX) unit, design and installation is to be in line with AS5149

#### Other areas

- Cleaner's cupboard to be exhausted directly to outside in line with AS1668.2 requirements
- Ventilation of toilets and change rooms to 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

#### Fire engineering/smoke control

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

#### Design criteria

| ITEM                      | 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
- AS5149.1-4 (2016 + latest amendments) – Refrigerating Systems and Heat Pumps
- 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:  $K_t \leq 0.89$
  - Bends:  $K_t \leq 0.25$
  - Rectangular contractions:  $K_t \leq 0.19$

Where the total pressure loss through the fitting is defined as  $P_t = K_t \times P_v$ :

- $P_t$  = Total pressure loss through fitting (Pa)
- $K_t$  = Loss coefficient
- $P_v$  = 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

## **IStructE**

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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