

Creative Spaces Design Guide

PART 3A
TECHNICAL
APPENDIX:
**CREATIVE
OFFICE
SPACE**



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 management¹, 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 Charter², 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 Spaces³ – 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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Image: Arup

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Creative Spaces Design Guide
PART 3A: TECHNICAL APPENDIX
CREATIVE OFFICE SPACE

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 creative office space:

- Programmatic – key spaces and spatial relationships
- Spatial – key dimensions and spatial relationships
- 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.

Creative office space

A creative office space is used by individuals and organisations to operate a creative business. To enable better outcomes, these spaces have specific requirements to support creative activities that differ from standard private or co-working spaces.

Usage profile

Target user groups include:

- Visual artists
- Graphic designers
- Architects
- Interior designers
- Writers
- Creative administration workers, such as event planners
- Cultural organisations

A creative office space 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 sharing the space

Creative office spaces typically operate during normal business hours, but 24/7 access is required.



References:

WeWork - 500 Yale, Seattle.
Photographer: Lauren Kallen.
Credit: WeWork.Com

Second Home Spitalfields
Credit: Second Home Spitalfields



Programmatic requirements

A creative office space should support a variety of creative users, such as artists, designers, producers, creative support staff, technical staff and customers.

The space may be used for a vast range of uses, including design and creation of physical and digital work, administration and management of creative businesses, hosting meetings, prototyping and model-making.

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

A creative office space should include the following areas:

Variety of creative working spaces, including an open plan office space, focus rooms and zones

Variety of meeting rooms, including large board room and smaller collaboration rooms

Event space with a reception area to exhibit creative work, host events and entertain clientele

Small making space with basic printing, 3D printing and laser cutting facilities

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

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

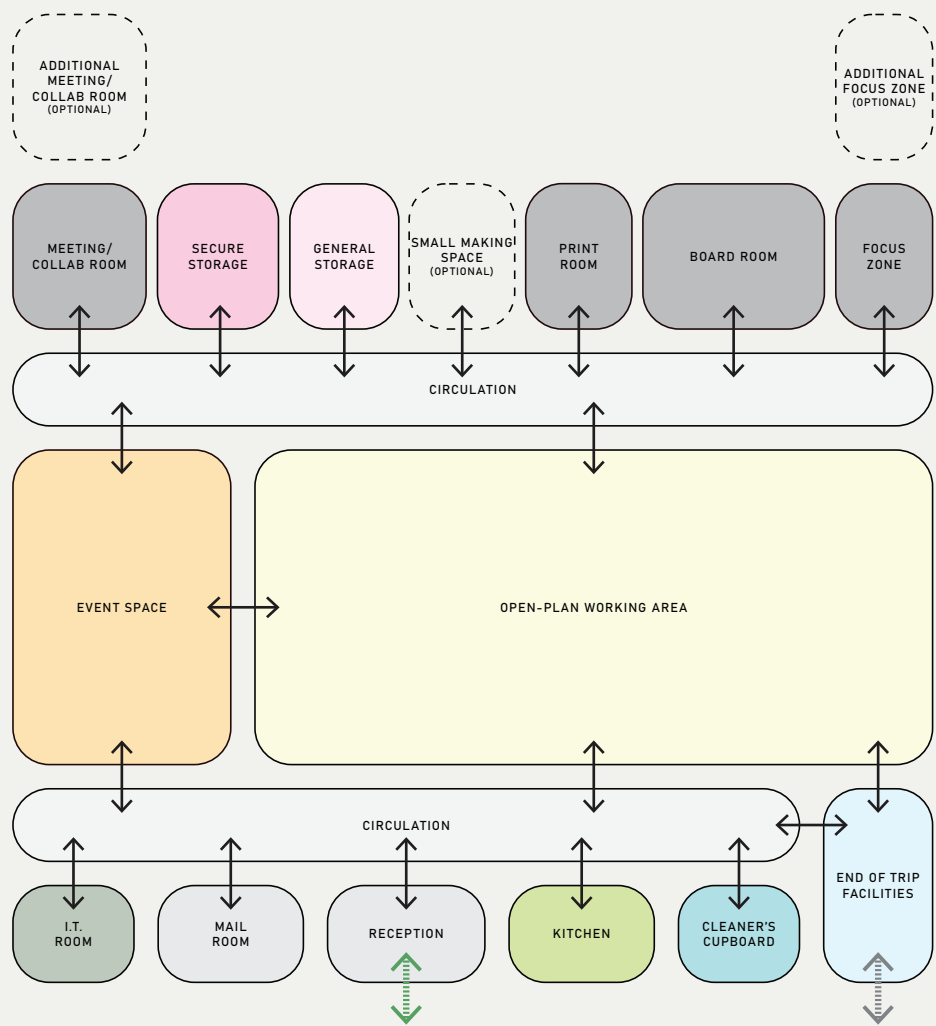
Storage areas connected to the open plan working area

Loading area for large items (e.g. for an art exhibition)

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

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

Creative office space –
Spatial adjacency diagram



Spatial requirements

Creative office spaces should be designed to inspire creativity and idea generation. These spaces should be able to adapt and mould to multiple use settings and suit a variety of creative users. They should also 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. Minimum areas for key spaces for a creative office space are outlined below.

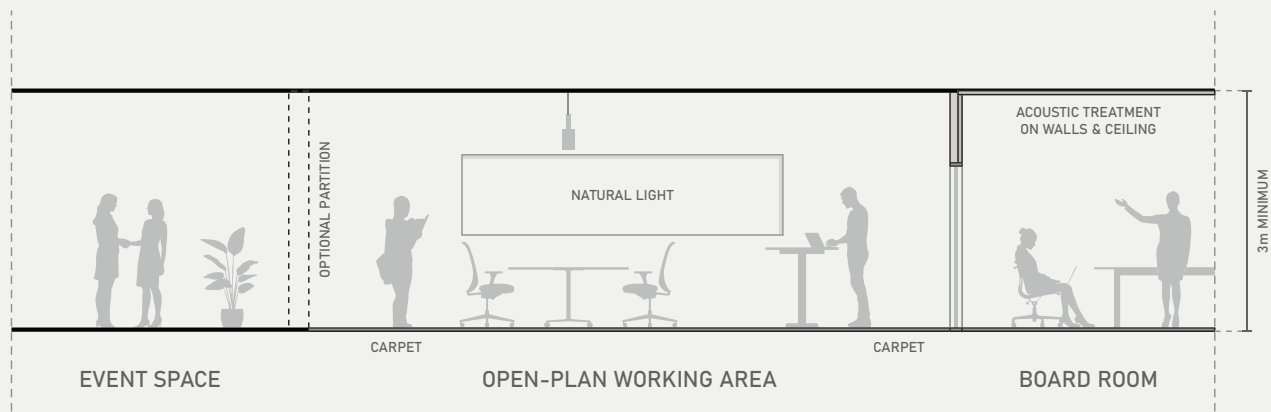
- Early engagement with the operator and user groups to determine the usage is key to defining area requirements. The following area allowances have been provided as an early planning guide:
-
- Open plan creative office space: **10 sqm per person**
-
- Meeting and collaboration rooms:
- Small/focus room: **9 sqm**
 - Medium: **18 sqm**
 - Large/board room: **30 sqm**
-
- Event space: **50 sqm**
-
- Small making space: **15 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**
-
- Ceiling: **2.7 m 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 creative office 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 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, Wi-Fi and data points. Individual secure storage should be provided in open plan working areas shared by multiple creatives.

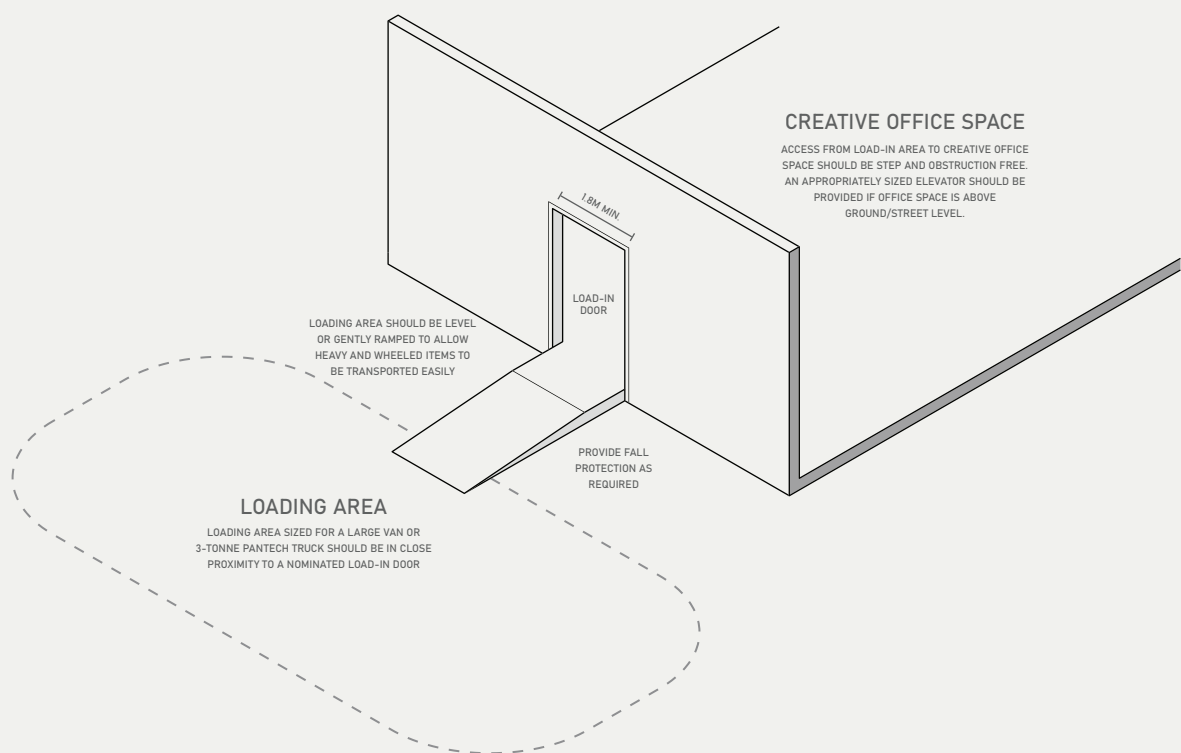
DEPARTURE GUIDANCE

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

Creative office space –
Sectional diagram



Creative office space –
Loading diagram



The entire creative office space should be compliant to allow disabled access and primary circulation routes throughout the space should be 1.5m wide. Finishes should allow for absorption and diffusion of sound to create an acoustically pleasing working space. Care should be provided to acoustically separate quiet focus zones 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.

Meeting and collaboration rooms

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.

Event space

The provision of an event space can be an appealing feature for creative users renting the creative office space as it can allow them to promote and sell their work to the public. The event space can also add additional revenue-generating opportunities for the creative office space by doubling as a rentable space for events and lectures, meetings, collaboration and entertaining clientele.

The event space should have direct access from the reception/entrance area and should not allow unsecured access into the secured working areas within the creative office spaces. The room size and shaping, equipment location (in particular loudspeaker positions and finishes) will require close co-ordination with the architect, acoustic consultant, audio-visual consultant, and services engineers. The event space should have a general storage area to store furniture and other equipment.

Print room

A print room is a dedicated room that houses printers for small and large format printing along with photocopying facilities. Additionally, these rooms should also include a work bench, pin board, general storage and a waste station that allows for recycling as well as confidential

document disposal

Mail room

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

IT room

The IT room houses the servers required to support digital technologies. Creative offices should also be equipped to provide high amount of digital storage.

Wellness room

The wellness room is a private room that offers a vital break from other users of the open creative office space. This room can accommodate a diverse range of uses, such as for prayer, napping 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.

Small making space (Optional)

This room can be used for creative work using light machinery, such as laser cutting, model making, etc. If required, this space can also be fitted with a paint sink and a wash-up area, have mechanical ventilation for safe use of toxic materials and fitted with dust and fume extraction. There should be a clear delineation between sensitive electrical equipment and wet areas. All wall, floor and ceiling finishes should be acoustically treated and durable.

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 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 for an oven and a stove 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 creative office space should be provided and capable of storing:

- Loose furniture such as folding tables and chairs

Secure storage adjacent to or within the creative office space should be provided to safely store:

- High-value items belonging to users of the office 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 creative office space 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 is often the biggest overlooked space in creative spaces design, sometimes being sacrificed to make space 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.

Loading zone and circulation requirements

The loading and unloading of equipment into the creative office space and/or the building in which the creative office 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 creative office space. 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 office space 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 office space is situated above ground/street level.

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

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, 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:

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, 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

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 creative office space are arranged within key themes below:

Greenhouse gas emissions

Victoria has a goal of being net zero by 2050. Creative office spaces 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
 - Consideration of solar hot water and electricity panels where this makes sense

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	Sustainable energy production <ul style="list-style-type: none"> — 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 creative office spaces 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 creative office spaces. 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 creative office spaces 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
- 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

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 creative office space 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.

Overhead loading allowances

Overhead rigging of artwork, sound systems or unusually heavy items may be required in the Event Space within the creative office space. The structural floor above these spaces should be designed to support these additional concentrated loads. Fixing points are required to be coordinated with the structure above and align with beams or structural thickenings.

Specific requirements of these hanging loads are to be determined and agreed with the user or client to support the functionality and intended use of the space.

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 creative office space.

To minimise the depth of the floor plate and improve structural efficiency, a regular column grid is recommended. Columns can be either expressed or easily incorporated into fit-out and internal partitions.

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)
Office (general)	2.0	3.0	2.7
Event space	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.

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:** 3.5 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
Office space	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:

- Provision for natural lighting and controlled task lighting
- lighting provision to allow variety of furniture layouts
- General work light,
- House lights,
- Emergency lighting,

Lighting design considerations

- All work lighting and house lighting to be efficient LED DALI dimmable.
- The colour temperature of the lighting fixtures to be 4000K or 3000K and consistent throughout.
- The colour rendering (CRI) of the luminaires to be 90 or higher.
- Uniform lighting levels to be maintained throughout workstation spaces and min 320lux to be maintained.

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.

Lighting design compliance

- Lighting illuminance and uniformity requirements must comply with AS 1680. A office space should have good general uniform lighting throughout. The average horizontal illuminance level should meet 320 lux. This is indicated in AS1680.2.2 (Interior and workplace lighting Specific applications - Office and screen-based tasks)
- Motion sensors and lighting timers should also be considered to turn off the lighting and conserve energy when room is not in use.

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.

Electrical design requirements

Key electrical design considerations and requirements are outlined below:

Electrical requirements

- Incoming power supply to the creative office 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 should be provided with separately metered power and lighting as required by NCC, for ESD purposes and for subleasing (if required)
- General power outlets to be provided for the user ports and cleaners' outlets as required
- Separately metered power supply to be provided for the kitchen space as required
- Power provisions to be provided for reception, workshops, ICT room, meeting rooms and event space as required
- Provision for flexible power and data to allow for a variety of furniture layouts
- Distributed GPOs and network connections for all desk areas.
- 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 (if any) based on the installation requirements, rigid conduits or flexible conduits or steel conduits to be used

DEPARTURE GUIDANCE

As well as ensuring adequate electrical supplies, the distribution of power supplies is critical to success for a creative office space. Power to be reticulated to workstation spaces and individual office locations and soft wired power connections for workstations to be considered to allow flexibility.

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 creative office space will require:

A dedicated ICT rack and switch in a dedicated communication room with rack mounted UPS back up system

Data outlets distributed throughout

Internet connection to the AV rack / switch (if any)

Wi-Fi network connection provisions

AV systems to support office: meeting rooms, booking panels (screens at the entry or within the rooms for room booking systems), display screens, racks, etc.

Provision for 24 /7 access through electronic security system

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 or spaces with privacy requirements such as private offices or meeting rooms, and areas with noisy activities such as collaborative or event spaces is critical in a functional office. Quiet spaces should be grouped together and separated from louder spaces using circulation spaces where possible.

Design criteria and management requirements

ITEM	CRITERIA AND REQUIREMENTS
Environmental noise and vibration emission	<ul style="list-style-type: none"> — 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	<ul style="list-style-type: none"> — 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 the lower bound design sound level range in AS/NZS 2107:2016 by more than 5 dB. This would typically be assessed with any operable windows closed. — Internal background vibration not to exceed the maximum levels in British Standard BS 6472:2008.
Internal acoustic separation, including spatial planning and physical isolation	<ul style="list-style-type: none"> — Vibration and structure borne noise sources are generally limited. — Noise control and privacy should be considered for internal partitions. Where the space is located above or below other tenancies, the floor/ceiling sound insulation and footfall impact control measures should be considered. — Where the space is located above or below other tenancies, the floor/ceiling sound insulation and footfall impact control measures should be considered.
Room acoustics	<ul style="list-style-type: none"> — Reverberation targets should be in accordance with AS/NZS2107:2016. <ul style="list-style-type: none"> • For the main office area and workshops, reverberation should be minimised for noise control, occupant comfort and space functional requirements. • For board room and spaces where critical speech occurs, sound absorptive wall panels should be considered to control echoes. • For event spaces reverberation times should not exceed Curve 1 (Speech) of Appendix A, AS/NZS2107:2016.

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, including number of floors interconnected by an open stair, and the exit width and number of occupants within event space spaces are to be in accordance with the requirements of the NCC.
- 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.
- 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 kitchens, 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 sensitive electrical rooms such as IT rooms, digital storage, network and rack rooms. Where this is not possible, leak detection or leak management should be considered with the stakeholders to avoid risk of water damage.
- 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
 - 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 regulations and any Fire Engineering
 - Electrical Supply Authorities
 - Applicable ESD Requirements
 - Applicable Acoustic Requirements
 - Property Council of Australia – A Guide to Office Building Quality

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 AS/NZS 3500.1 AS/NZS 3500.4 AS/NZS 2500.3	<ul style="list-style-type: none"> — 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 (bin stores, kitchens, non ablution areas etc): 55°C to 60°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: 250kPa — Max. operating pressure: 500kPa
Sanitary plumbing and drainage	NCC AS/NZS 3500.2	<ul style="list-style-type: none"> — 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	NCC AS/NZS 3500.3 Australian Rainfall and Runoff Guidelines Local council requirements	<ul style="list-style-type: none"> — Flat roofs, box gutters: 5min 1% AEP — Eaves gutters: 5min 5% AEP — Climate change allowance +10% — Full capacity overflows to be provided to all building rainwater drainage catchment areas — 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

- For mechanical sizing, internal gains within the space should be based on metabolic rates to reflect predicted 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.

Office, reception, event space and meeting space requirements

- 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 increase occupant comfort or 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)
- CO₂ sensors should increase the outside air proportion to the space in response to high CO₂ levels. Mechanical equipment should be sized to maintain internal temperatures and deliver increased outside air at high ambient temperatures.
- Wall-mounted temperature and CO₂ 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 CO₂ levels within 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 drapes/curtains.
- Diffusers should be high induction to reduce drafts in space.
- Event space mechanical system should be able to be separately operated independently of other spaces to avoid unnecessary HVAC energy usage.
- For the event space, the mechanical system should be capable of dealing with fast temperature fluctuations (e.g. when a large number of people enter the space for an event).

- Consider 'boost' mode for large events to enable faster cooling times to maximise occupant comfort.
- 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.

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.

Workshop

- Provide suitable ventilation in line with AS1668.2 requirements. Consider whether the workshop will require specialist dust or other extract. Provide appropriate filtration on extract systems to protect upstream mechanical equipment.
- If large equipment with significant heat loads are to be located in the workshop, additional cooling may be 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 to be redundant to ensure room conditions deviate minimally. Rooms requiring close control of conditions should be located internally and not against the façade or adjacent to unconditioned spaces. They should be served by dedicated units and utilise code minimum outside air to reduce temperature deviations (refer 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 & RH conditions and maximum temperature/ RH fluctuations allowed within the storage rooms. Refer 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.
- The 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

- Cleaners store 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 300 ft
110	Chain saw at 3 ft
100	Inside disco
90	Heavy trucks at 15 ft
80	Sidewalk of busy street
70	Loud radio (in typical domestic room)
60	Office or restaurant
50	Domestic fan heater at 3 ft
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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