Urban Design, Architectural, Landscape and Heritage Principles, and Flooding Controls

The following Urban Design, Architectural, Landscape and Heritage Principles have informed the layout and design of the precincts and will inform future building design resolution. Detailed flooding controls are also included to inform the future built form in each precinct.

URBAN DESIGN PRINCIPLES

The CIP establishes the following urban design principles which have informed precinct building envelopes, their inter-connections with surrounding streets and public domain, and the environmental impacts they generate on surrounding context:

Connectivity, outdoor space and campus legibility

- Internal and external spaces should connect in a way that makes easy reading of the precinct and its components, guiding movement through and within precincts.
- Allow for transparency and porosity at ground levels in order to encourage permeability and passive surveillance.
- Create opportunities for social interaction maximising high quality open space and relationship with food and beverage offer. Open spaces within buildings should integrate with the architecture, and provide a variety of direct sunlight and filtered shade as a minimum.
- Landscaping and outdoor space around and within buildings must enhance the University environment, identity, character, and sense of place.
- Internal building functions should be zoned within buildings to allow activation and interface with the public domain.
- Awnings and colonnades are to be considered to provide weather protection connecting pedestrian spaces without creating barriers and obstacles.
- Any new building or refurbishment work should complement and enhance the primary function of any surrounding building or green space environment.
- Achieve a balance between built form and the external environment within the campus.
- New buildings and major external refurbishments should be designed with a view to enhancing and complementing the surrounding environment, minimizing the impact of overshadowing, loss of privacy and general amenity.
- Spaces between buildings should be considered in their own right in terms of providing a stimulating environment which is legible, safe and accessible, whilst reinforcing the identity of the precinct and University.Vehicular movement around buildings and through the campus should be well defined in terms of the separation between cars, bicycles, and emergency vehicles, giving priority to pedestrians. Consideration must be taken at the conceptual design stage for the integration of public art. Refer to University Draft Public Art Policy.

Axes and vistas

- New buildings should be designed to enable occupants to enjoy views and, to the extent possible, maintain views from existing buildings and public spaces. The preservation of specific vistas will be referred to on a project-by-project basis.
- New buildings must maintain and enhance views, vistas, connectivity and permeability into the campus from surrounding streets.
- The University's Grounds Conservation Plan has a number of existing axes and vistas to be maintained. Any refurbishments or extensions should take context and curtilage into account.

Precinct identity

- Precincts will be clearly articulated, responding to permeable pedestrian networks and the promotion of world class facilities.

External micro climate

- Building designs should be based upon an analysis of solar access, prevailing winds and other environmental factors including noise, pollution and the like to maximize the performance and quality and the building fabric, internal and external environments.

Natural Daylight

- Avoid overshadowing and visual intrusion onto adjoining sites, and spaces.Design and site buildings to avoid hazardous or undesirable glare to pedestrians, motorists, people using open spaces and those in other buildings.
- Design to minimize the impact of night light spill on adjacent sites and buildings.

Built Form

- Design building forms that contribute to and respect the existing scale, Heritage fabric and curtilages of precincts. Create innovative solutions for the built form that respond to current pedagogical methods and are flexible enough to accommodate future teaching trends.
- Consider new building forms that have the opportunity to contribute to the overall expression of the precinct.
- Consider environmentally sustainable solutions that embrace energy efficient strategies, water sensitive design principles and alternative energy sources.Minimise the use of motor vehicles and parking areas at ground level, promoting conflict-free bicycle access and a "pedestrian first" environment.

Social Impact

- Create spaces that promote the integration of inter faculty activities and allow for collaborative work, whilst inviting and encouraging the wider community to engage and participate with University.Promote opportunities for collegiate style of research, teaching and learning.

Deliverability

- Consider strategies and concept that allow for the precinct to develop while the campus is remaining operational.

ARCHITECTURAL PRINCIPLES

The purpose of the Architectural Design principles is to inform architects and other consultants when preparing projects and planning documents for the University. The University provides Architectural Design Standards which must be taken into consideration when designing any built form at the University. This document is updated periodically, and is available on the University website.

The Architectural standards and principals provide:

- Details of the minimum requirements for Planning and Architectural Design.
- A reference document to enable consistency with the design objectives.
- A support of the University Vision for the built environment and world best practice.

The University's Architectural Design Standards address key objectives:

- Quality architectural design which responds enhances and complements the environment.
- Responsiveness to the heritage context and cultural history of the campus.
- Value for money in all aspects of the project.
- The design of low maintenance building and environments.
- Longevity in life of construction and a whole of life approach to design.
- Standardization of space, to minimize individual specialization of spaces.
- Flexible space design, to future proof building usage for expansion or adaption to new uses.
- Safety in design.

The design standards describe the minimum requirements for the design, construction and maintenance of new buildings and the refurbishment of existing buildings throughout all campuses owned, operated and managed by the University of Sydney.

The standard applies to planners, project managers, consultants, contractors, sub-contractors, tenants, managing agents, University staff and others involved in the design, construction and maintenance of existing, new and proposed University buildings and facilities.

Design Principles

Sense of place

- Enhance the nature and character of the original sandstone campus, while integrating new sensitively designed buildings which create a sense of place and reinforce precinct identity.Respond and relate to the Wilkinson Axis and heritage curtilages.
- Facilitate seamless movement between, through and into buildings and open spaces.
- Create a sense of arrival, with iconic buildings and landscapes at gateways, particularly along City Road.
- Facilitate the co-location of knowledge hubs.
- Define building envelopes to establish and enhance the physical amenity of the campus.

Building typology

- The development intention for the majority of future sites is for mixed use buildings including student accommodation, to create a vibrant and varied campus and student experience.Economy and flexibility
- The University aims to achieve the optimum balance between capital and operating costs for construction and refurbishment, and eliminate wasteful use of space whilst providing a constant level of quality and service throughout the lifetime of each building.
- The University buildings and external spaces should be robust, designed for flexibility, and accommodate the capacity for change.

Functional planning and zoning

- Generally the most highly utilised spaces, usually undergraduate areas, are to be located the at ground floor levels to reduce vertical circulation within the building.
- As a security consideration, public access should be limited to one entry point.
- To reduce demand on the lifts, stair wells shall be located in prominent positions to encourage their use as the primary form of vertical travel, with lifts located close by as a secondary option.
- Design of stair wells should be appealing to encourage use.
- Service zones should be located so as not to impact adversely on other functions within the building, or that of neighbouring buildings.

Landmark buildings

- Certain buildings may have a greater hierarchical significance to other buildings on campus, where the significance may be functional, architectural or cultural.
- These building may be designed as landmark buildings demonstrating design excellence.
- The buildings may establish a campus gateway identity, addressing external public domains, neighbourhoods and surrounding streets.

Weather protection

- Continuous weather protection should be considered along major street addresses by means of colonnades rather than awning structures.

Sustainable design in concept design

- All new buildings and refurbishments are to be designed using environmentally sustainable principles.
- The University is committed to sustainable design. Buildings are to be designed with reference to the Sustainability Framework, rather than any other environmental rating tools.
- To minimize the thermal load on a building, the following must be considered:
- Thermal insulation to roof, floors and walls.
- Reflectivity of external building materials.
- Thermal performance of glazing.
- External shading of both windows and walls.
- Refer to The University of Sydney Sustainability Framework for more details on the above.

Security

- Buildings and green spaces must be designed to meet the University's security standards and accommodate its security systems. Crime prevention and security should be addressed via appropriate environmental design.
- Consideration should be given to crime prevention through design influencing behaviour.
- There should be one clear form of entry and exit from each building, to ensure passive surveillance of entry points.Noise mitigation
- During the planning process separate noise generating activities from quiet activities.
- Protect all occupied spaces from noise pollution from external and internal sources.
- Minimize noise emitted from external equipment such as fans, air-conditioners, compressors and from other noise generating sources. The co-location of plant for grouped buildings in precincts should be considered.
- Minimize noise transmission from space to space within multiple-occupancy buildings. Noise creating activities should be co-located where possible.

Building Fabric

Facades

- Ground floor areas are to be visually permeable where the function allows, in order for the ground floor and streetscape to become lively and interesting.
- Blank walls public areas are not permissible.

Building scale

- Due to the diverse range of precincts and building locations a uniform building scale across the campus cannot be achieved. Scale, form and façade treatment will be dealt with at precinct level.

Materiality

- Consideration is to be given to the 'whole of life' implications of material choices, the implications of the material's extraction, manufacture, use, longevity and disposal.
- Adopt life cycle costing principles for materials and systems selection that includes capital, recurrent and disposal costs.
- Use recycled and recyclable building materials, where fit-for-purpose, in walls, roofs and floors and demolition materials in fill and hard core. This may include the re-use of materials or components from existing site facilities that are to be demolished. Investigate local facilities for receiving recyclable materials and establish a policy for the construction phase to be written into specifications.
- Rainforest timber and timber from Australian high conservation forests shall not be used. Balance consideration of environmental impacts of use of treated plantation timbers against use of untreated timbers from natural growth forests.
- Design for use of timber substitutes or engineered wood products in preference to solid wood. Consider appropriate design detailing for engineered products to avoid any off-gassing potential.

Heritage Assets

Conservation

- The University has a responsibility and commitment to maintain and conserve its heritage buildings which are listed in the Grounds Conservation Plan. Each heritage building also has its own Conservation Management Plan. Specific policies guiding conservation are outlined in these documents.

New work

- Appropriate setbacks and heritage curtilages are outlined in the applicable Conservation Management Plan. Where new buildings or additions are proposed the Grounds Conservation Management Plan should be referred.
- Construction needs to take into account requirements and priorities at the levels of significance outlined within the Grounds Conservation Plan (design and details).
- All new buildings and additions require a heritage impact statement and archaeology report, suitable for submission with the development application, to be submitted to CIS for approval.

Internal space planning

Ventilation

- Wherever possible, designers should utilize natural cross ventilation, or mixed mode systems for habitable rooms and corridors, to minimize the requirement for air conditioning.
- Roof vents and eaves ventilation may be considered.

Building Services planning

Siting, integration and coordination of all building services

- The location and presentation of external plant and services must be considered as an integral part of the total design.
- All rooftop plant is to be screened.
- Appearance or impact of these servicing and plant elements on the surrounding open space and neighbouring buildings must be considered. Access for maintenance or use is to be facilitated.
- In considering an integrated approach to the implementation of building services, there should be no adverse effects or impacts from one service to the other. Preference will be for services to be grouped together and service zones established – whether they be vertically and/or horizontally within the building. Services should be designed to have sufficient tap-in points in required locations.
- The ability to upgrade, maintain and pre-empt future needs for plant and services without major disruption to the use of the surrounding public domain space or its physical fabric is also a major design and siting consideration.

Signage and Wayfinding

- Designers must work to ensure consistency with the Signage Standards for any building work across the University campus.
- For new buildings, signage must be purpose designed and respond to the design intent of the new building.
- Signage inside a building should be sufficient to orient staff, students and visitors . There should be sufficient directional signage and identification signage at the destination.
- Refer to Signage Standard for further detail on the above.

LANDSCAPE DESIGN PRINCIPLES

The design principles guiding the selection of University landscape elements are:

Sustainability.

Design cohesion, continuity of material and design.

Campus or precinct identity.

Maintenance & cost.

Sustainability

The University's Sustainable Campus Program is aimed at achieving a sustainable campus through the following objectives:

- Apply environmental principles to the building and maintenance program.
- Conserve energy and water.
- Monitor and reduce greenhouse gas emissions.
- Minimise waste, environmental risk and pollution.
- Account for environmental impact when purchasing goods and services.
- Conserve biodiversity.
- Select sustainable construction material and products.
- Promote re-used or recycled content.
- Use zero or low off-gassing products & materials.
- Use zero or low toxicity products & materials.
- Ensure durability and longevity of materials – to reduce maintenance and replacement costs.
- Utilise locally produced materials –to reduce transport costs & emissions.

Continuity & Cohesion

The objective is to provide consistent and linking elements to connect the disparate buildings and structures throughout the University.

- Achieve consistency of elements & standards.
- Utilise a simplified palette of materials and products to provide greater cohesion and link disparate University structures.

Identity

The objective is to clearly articulate the University's identity, including gateways and existing/future precincts.

- Ensure continuity of design elements.
- Customise furniture, limited to contained, discrete areas, e.g. courtyards, precinct hubs or precinct buildings.

Maintenance

The objective is to facilitate an efficient landscape maintenance program.

- Reducing maintenance requirements.
- Ease of replacement.
- Continuity of supply, matching materials.
- Vandal resistant materials.

Landscape Design Elements

CIP precincts and development proposals will address specific landscape plans as the development fabric for each precinct evolves in greater detail. Landscaping will be guided by the University's established Landscape Design Elements. Carefully selected design elements are to be derived from the University's palette of materials, finishes and colours currently found on campus, and which:

- Have a history & continuity of use on site.
- Have a heritage association where appropriate.
- Are selected from those already on site (standardised materials/limited palette).
- Can be replicated & reproduced.
- Have a secured supply over time to ensure continuity.
- Meet relevant Australian standards and codes.
- Meet current accessibility standards.
- Have low maintenance costs.

Planting Principles

All campus planting, including that for CIP precincts, is to be based on the following planting principles:

- Continuity of form and structure.
- Context with existing planting.
- Clear, unified planting structure.
- Strong structural form, hedging and architectural foliage.
- Combined use of exotic plants and native species.
- Strong massed planting with large numbers from a limited species range.
- Species selected that are suitable for the available solar access, both present & future.
- Species suited to location & micro-climate.
- Shade trees selection which recognizes the impact on both open spaces they overshadow and likewise the passive solar requirements of adjacent buildings.
- Advanced plants & large stock sizes utilized where possible.
- Low water requirement / drought resistant species.
- Resistance to pests and diseases.
- Low maintenance requirements. Requirement for dead heading, hedging, pruning or pollarding etc. should be minimised.

Campus planting species are to be selected from the University's established planting schedules. These schedules ensure that the University's public domain maintains a contiguous University character. Planting selection is to be designed around the following campus characters shown in **Table 1**.

TABLE 1 PLANTING TYPES AND CHARACTER

Heritage zone planting

The list of heritage plants includes some of the major species planted on the campus in the nineteenth and early twentieth century. These plants are particularly well demonstrated in Science Road, Quadrangle and Manning Road Precincts.

Contemporary Planting

The mix of exotic and native species is a combination of species currently successfully used throughout the Campus and some additional species. The native palette has been extended in line with changing expectations with regard to maintenance & water use. The list is characterised by a wide and eclectic range of species selected in context with the heritage nature and planting character of the University.

Endemic Planting

This mix of endemic species is selected from plant communities originally found in the University area. The plants selected are suitable for some limited massed boundary planting areas throughout the Campus.

HERITAGE PRINCIPLES

The CIP Precinct building envelopes have been informed by individual Heritage Impact Assessment (HIA) reports. These reports identify heritage items within the respective precinct and inform the appropriate siting and massing of building envelopes which will in turn guide the form and scale of future buildings.

In addition to the HIA reports, the Campus Grounds Conservation Plan (GCP) has been reviewed and updated to identify the heritage significance of buildings, significant landscapes and landscape elements, and key view corridors and planning axes. This GCP review ensures that heritage significance is appropriately managed as an integral part of any future developments on the University campus.

The key heritage principles informing the precinct designs are:

- Preserve and conserve those buildings and landscapes deemed to have heritage significance.
- Maintain the existing buildings, including heritage buildings, in good repair.
- Manage a growing campus in a way that respects its heritage.
- Identify areas on the campus that are appropriate for redevelopment.
- Protect significant open space and key vistas.

FLOODING CONTROLS

An assessment of flood inundation to each of the precincts has been undertaken. **Table 2** indicates the extent of flood impact and hazard and details development controls to be factored into future built form designs for the respective precinct.

TABLE 2 100 YEAR ARI FLOOD IMPACTS AND DEVELOPMENT CONTROLS

CIP Precinct	Flood Impacts	Flood Hazards	Development Control
City Road	**1.** Minimal flooding largely caused by overflows from the City Road drainage system	Negligible	▪ Floor levels and above ground car parks must be located above the 100 year ARI peak flood level. ▪ Entry points to buildings from City Road to be higher than the flood planning level. ▪ Critical facilities like electricity substations must be located 500mm higher than the 100 year ARI level or PMF level, whichever is higher.
Engineering	**1.** Most buildings experience flooding above floor levels **2.** Critical electrical substation infrastructure in low lying flood prone areas	Generally low High floodwater velocities on the major access roads including Shepherd Street and Cleveland Street is a hazard to flood evacuation routes	▪ Augmentation and improvements required to precinct stormwater drainage ▪ Floor levels and above ground car parks are to be located above the 100 year ARI peak flood level. ▪ Entry points to buildings from City Road are to be above the flood planning level. ▪ Critical facilities like electricity substations must be located 500mm above the 100 year ARI level or PMF level, whichever is higher. ▪ New development must be designed to avoid or accommodate overland flowpaths and withstand lateral and buoyancy forces from relatively deep flows.
Health	**1.** The Health precinct is situated in a low lying area. **2.** Buildings experience flooding in common rainfall events i.e. the 5 year ARI event. **3.** Floodwaters in the Health precinct flow north discharging into University Oval No. 1 which acts as an informal detention basin. **4.** Peak flood depths are > 1 m on the Oval No. 1 in the 100 year ARI flood. **5.** Redevelopment of Bosch Glasshouses could obstruct existing overland flow paths which will impact surrounding areas or buildings.	High Up to 1 m of peak flood inundation around the main buildings. Western Avenue and the Veterinary Hospital entrance serve as emergency egress routes	▪ Measures are required to safeguard underground areas that may contain expensive assets and equipment. ▪ New development must avoid overland flowpaths, divert upstream flows around the development into Oval No. 1 or withstand lateral and buoyancy forces from relatively deep overland flows ▪ Floor levels and above ground car parks must be above the 100 year ARI peak flood level. ▪ Critical facilities like electricity substations must be located 500mm above the 100 year ARI level or PMF level, whichever is higher.
Life Sciences	**1.** Buildings are affected by local overland flooding from floodwaters originating from Science Rd and University Oval No. 2. **2.** Gunn Building and the Grandstand developments could obstruct existing overland floodwater flow paths which may impact on neighbouring buildings.	Low Floodwater velocities are less than 1 m/s Western Avenue and the Veterinary Hospital entrance serve as emergency egress routes	▪ Floor levels and above ground car parks are to be located above the 100 year ARI peak flood level. ▪ Critical facilities like electricity substations must be located 500mm above the 100 year ARI level or PMF level, whichever is higher. ▪ Potential stormwater diversion around development footprint
Merewether	**1.** Relatively flood free with shallow flooding only on major roads such as City Road, Darlington Road and Codrington Street.	Not significant	▪ Floor levels and above ground car parks must be located above the 100 year ARI peak flood level. ▪ Critical facilities like electricity substations must be located 500mm above the 100 year ARI level or PMF level, whichever is higher.