Design Guidelines
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UC
UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Section 9 Environmentally Sustainable Design.

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Standards in the Design Guidelines Suite

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Document Control

Revision History

Revision Number	Description	Section Owner	Date
Issue 1	Original Draft	-	-
Issue 2	Internal Review	-	-
Issue 3	First public circulation	T. Sellin	October 2016
Issue 4	Updated Issue	*Rob Oudshoorn*	*September 2019*

Current Document Acceptance

Update Authored	Approved	Date
T.Sellin	*Rob Oudshoorn*	*September 2019*

Key Updates from Previous Issue

Revision Item	Details
9.1.1 Purpose	*Additional content*
9.1.4 Life Cycle Costing	*Additional content*
9.2.1.1 Insulation	*Additional Content*
9.2.1.2 Glazing	*Additional content*
9.2.2.3 Renewable Energy Sources	*New Section*

Contents

9.1 Overview

9.1.1 Purpose

At the core of this guidelines are the principles of embodied by 'kaitiakitanga': the guardianship of resources. "Ngāi Tahu aspirations for urban development is to decrease the overall impact on existing infrastructure, and to find and implement alternative low impact and self-solutions for water, waste, energy and biodiversity issues."

The University recognises that there is increasing pressure upon the built environment and connected infrastructure from recent extremes of weather. Where it is anticipated there are likely or foreseeable consequences that compromise normal use, operation, or any knock-on effect from capital project work within the anticipated operational life-cycle horizon of that facility, then potential issues and implications should be identified, assessed and where appropriate changes to design proposed in order to mitigate or minimise those impacts.

To achieve this objective, consultants shall demonstrate an integrated approach to the design of any facility.

Consultants shall design facilities that are energy efficient and integrate Environmentally Sustainable Design principles into projects from the early concept phase, facilitating innovative design solutions that will provide managers and users of the facility with ongoing environmental, economic and social benefits well into the future.

Environmentally Sustainable Design principles are to be considered by all stakeholders throughout the development of the project and communicated and reported on effectively to the University.

This section of the Design Standard Guidelines is intended to be read and implemented in design in conjunction with **Section 01 – General** and any project specific brief and agreements.

9.1.2 Greenstar

All new buildings shall be designed to comply with the intent to achieve sufficient points towards obtaining a 5 Star Green Star rating on a self-assessed basis of the Green Star Education and/or Office tool.

A formal accreditation is not explicitly required; unless stated otherwise in the Design Brief. However, Environmentally Sustainable Design considerations are to be taken into account on all projects no matter how large or small they are.

9.1.3 NABERS NZ Rating

Buildings are to be designed to achieve the equivalent energy efficiency of a 4 Star NABERS commercial building (Energy) whole building rating (223kgCO2/m2/annum).

The Lead Consultant shall coordinate with the Electrical Engineer to ensure that electrical sub-circuits and metering is designed in order to support the provision of a Nabers NZ whole building rating.

9.1.4 Life Cycle Costing

Environmentally Sustainable Design initiatives are often 'value managed' out of the design and construction process as being too costly when the design and construction process is managed as a conventional property development. The University is not a conventional property developer since it will typically own a building from design, through refurbishment and or extension through to demolition.

Life cycle analysis should include the costs associated with using a low temperature heating solution in the building (either new build or refurbishment) covering upgrades to insulation and glazing as well as reductions in overall energy consumption.

Therefore, the University directly benefits from whole -of-life efficiencies that are not realised to a typical property developer.

9.1.4.1 Design Philosophy

Our buildings generally have a long-life span and are likely to be intermittently refurbished, including adaptation for other uses. The University aims to achieve the optimum balance between capital and operating costs for buildings, consistent with a constant level of quality and service throughout the lifetime of its buildings.

Throughout the design process, the design team is to consider the implications and estimates of costs for designs, materials, construction techniques, finishes, equipment and energy systems that will develop economies on a life cycle costing basis.

The design process must also consider the influence of climate change over the life cycle of the building and where this may have likely implication on building structure or operation this should be risk assessed and presented to the University of Canterbury Project Manager at the Concept Stage design review.

Whilst the question of any financial return on the capital outlay and final disposal value of these facilities is not to be considered in the project budget, all other principles governing the construction of a commercial building shall be given critical consideration. These principles shall be discussed with the University at an early stage in each project.

A report detailing life cycle cost options analyses should be prepared and made available to the University of Canterbury Project Manager at the Concept stage design review.

For life cycle costing analysis, the University recommends a 7.75% discounted rate over a life of 25 years. As a guide, a Whole-life cost or Life Cycle Cost Ratio of 1 : 0.5 : 12 (total cost of building : total annual maintenance 25 years : occupation costs over 25 years).

Consultants are also to provide a report on the suitability of utilising solar domestic hot water, photovoltaic (PV) cells, wind turbines, geothermal heat pumps and installations to harness renewable or low emission energy.

9.1.5 Management

9.1.5.1 ESD Consultant

The University requires the inclusion of an Environmentally Sustainable Design consultant on the design team for new buildings and major projects to prepare all reports and ensure that Environmentally Sustainable Design principles are considered by the design team throughout all phases of the project.

9.2 Design Concepts

9.2.1 Building Fabric

The thermal performance of a building envelope has a significant and ongoing impact on energy use and user comfort. Investment in improving the building envelope will provide long term benefits; consequently the University requires the thermal performance of the building to be above minimum compliance with regulations.

9.2.1.1 Insulation

The University requires that the energy performance of its buildings is better than that of the minimum requirements identified in current regulations.

Buildings must be thermally modelled to understand relative dynamic heat-losses and heat-gains from within and through the building envelope and consequently both external air-tightness and insulation should be coordinated to demonstrate the requisite superior thermal integrity and resistance to un-controlled inward and outward air leakage, whilst maintaining a suitable level of comfort for occupants. *Thermal insulation and glazing performance suitable for low temperature heat sources should be included in the thermal modelling.*

9.2.1.2 Glazing

To avoid discomfort from direct glare and unwanted heat gain, building façades must be designed so that for 80% of the working day (8am to 6pm) there is no direct sun entry.

Exterior windows on faces exposed to direct sunlight are to be fitted with Low-E double glazing to minimise unwanted heat transfer. *Thermally broken frames should also be incorporated in all circumstances.*

Reflective glass shall not be used, except in exceptional circumstances and only with the express approval of the University.

Natural daylight has been demonstrated through numerous studies to provide substantial productivity and wellbeing benefits to building occupants. To ensure the comfort and wellbeing of staff and students in University buildings, a minimum of 70% of the floor area of all offices, laboratories, teaching spaces (non-lecture theatres) and informal gathering spaces (eg. tea rooms) must achieve a daylight factor >2.0%, achieved at desk-height level (720mm above finished floor level). Spaces which have a specific use that preclude the provision of daylight (e.g. Laboratories that utilise Class 3a, 3b or 4 lasers) need not comply with this initiative.

9.2.2 Energy

9.2.2.1 Heating and Domestic Hot Water System

The University requires the most energy efficient design and subsequent provision of heating and domestic hot water systems.

Where a proposed building or occupied space requires a medium temperature hot water and/or low temperature hot water heating system, then the building should be connected to the existing campus central boiler plant.

HVAC heat emitters must be design to support potential low temperature operation.

Systems shall be designed to deliver the required temperature condition to each thermal zone and/or application and the appropriate quantity of domestic hot water to provide for the occupational welfare and possible catering requirements of that building or space.

All domestic hot water systems should be solar-boosted where the life cycle costing analysis can justify the installation.

9.2.2.2 Cooling

The University has a chilled water ring-main served by two chillers which are housed at the School of Biological Sciences and external to the Rutherford Building.

Where chilled water cooling is required, connection to a centralised chiller plant is required.

Any proposal to connect to the chilled water ring main must be made through the Engineering Services Department.

9.2.2.3 Renewable Energy Sources

Renewable energy solutions should be considered on all projects (new build and refurbishment) where appropriate and viable. All projects should also consider artesian cooling as the primary source and ground source heating. No new projects or major refurbishment projects should rely upon the central boiler plant or chillers for heating or cooling.

9.2.3 Water

9.2.3.1 Rainwater Harvesting

Rainwater collection is to be installed on all major projects and used within and around the building to replace use of potable water. Rainwater collection tanks are to be appropriately sized so that a minimum of two months average annual rainfall on the building can be captured, stored, and reticulated back to toilets to provide a minimum 50% of toilet water use.

9.2.4 Waste

9.2.4.1 Operational Waste

All developments must demonstrate achievement of the Green Star - Education v1 MAT-1 credit criteria.

9.2.4.2 Construction and Demolition Waste

A site specific Construction Environmental Management Plan (CEMP) is to be formulated to indicate the approach that will be taken to manage the immediate environmental impacts of construction.

9.2.5 Transport

9.2.5.1 Bicycle Parking

Adequate bicycle parking is to be provided in line with Green Star - Education v1 Tra-3 credit criteria.

9.3 Materials & Equipment

9.3.1 Volatile Organic Compounds

Refer to Architecture, Section 02 for information on materials.

Volatile organic compound (VOC) means any organic compound which has a vapour pressure more than 0.1mm Hg at 25oC.

Formaldehyde is a common VOC found in most engineered wood products (egg. MDF and chipboard). To reduce the off-gassing of formaldehyde within buildings, all engineered wood products must be low formaldehyde class E0 or better. This is required for all joinery, storage, doors and any other product that contains engineered wood products.

VOC's are found in many building products and are linked to irritation of the eyes, nose and throat, headaches, fatigue, asthma, liver and kidney disease and a major contributor to sick building syndrome.

All service providers are required to restrict paint, sealant and adhesive products specified and used to those that comply with the 'The New Zealand Ecolabelling Trust Licence Criteria for PAINTS EC-07-09', and 90% or more of the new adhesives and sealants used must meet the VOC limits set by the recognised GBCNZ, IAQ scheme for adhesives and sealants.

Contractors are also required to provide the University with product specific data sheet or MSDS which states the Total VOC (TVOC) content and test method used to determine the stated TVOC value available for use and review on site.

Service providers are to keep, and hand over, project specific supply documentation to demonstrate the products used on the project as part of the work as executed package.

9.3.2 Mechanical Fans and Pumps

All mechanical fans and pumps over 1kW are to be fitted with a variable speed drive (VSD).

9.3.3 Sanitary Fittings and Fixtures

Refer to the approved equipment schedule in **Section 01 - Appendix AA** for a list of sanitary fittings and fixtures approved for use at the University.

All fixtures and fittings are to have a minimum 3 star WELS rating.

Many electrical appliances are rated under the Energy Star rating system including dishwashers and washing machines, and these must also be WELS rated and labelled.

Where such appliances are purchased they must achieve, within .5 of a star of the highest rating possible in their class (e.g. if the highest rating possible for a dishwasher was 4 stars, all dishwashers purchased must be 3.5 stars and above).

9.3.4 Construction Materials

In general, preference will be given to NZ made products to reduce transport costs and associated carbon emissions.

The following materials are preferred in construction provided that structural design requirements can still be met.

9.3.4.1 Timber

Preference will be given to construction timber that is Forestry Stewardship Council (FSC) certified timber.

9.3.4.2 Concrete

Ensure that 20% of cement used for in-situ concrete and 15% of cement used for pre-cast concrete is to be replaced with industrial waste product.

9.3.4.3 Steel

All structural steel is to contain 10% recycled content.

Compliance Checklist

Project Name:	Date:
Submitting Consultant:	Design Stage:

Section 09 – Environmentally Sustainable Design

Compliance Checklist

		Complies	Does Not Comply	Not Applicable	Comments:
1.0	**Section 01 - General**				
#	All Clauses	☐	☐	☐	
9.1	**Overview**				
9.1.1	Purpose	☐	☐	☐	
9.1.2	Greenstar	☐	☐	☐	
9.1.3	NABERS NZ Rating	☐	☐	☐	
9.1.4	Life Cycle Costing	☐	☐	☐	
9.1.5	Management	☐	☐	☐	
9.2	**Design Concepts**				
9.2.1	Building Fabric	☐	☐	☐	
9.2.2	Energy	☐	☐	☐	
9.2.3	Water	☐	☐	☐	
9.2.4	Waste	☐	☐	☐	
9.2.5	Transport	☐	☐	☐	
9.3	**Materials & Equipment**				
9.3.1	Volatile Organic Compounds	☐	☐	☐	
9.3.2	Mechanical Fans and Pumps	☐	☐	☐	
9.3.3	Sanitary Fittings and Fixtures	☐	☐	☐	
9.3.4	Construction Materials	☐	☐	☐	

Date:	☐ Acceptable
University Reviewer:	☐ Acceptable subject to comments
Signed:	☐ Resubmission required