

TAFENSW



Lighting Services

Design Standard

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TAFE NSW would like to pay our respect and acknowledge Aboriginal and Torres Strait Islander Peoples as the Traditional Custodians of the Land, Rivers and Sea. We acknowledge and pay our respect to the Elders; past, present and emerging of all Nations.



TAFE NSW Strathfield TV Studio

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This document was commissioned by TAFE NSW and prepared by JHA Consulting Engineers (NSW) Pty Ltd

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This document is a design standard only. The project team retains responsibility for the coordination, design, procurement and delivery of lighting systems. This includes taking all reasonable steps to make sure that the lighting selection complies with all applicable Australian Standards required by the NCC, WHS Legislation, Statutory planning approval processes, TAFE NSW Procedures & Policies, and all other relevant statutory requirements.

Rev	Issue date	Issue	Amendments since previous issue
4	13 August 2021	Pre-final Draft	
5	17 August 2021	Pre-final Draft	As per Rev 4 review comments
A	20 August 2021	Final	WHS & Formatting
B	01 September 2021	Draft for reference	As per comments
C	10 November 2021	Final	Accessibility Review



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Introduction

1 Introduction

1.1 Overview

This document forms part of the TAFE NSW ITN Design Book and is to be read in conjunction with the overarching design principles described in the TAFE NSW ITN Design Principles, the TAFE NSW ITN Design Procedures and other relevant TAFE NSW Design Standards.

This Design Standard provides specific guidelines for the planning, design, operation and maintenance of lighting systems within built environment projects across TAFE NSW.

This Design Standard applies to a variety of physical environments including but not limited to new buildings, refurbishments or a cluster of learning areas within existing or new buildings.

1 Introduction

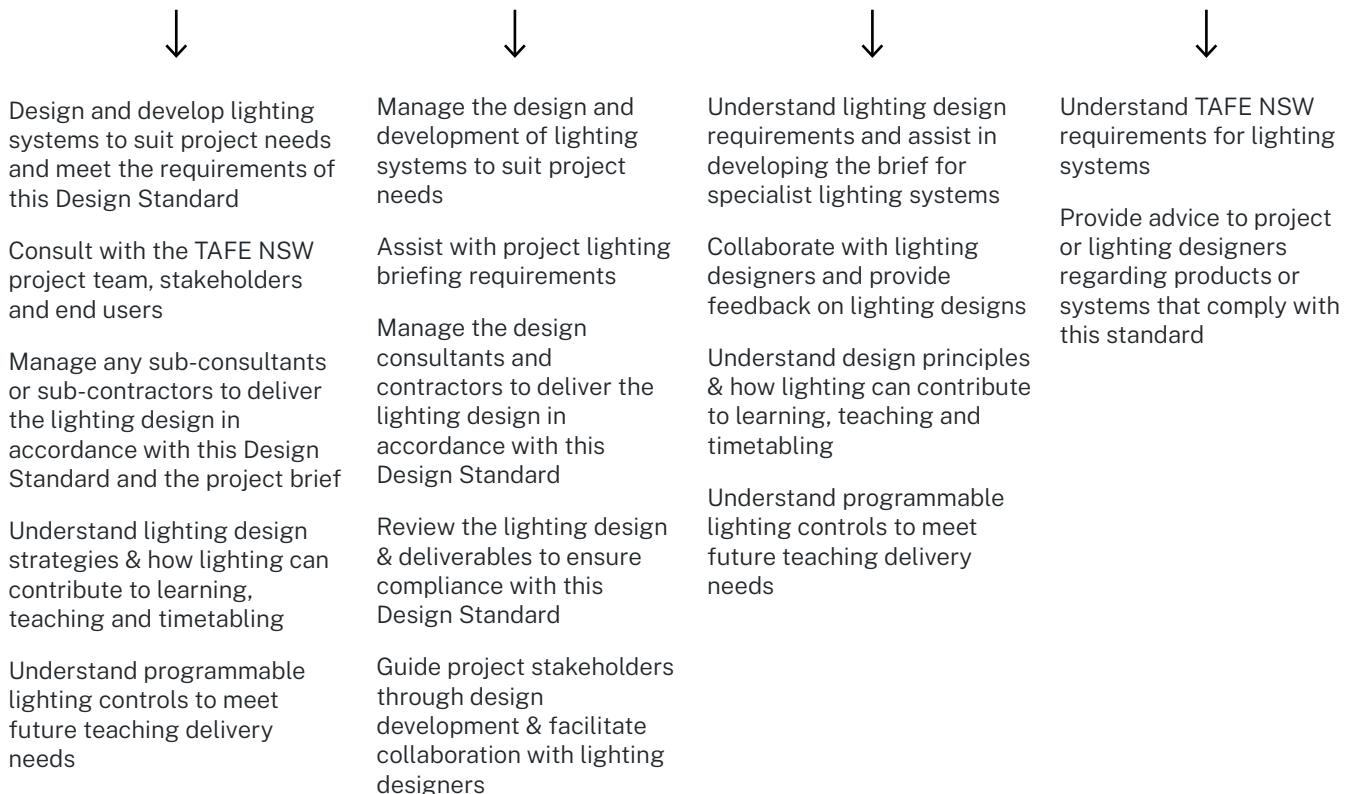
1.2 Audience

The diagram below broadly defines the diverse audience this Design Standard is written for and the roles they play through the design, selection and delivery process.

Who should use this Design Standard



How this Design Standard could be used



1 Introduction

1.3 Standards & Documents

The following standards and documents, as relevant to the project, should be read in conjunction with this Design Standard when designing, documenting & delivering lighting systems. This list is not exhaustive and other documents may apply.

1.3.1 External Requirements

Statutory Requirements

The planning and design must incorporate the relevant requirements as stipulated by the following Statutory Authority bodies:

- State Environmental Planning and Assessment Legislation
- All Commonwealth, State and Local Government Legislation
- Any conditions of consent identified through the statutory approvals process
- Insurance Council of Australia
- Fire & Rescue NSW
- Australian Communication Authority
- National Construction Code/ Building Code of Australia
- Principal Certifying Authority (person qualified to conduct a Certification of Crown Building Works)
- NSW Wiring and Installation Rules
- Clean Energy Council
- Work Health and Safety Act
- Disability Discrimination Act
- Safe Work NSW Authority Requirements
- Any other authority having jurisdiction

External Certification Schemes

- Green Building Council of Australia (GreenStar) and other recognised certification schemes (eg. GECA, etc)

NSW Government Policies

- Workplace Design Principles (NSW Department of Planning, Industry and Environment)
- NSW Climate Change Policy Framework
- Better Placed-Design objectives for NSW (Government Architects NSW)
- NSW Government Resource Efficiency Policy (GREP)

1 Introduction

1.3 Standards & Documents

1.3.2 TAFE NSW Requirements

TAFE NSW Interconnected Training Network Design Book

- Interconnected Training Network Design Principles
- Interconnected Training Network Design Procedures
- Other Design Standards relevant to project

TAFE NSW Policies

- Environmental Sustainability Policy
- Reconciliation Action Plan
- Diversity and Inclusion Policy
- Work Health and Safety Policy
- Disability Inclusion Action Plan and Implementation guide

1 Introduction

1.3 Standards & Documents

1.3.3 Standards

The following Australian and New Zealand standards must be incorporated within the lighting system design:

Code Standards	Description
Australian Standard AS 1428.1 & 1428.2	General Requirements for access – Premises
Australian Standard AS/NZS 3000	Wiring Rules
Australian Standard AS/NZS 1680	Interior lighting
Australian Standard AS/NZS 2293	Emergency lighting and exit signs for buildings
Australian Standard AS /NZS 1158	Lighting for roads and public spaces
Australian Standard AS/NZS 4282	Control of the obtrusive effects of outdoor lighting
Australian Standard AS/NZS 3100	Approval and Test Specification -General requirements for electrical equipment (Parent specification for essential safety requirements)
Australian Standard AS/NZS 3112	Approval and Test Specification -Plugs and Socket Outlets
Australian Standard AS/NZS 3760	In-service Safety Inspection and Testing of Electrical Equipment
Australian Standard AS/NZS 1170.4 Section 8	Seismic Restraints Performance of Non-Structural Components
Australian Standard AS/NZS 60065	Audio, Video and Similar Electronic Apparatus - Safety Requirements
Australian Standard AS/NZS 60529	Degrees of protection provided by enclosures (IP Code)
Australian Standard AS/NZS 61000.6.1	Electromagnetic Compatibility (EMC) -General standards: Immunity for Residential, Commercial and Light Industrial Environments
Australian Standard AS/NZS 61000.6.2	Electromagnetic Compatibility (EMC) -General standards: Immunity for Industrial Environments
Australian Standard AS/NZS 61000.6.3	Electromagnetic Compatibility (EMC) -General standards: Emission Standard for residential. Commercial and light-industrial environments
Australian Standard AS/NZS 61000.6.3	Electromagnetic Compatibility (EMC) -General standards: Emission Standard for residential. Commercial and light-industrial environments

1 Introduction

1.4 Definitions

1.4.1 Abbreviations

Abbreviation	Description
AFFL	Above Finished Floor Level
AS	Australian Standard
AS/NZS	Australian/New Zealand Standard
AV	Audio Visual
BACS	Building Automation and Control System
BCA	Building Code of Australia
CRI	Colour Rendering Index
DALI	Digital Addressable Lighting Interface is an open protocol standard used to control luminaires
DB	Distribution Board
DIN	Switchboard industry standard rail mounting system for control and metering equipment
DSI	Digital Signal Interface (DSI) is a protocol for the controlling of luminaires (electrical ballasts)
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
FIP	Fire Indicator Panel
IT	Information Technology
IK	Ratings are an international numeric classification to indicate the degrees of protection provided by enclosures for electrical equipment against mechanical impact
IP	Ingress Protection rating is a numerical two digit code to indicate the degree of dust and moisture provided by an enclosure of electrical equipment
ITN	Interconnected Training Network
MSB	Main Switchboard
KNX	Open Protocol for building automation
LED	Light Emitting Diode
NTTA	National Association of Testing Authorities
NCC	National Construction Code of Australia
PIR	Passive Infrared sensor
QA	Quality Assurance
RCD	Residual Current Device
WHS	Workplace Health and Safety

1 Introduction

1.4 Definitions

1.4.2 Terms

Terms	Description
Colour rendering Index	The measure of the ability of light source to reveal colours in comparison to natural light source.
Correlated Colour Temperature	Correlated colour temperature defines the warmth or coolness of the white light produced
Lamp Depreciation	The derating factor applied in accordance with AS1680 to luminaires over a the maintenance period
Lumen	Measure of light emitted by the lamp source
Luminaire	The housing construction to accommodate the light source, reflector, diffuser, hardware, wiring, control gear and the like to allow suitable mounting and provide safe operation.
Lux	Measure of lumens falling on an area
This Design Standard	TAFE NSW Lighting Services Design Standard

Applications

2 Applications

2.1 Scope

2.1.1 How This Design Standard Applies

Compliance

This Design Standard is intended to support and assist the selection, design and procurement of lighting systems. It is expected that projects must comply with this Design Standard.

This Design Standard must also be read in conjunction with:

- Statutory and legislative requirements
- Contractual Agreement with TAFE NSW
- The Project Brief and relevant project requirements
- Any other TAFE NSW Design Standards

Where there is a conflict between this Design Standard and any statutory or legislative requirement, the higher standard applies.

Mandatory/Must

Where the word “must” is used, this indicates that a statement is mandatory.

Preferred/Should

Where the word “should” is used, this indicates that a statement is a recommendation.

Contractual Responsibility

The contents of this Design Standard does not relieve any consultant, contractor or supplier from their contractual responsibility relevant to the project.

It remains the responsibility of the consultant, contractor or supplier to fully complete, coordinate and identify any errors or omissions in the documentation produced for the lighting design.

Queries

Any project specific queries are to be raised through the TAFE NSW project lead, or project manager as applicable.

If this document appears to contradict or deviate from good industry practice or any statutory requirements, this is to be brought to the attention of the TAFE NSW project lead responsible for the delivery of the lighting design project.

2 Applications

2.1 Scope

2.1.2 Lighting Systems Covered By This Standard

This standard outlines the lighting system provisions as follows:

1. Luminaire construction
2. LED modules
3. LED drivers
4. Interior lighting systems
5. Exterior lighting systems
6. Lighting control systems
7. Lighting control interface
8. Emergency and exit lighting

2.1.3 Other Lighting Systems

In addition to general lighting design covered by this Design Standard, lighting designers must liaise, consult and collaborate with TAFE NSW stakeholders and user groups to include specific lighting design, operation and maintenance requirements for the following faculty specialist areas:

1. Engineering and electrotechnology systems
2. Welding, fitting, machining, metal fabrication, carpentry and other building services trades
3. Hospitality and food preparation
4. Laboratory and science preparation
5. Nursing, dental, Allied Healthcare and research areas
6. Photography and film, TV, digital media
7. Vehicle painting, automotive trades
8. Printing, graphic arts
9. Watchmaking and detailed working
10. EDI/theatre spaces
11. Horticulture/greenhouses
12. Dangerous goods and hazardous material storage areas
13. Visual merchandising and retail tenancies
14. Multiple use learning spaces
15. Any other specialist faculty or learning areas not covered by this Design Standard

2 Applications

2.2 Project Application

2.2.1 Project Types

This Design Standard is intended to guide the lighting design and delivery of a variety of physical environments including but not limited to the project types below.

Major Capital Works & Special Projects

1. All new building and major refurbishment projects must comply with this Design Standard
2. Lighting, lighting controls and emergency lighting must be consistent throughout the entire building project
3. All existing electrical distribution switchboards, lighting controls, emergency and exit lighting and associated wiring and cable management infrastructure must be assessed for suitability, capacity and compatibility with new works. Where assessed as not suitable, replace with new

Minor Works

1. All building alterations, additions and major luminaire replacement programs must comply with this Standard
2. Lighting, lighting controls and emergency lighting must be consistent throughout the entire project fitout area. Every effort should be made to integrate the fitout with the adjoining areas, in particular meeting the statutory emergency and exit lighting requirements
3. All existing electrical distribution switchboards, lighting controls, emergency and exit lighting and associated wiring and cable management infrastructure must be assessed for suitability, capacity and compatibility with new works. Where assessed as not suitable, replace with new

Mini-minor Works

1. All minor fitouts of buildings and luminaire replacement programs should make every effort to comply with this standard
2. Lighting, lighting controls and emergency lighting must be consistent throughout the entire project fitout area. Every effort should be made to integrate the fitout with the adjoining areas, in particular meeting the statutory emergency and exit lighting requirements
3. Utilise spare capacity available or provide additional modules to connect to existing electrical distribution switchboards, lighting controls, emergency and exit lighting and associated wiring and cable management infrastructure. Provide additions and modifications that are compatible and of suitable capacity to accommodate the proposed project requirements.

2 Applications

2.2 Project Application

2.2.2 Project Stages

This Design Standard is to be used for the whole life cycle of the project. Depending on the user and project type, the requirements in this guideline should be used in all or only select stages.

2.2.3 Project Designer

The lighting designer or consultant must be an experienced and suitably qualified lighting designer covered by professional indemnity and public liability insurance in accordance with the TAFE NSW contract and relevant industry requirements.

At the completion of the briefing stage and at every design stage, the lighting designer must obtain endorsement of the proposed lighting design from the TAFE NSW project team to proceed to the next stage.

In addition to the project deliverables, the lighting designer has the following obligations:

- Review of all documents and specifications provided by the installer to ensure the installation complies with the agreed design
- Review of samples provided by the installer to maintain quality of the installation in accordance with the design

2.2.4 Project Installer

The lighting installer or contractor must be an experienced and suitably qualified lighting installer covered by professional indemnity and public liability insurance in accordance with the TAFE NSW contract and any relevant industry requirements.

At the completion of every design stage, the lighting installer must obtain endorsement of the proposed lighting design from the TAFE NSW project team in order to proceed to the next stage.

In addition to the project deliverables, the lighting designer has the following obligations:

- To provide detailed on-site measurement, co-ordination with building elements and other services to establish final set-out, location of equipment allowing for maintenance access envelope requirements
- To provide detailed programs including milestones indicating shutdowns, temporary requirements to maintain occupancy, staging of works and commissioning prior to handover
- To provide manufacturer's workshop, equipment specifications and construction drawings, schedules and details

2 Applications

2.3 Project Design Documents

2.3.1 Designer Deliverables

The lighting designer or consultant must prepare and submit all reports, design documents and certification as required to fully describe the design and to suit the scale and complexity of the project. The minimum documentation is as indicated below:

Site investigation and audit report must include:

A comprehensive detailed site investigation and audit is undertaken for the entire existing lighting system and associated control provisions, lighting controls and interface facilities within all existing switchboards serving the lighting systems, including:

1. The condition, assessment and compatibility for the intended existing equipment and/or system suitable for use
2. A due diligence review of any non-conformances to any applicable standards and authority requirements
3. List all non-compliance items with TAFE NSW standards and/or any other reference documents provided
4. Any site constraints, potential hazards or risks
5. Outline the findings, outcomes and recommendations

Return Services Brief must be prepared and submitted to include:

1. Identify and qualify the strategic deliverables achieved
2. Incorporate all site audit investigation findings and outcomes
3. Indicate demolition, disconnection, making safe, dismantling and de-commissioning of existing redundant systems
4. Identify site storage, disposal and removal of redundant lighting systems and their associated control and wiring requirements
5. Outline staging of works in accordance with the construction deliverables satisfying stakeholder and user group requirements
6. Investigate temporary construction lighting requirements and indicate origin, maintaining reliability and availability of lighting systems to buildings satisfying user group requirements
7. Ensure all luminaire spatial considerations including maintenance envelopes of the luminaire and associated driver control gear are considered and incorporated within layouts
8. Outline findings in liaison with TAFE NSW stakeholder and user groups and all other design consultant input for each general lighting system provision and each specific area requirement
9. Identify all existing areas where fluorescent or the like non-LED luminaires and associated controls can be replaced with LED and provide list of energy saving certificate providers for contractor to engage and submit on behalf of TAFE NSW
10. Identify Green Star lighting initiatives and their design requirements
11. Outline spare capacity and modular addition spatial considerations
12. Outline coordination of all lighting system provisions to outline demarcation with interfaces and in connection with other trades
13. Nominate sample submission requirements and applicable warranties of proposed equipment
14. Describe a comprehensive labelling methodology

2 Applications

2.3 Project Design Documents

15. Confirm compliance with mandatory standards and regulatory authorities
16. Confirm compliance with this Design Standard and any other relevant TAFE NSW standards
17. Provide a list of where there is any ambiguity, conflicts or discrepancies and highlight these within the design brief

Budget Cost Summary must be prepared and submitted identifying costs for all lighting systems at each specific area in accordance with the return services brief. Any assumptions and exclusions are to be itemised.

For all fitout and refurbishment projects provide a separate costing schedule for the replacement of existing fluorescent or other non-LED luminaires with LED luminaires and associated controls. Allow for the engagement of an energy saving certificate service provider and prepare documentation for TAFE NSW submission and approval.

Any proposed alternate innovative lighting solutions must undertake a cost/benefit analysis study. This must identify capital costs, ongoing energy and maintenance costs, along with a qualitative analysis illustrating the reliability, longevity, and maintenance regime for the proposal. Offer a fair, comparative assessment of the capital and operational costs of this alternative solution when compared with the applicable specified provisions.

Design Calculation Report must be prepared and submitted identifying lighting design criteria provided, photometric calculations, NCC/BCA Section J calculations and associated control methodology.

Risk Management Report must be prepared and submitted identifying:

1. Safety in Design requirements for construction, operation and maintenance
2. The origin of all identified risks
3. Any work to be carried out in hazardous and confined spaces
4. Asbestos retention and/or removal
5. Hazardous goods handling and storage areas
6. Any specific stakeholder requirements
7. Any insurance risk requirements
8. Potential latent conditions including the process for early resolution to agree costs involved prior to proceeding with works and to avoid/mitigate construction delays

Design Certification must be submitted to the Principal Certifying Authority (person qualified to conduct a Certification of Crown Building Works) in accordance with the NCC/BCA, statutory and regulatory authority requirements, this Design Standard and any other relevant TAFE NSW standard.

2 Applications

2.3 Project Design Documents

Specification and Documentation must incorporate and further develop the detail of the lighting system design requirements of all relevant report findings and outcomes, along with the inclusion of the following as a minimum:

1. Address the design principles and strategies of this Design Standard
2. Address the project specific strategies
3. Comprehensive project specific scope of lighting systems, luminaire schedule and all associated technical requirements
4. Detailed demarcation requirements of interface and associated works
5. Compliant with this Design Standard, all other relevant TAFE NSW standards, all statutory and regulatory authority requirements in accordance with certifications provided
6. Co-ordinated with the latest reference documents and each trade services design input
7. Commissioning, testing and quality monitoring framework during the construction works
8. TAFE NSW staff training and handover procedures
9. Identify working and final documents and record requirements
10. Identify a comprehensive list of Operating and Maintenance Manual requirements

2.3.2 Installer Deliverables

The lighting installer or contractor must prepare and submit all reports, design documents and certification as required to suit the scale and complexity of the project. The minimum requirements for deliverables are as indicated below:

Samples: Submit all specified luminaire and all lighting control devices, switches and panel samples and in addition any installer proposed alternative samples for review and comparison by the design team.

Alternative Design Verification: Where alternatives are proposed, provide an alternative design assessment report indicating compliance with the lighting design intent and design criteria. Provide all supporting technical data, photometric calculations, NCC/BCA Section J calculations and associated control methodology which must be in compliance with statutory requirements.

Risk Management Report is to be prepared and submitted identifying:

1. Safety in Design requirements for construction, and installation
2. The origin of all identified risks
3. Any work to be carried out in hazardous and confined spaces
4. Any potential electrical hazards
5. Asbestos retention and/or removal
6. Hazardous goods handling and storage areas

Interruption of Supply notices: Notice of interruption of supply is to be submitted for acceptance when undertaking any planned interruption of supply to existing areas of an occupied building.

2 Applications

2.3 Project Design Documents

Commissioning and Testing: The electrical contractor must develop and submit a project specific commissioning and testing plan in accordance with their quality assurance plan. This must be consistent with the builder's construction program including:

1. All defined staged handovers of area
2. All milestones
3. Notice for witness upon completion of all acceptance testing and commissioning activities
4. Completion of all mandatory site tests in compliance with standards and authority requirements
5. Detail of testing for each system and associated sub-component
6. All acceptance testing and commissioning records and certificates
7. All commissioning and test reports and certificates indicating observations and results of tests, commissioning and compliance or non-compliance with statutory authority requirements
8. All final and acceptance test records in suitable format for the inclusion in Operating and Maintenance manuals
9. A twelve month building tuning process must be provided for the remote emergency lighting monitoring system with the commencement at handover to TAFE NSW with the systems monitoring and monthly reporting reviewed and assessed each three month period to include feedback from the TAFE NSW staff

Workshop Drawings: Submit further developed detailed design drawings, addressing method of installation, mounting and fixing, circuiting referencing to circuit breaker termination, switching and grouping address, temporary works and staging, minor alterations in construction, approved value engineering initiatives and alternative designs.

As-built Drawings: Submit As-installed drawings, circuiting matching switchboard schedules, illustrating as-installed mounting and fixing details.

Warranties: Submit all lighting installation and associated control warranties.

Operating and Maintenance Manuals: Prepare and submit operating and maintenance manuals in accordance with the project specific contract documents. The following lighting specific detailed requirements must be provided:

1. Table of contents: As per contractual requirements
2. Directory: As per contractual requirements
3. Format: As per contractual requirements
4. Installation description: General description of installation
5. Systems descriptions: Technical description of the systems installed, written to ensure that the Proprietor's staff fully understands the scope and facilities provided. Identify function, normal operating characteristics, and limiting conditions
6. Systems performance: Technical description of the mode of operation of the systems installed

2 Applications

2.3 Project Design Documents

7. Certificates:

- Product certification
- Contractor Fire and Smoke sealing penetrations certificate
- Contractor Acoustic sealing of penetration certificate
- Seismic Restraint mounting certification
- Calibration certificates at acceptance testing and final testing
- Design certificates demonstrating compliance to TAFE NSW Standards, all statutory & authority requirements, and the NCC
- Installation certificates to TAFE NSW Standards, all statutory & authority requirements, and the NCC
- Supply authority completion forms, inspection records and contractor rectification records

8. Drawings and technical data: As necessary for the efficient operation and maintenance of the installation

9. Equipment descriptions:

- Name, address and telephone and facsimile numbers of the manufacturer and supplier of items of equipment installed, together with catalogue list numbers
- Schedules (each area type) of luminaires and associated control equipment including:
 - Identification of locations, lighting control requirements and settings, performance figures and dates of manufacture. Provide a unique code (Asset) number
 - Cross-reference to the record and diagrammatic drawings and schedules, including easy to find replacement parts schedule, for each item of equipment installed
 - Manufacturers' technical literature for luminaires and associated control equipment installed, assembled specifically for the project, excluding irrelevant matter. Mark each luminaire and control device product data sheet to clearly identify specific products and component parts used in the installation, and data applicable to the installation
- Generic brochures are not acceptable, project specific luminaire and control device cut sheets to be provided
- Mounting and fixing product data to illustrate relations of component parts. Include typed text as necessary

10. Manufacturer's product data for proprietary equipment, including:

- Technical specifications and drawings
- Verification Reports
- Performance and rating tables
- Recommendations for installation and maintenance
- Schedule of proposed major products that are not specified as proprietary items
- Product certification

11. Operation procedures:

- Manufacturer's technical literature as appropriate
- Safe starting up, running-in, operating and shutting down procedures for systems installed. Include logical step-by-step sequence of instructions for each procedure including automatic and manual control override procedures

2 Applications

2.3 Project Design Documents

- Programmable time clock schedule of setting established at acceptance and final commissioning and testing; making reference to building and room numbering
- Schedule of Settings of sensor time delay established at acceptance and final commissioning and testing
- Program Time clock settings and procedures for occupied and student vocational periods
- Lighting control schedule of switching or grouping addresses, dimming settings, time delay settings after acceptance testing and after final testing making reference to building and room numbering
- Control sequences and flow diagrams for systems installed
- Formulate lighting system and controls building user interface guide to include all operating instructions to enable full functionality in a reliable, energy efficient, ergonomic and safe operation

12. Maintenance procedures:

- Manufacturer's technical literature as appropriate. Register with manufacturer as necessary. Retain copies delivered with equipment
- Detailed statutory emergency and exit lighting maintenance testing and recording within logbook to AS/NZS 2293, frequency and procedures which must be adopted by the TAFE NSW maintenance contractors to ensure the operation of the systems installed to satisfy AS/NZS 2293 and NCC/BCA requirements
- Safe trouble-shooting, disassembly, repair and reassembly, cleaning, alignment and adjustment, and checking procedures. Provide logical step-by-step sequence of instructions for each procedure
- All luminaires, control driver gear and lighting control device items, local sources of supply, and expected replacement intervals up to a running time of 50,000 hours
- Instructions for use of tools and testing equipment
- Emergency procedures, including telephone numbers for emergency services, and procedures for fault finding

13. Records and Documents:

- All construction drawings must be revised to ensure inclusion of all additions, modifications and alterations during the construction stage to be submitted As-built drawings, to same scale and format
- All workshop drawings must be revised to ensure inclusion of all additions, modifications and alterations during the construction stage to be submitted As-built drawings, to same scale and format
- All lighting systems and control schematics, electrical wiring diagrams
- Switchgear and control gear assembly circuit schedules serving lighting systems and associated controls including electrical service characteristics, controls and communication protocols
- All luminaire and lighting control equipment lists and operation schedules.
- All licensed versions of computerised software required to program and monitor systems
- All security code access, usernames and passwords, configuring, data base and recovery protocols stored in digital format on an external hard drive, required to reset and access all lighting control equipment and software
- Equipment asset numbered schedules, identifying condition and use with unique label

2 Applications

2.3 Project Design Documents

14. Commissioning and Testing Records

- Provide all commissioning and testing record
- Contractors completed self-regulated inspection & test plans for the lighting systems installed
- Completed logbooks and the like

15. Warranties

Minimum five year warranties must be provided for:

- All luminaires
- LED DALI drivers
- Lighting DALI control devices
- Occupancy detectors
- Light switches and lighting control panels
- User interfaces
- Emergency and exit lighting with self-contained batteries

Installation Certification is to be submitted to the Principal Certifying Authority/Crown Certifier in accordance with design documents, NCC/BCA, statutory and regulatory authority requirements, this Design Standard and any other relevant TAFE NSW standard.

Design Strategies

3 Design Strategies

3.1 Design Strategies

3.1.1 User Wellbeing

Create a comfortable and safe environment for occupants with friendly user interfaces that are readily accessible.

Strategy	Requirement
Safety	Identify potential hazards through risk assessments and implement safe installation, operational procedure and ongoing maintenance methods
Safe access	A method of safe access for internal and external lighting installations must be established for periodic cleaning, repair or replacement of equipment
Accessibility	Create an environment that promotes equitable access for all users regardless of ability. User lighting controls to be accessible and clear from any obstructions
Visual Comfort	Achieve a uniform lux level for the intended task area, mitigate glare and even distribution of light in contrast to the surrounding surfaces
User Interface	Enable easy user-friendly interface with non-technical operating instructions to facilitate intended use

3 Design Strategies

3.1 Design Strategies

3.1.2 Adaptability

Lighting design to be consistent, compatible, accommodate environmental conditions, and facilitate multifunction use and future growth requirements.

Strategy	Requirement
Consistency	Consistency of manufacture and model type within adjoining areas, rooms or areas within the building to be accommodated and compliment the architectural building fabric, elements and aesthetic interior design. Address items of heritage significance
Compatibility	Accommodate existing installation ceiling type, penetrations, control and interfacing requirements, site conditions and be designed to be suitable for the area intended
Future growth	Allow a modular system framework allowing readily available future expansion
Multi-function	Location, type of user interface control, and installation method to allow adjustable orientation and mounting position for flexible user operation
Environment	Address the longevity of the installation subject to the environmental conditions of the area such as high ambient temperatures, dust, moisture and/ or impact on luminaires, lighting controls and the like
Operation	Provide consistent approach to operation and automation of the lighting systems across the project, building or campus as appropriate

3 Design Strategies

3.1 Design Strategies

3.1.3 Understanding Context

Address the project scope and construction, cost, maintenance, sustainability and quality requirements.

Strategy	Requirement
Project Type	Facilitate the specific project scale, site conditions and campus location
Construction	Resilient and robust construction to allow reliable use within the installed environment
Cost	Undertake a holistic cost-effective design approach to mitigate procurement, installation method, and ongoing maintenance costs and support the longevity of the proposed lighting installation
Maintenance	Facilitate ongoing monitoring procedures, selection to allow for the readily available procurement from local suppliers and enable installation within a built environment without any access constraints or the need for dismantling or demolition
Sustainability	Achieve an efficient power density (W/m ²) for the lux level requirement in conjunction with energy saving lighting control initiatives to mitigate operational energy consumption
Energy efficiency	Achieve any energy efficiency targets or strategies listed in TAFE NSW standards, NSW Government requirements, Greenstar initiatives, ESD reports or statutory approvals conditions of consent
Quality	Assess, evaluate and verify performance, method of installation, commissioning and testing to meet functional and operation requirements and achieve longevity of the installation in accordance with warranties provided
Security	Address site specific security requirements including Crime Prevention Through Environmental Design Principles

Technical Sections

4 Technical Sections

4.1 Lighting

4.1.1 Summary

The lighting design must be provided in accordance with the Design Standard to all works including:

1. New building works
2. Renovations or refurbishment of existing buildings
3. Minor and Major lighting replacement programs

The design of the lighting system for all internal and external areas will incorporate the following luminaire components:

1. Utilise latest proven LED technology
2. A low-profile body shape consistent with architectural design
3. Finish to be aesthetically pleasing to compliment decor
4. Preference should be given to selecting light fittings that are eligible for Energy Savings Certificates
5. Diffusers and reflectors must be easily removable without risk of damage and selected for visual comfort, glare control, and beam spread to satisfy the functional lighting requirements
6. Beam spread to facilitate the area illuminated to achieve uniformity without over illumination of functional lighting requirements of the area served
7. A uniform colour temperature within a room or area
8. Consistency with DALI control gear to accommodate smart control requirements.
9. Robust construction, impact resistant (IK rating), suitable dust and moisture sealing (IP rating), chemical resistance, installation to allow dissipation of heat and promote longevity of the luminaires to accommodate the environmental conditions of the area served
10. Manufactured to be of quality design, resilient, reliable and energy efficient
11. Consider luminaire and associated accessories are readily availability from local suppliers and distributors, in particular for regional areas
12. Contain NO harmful or hazardous materials or substances and is environmentally friendly to dispose of

The luminaire installation and mounting method are to be in accordance with the functional, operational and maintenance requirements of each room, area or building, in compliance with the design requirements.

4 Technical Sections

4.1 Lighting

4.1.2 Design

Design Requirements

The lighting design must incorporate:

1. Adequate lighting level, uniformity and visual comfort conditions required for students and staff within specific learning spaces
2. Minimal energy usage and without excessive maintenance
3. User friendly local and remote controls
4. An aesthetically architectural approach to compliment internal décor and draw attention to external significant elements
5. Interface to other building services such as security, FIP, BACS and the like

Visual comfort and contrast management lighting design must be considered with a focus in illuminating vertical surfaces of the rooms in the space to compensate for external glare sources.

The room layout must be arranged to minimise the effect of window glare.

Generally, designers must use 0.8 light loss factors in their calculations as a minimum within clean air conditioned learning spaces and otherwise must provide light loss factor derived in accordance with AS/NZS1680 allowing for a five year maintenance cycle.

Otherwise, lighting designs should be based on the best information available. Lighting designs must be based on the photometric data for the specific luminaire and lamp combination proposed and reflectance of room surfaces based on the actual colours proposed.

Layout within rooms comprising of ceiling fans must consider the configuration of luminaires so that any resultant strobing is eliminated.

Irrespective of the room colours used, the reflectance used in the calculations must not be higher than noted in *Table 1: Maximum Design Reflectance*, unless project specific specialised requirements are identified.

4 Technical Sections

4.1 Lighting

Table 1 Maximum Design Reflectance

Space	Maximum Ceiling Reflectance	Maximum Wall Reflectance	Maximum Floor Reflectance
Lecture Theatre	0.7	0.6	0.1
Connected Delivery Spaces	0.7	0.6	0.1
Connected Learning Spaces	0.7	0.6	0.1
Open and Enclosed Office areas	0.7	0.6	0.1
Laboratory Areas	0.7	0.6	0.1
Corridor Areas	0.7	0.6	0.1
Specialty Areas (Dry)	0.7	0.6	0.1
Specialty Areas (wet)	0.5	0.3	0.1
Amenities	0.7	0.5	0.1
Plantroom Areas	0.5	0.3	0.1

Illumination

The lighting design must avoid under or over-illumination by co-ordinating with all design requirements to ensure furniture and wall/ceiling reflection factors are modelled correctly. While it is acknowledged that physical limitations require some tolerance in illumination, excessive over-illumination is not acceptable.

The acceptable range for the average maintenance illuminance in a space, after compensation for the light loss factor, is +15% to satisfy uniformity or the minimum number of additional lights that can be added within the limitations of the luminaire layout, whichever is the lesser.

Where a relatively small portion of the space has higher illumination requirements, task lighting should be used rather than increasing the general illumination of the space.

Calculations

Internal and external lighting design photometric lux level calculations must be performed utilising computer modelling AGI Software in accordance with:

1. AS/NZS 1680 for internal average lux levels and uniformity
2. AS/NZS 1158 for external average lux levels and uniformity
3. AS/NZS 4282 for external obtrusive lighting requirements
4. NCC/BCA section J for energy density calculations
5. Greenstar to achieve comfort and energy efficiency initiatives

4 Technical Sections

4.1 Lighting

Location

Multi-function Areas

Track lighting systems incorporating plug-in type adjustable luminaires are to be provided within the multi-function spaces to enable flexible lighting solutions for a variety of specific learning requirements.

Specialist Areas

The lighting design must include local hard wired task lighting provisions to cater for specific applications where high maintenance illumination levels, over 320 lux, are required and /or to avoid shadowing from ceiling mounted lighting.

The lighting designer must implement task lighting within the following locations as a minimum:

1. Specialised machine equipment
2. Hospitality cooking and food preparation areas
3. Local bench areas requiring high illumination levels for fine detailed tasks
4. Examination area lighting
5. Under kitchen bench joinery
6. Workstations to underside of shelving
7. Lectern location

The lighting designer is encouraged to develop lighting design solutions that promote the use of hard wired task lighting to reduce excessive lighting within surrounding corridor and circulation areas.

Existing Ceilings

Luminaires to be retained within existing ceilings must be of LED lamp technology with a further assessment undertaken on their condition, location, relevant application and proposed refurbishment or fitout of the space.

Replace all existing non-LED luminaires with new LED luminaires and prepare all documentation required to submit applications to redeem energy saving certificates.

Heritage Ceilings

In consultation with the architect and heritage consultant identify limitations in locating luminaires.

Avoid up lighting to heritage ceilings.

4 Technical Sections

4.1 Lighting

4.1.3 Components

The designer must incorporate the following lighting functional and operational requirements in accordance with the application and scale of the project. Refer to *Table 2 - Schedule of Lighting Requirements* to establish the requirements for each type of space.

Light Sources

TAFE NSW projects must utilise LED lamp technology only.

For all existing installations within the project scope, luminaires must be replaced with LED lamp technology in accordance with this Design Standard where the existing light sources are not LED type, are found faulty, or have inadequate lighting performance. Adjacent areas to project scope such as corridors may also be included where agreed in the project brief.

Life of the LED in the complete luminaire must be L70 to IES LM-80-2008,

Colour rendering index:

- General CRI > 80.
- Specialist Areas: CRI>90

Unless otherwise documented in luminaire schedule.

IES LM-80-2008, for the rating of the life of LEDs links life to the lumen maintenance at the LED end of life.

A rated life to L70 is the time to reach 70% lumen maintenance irrespective of the eventual failure.

Colour Temperature

All internal areas must incorporate 4000k colour temperature within all learning areas and delivery areas adjacent to any learning area. A 5000k colour temperature may be considered where a learning area is subject to a large amount of daylight contribution or is required within the workshop environment. This must be identified in the return brief.

Colour temperatures must be consistent throughout the project, whether the scope includes the building envelope, area or room. Consideration of consistent colour temperature within adjacent areas where there are large openings to corridors or foyer areas are to be included within the return brief.

Glare Control

Luminaires must be selected to achieve the glare control requirements indicated within AS/NZS 1680, while still illuminating the vertical surfaces.

Supplementary lighting is encouraged in the form of wall washing, to accommodate contrast management of vertical surfaces to reduce gloom rather than increasing the illumination over the entire area.

Glare control must be achieved by reflector and refractor design of luminaire and not by methods that significantly reduce the light output of the luminaire.

4 Technical Sections

4.1 Lighting

Low brightness fittings must use semi-specular, high purity aluminium reflectors.

Micro-prismatic lens panels must incorporate a transmittance and high internal reflector reflectance.

“Soft tone” luminaires may be used provided that they achieve the required light output and glare control.

Eggcrate and silvertint refractor panels are not acceptable.

The Glare Index values specified in *Table 2 Schedule of Lighting Requirements* must be calculated as specified in AS1680.1 Internal Lighting Part 1: General principles and recommendations. The reference points for calculation must be confined to locations where students or staff are reasonably expected to be located to undertake the task required in the room.

Control Gear

DALI control gear must be used for all LED luminaires where a smart lighting control system or dimming application is implemented as indicated in lighting control section below.

The LED control gear must incorporate:

1. A driver current operation between 500mA to 750mA
2. Less than 10% energy loss factor
3. At least Five (5) year warranty

Where there are no smart controls or dimming applications required, Electronic ballasts must have the following characteristics:

1. Warm or soft start period of > 0.8 seconds
2. Power factor > 0.95
3. Switch off of defective lamps and automatic restart after lamp replacement
4. Internal overvoltage protection

Luminaire Construction

Luminaire enclosure must:

1. Be fabricated from zinc coat steel or pressure diecast aluminium
2. Be folded to give rigidity with folded ends to give a minimum overlap of 20mm and must be either spot or seam welded
3. Be formed to exclude light leaks with all edges of all openings of the fittings
4. Have corners of the trim that are visible must have mitred joints that are seam welded or fabricated in a manner that the joint cannot open or move out of alignment
5. Be constructed with a minimum thickness of 1.0mm or must be double folded and ribbed to achieve rigidity
6. Incorporate pre-drilled symmetrical fixing and mounting holes for easy installation. The fittings must not have more than 12 holes in the back of the body
7. Not be fabricated from pre-painted sheet
8. Be degreased and powder coated inside and out

4 Technical Sections

4.1 Lighting

9. Incorporate a minimum rating of IP4X for internal luminaires mounted above and below the ceiling and a minimum rating of IP54 within workshop areas
10. Incorporate a minimum IP rating where located externally within the following areas:
 - IP44 where located protected by awning or eave
 - IP56 where exposed and not protected by building awning or eave
 - IP68 where located in ground
11. Dissipate heat to satisfy the ambient environmental conditions
12. incorporate permanently fixed markings and labelling

Luminaire powdercoat must be:

1. White for the inside surface of the luminaire and have a minimum thickness of 80µM and reflector surfaces, 100µM
2. Of a white finish internally or match ceiling or adjacent surface or otherwise specified by the designer with a minimum thickness of 100µM
3. Of a black finish internally or match ceiling or adjacent surface or otherwise specified by the designer with a minimum thickness of 100µM with a corrosive resistant protective coating

Quality of Luminaires

All luminaires must be good quality fittings, locally sourced - Australian made and with good quality control gear and fittings designed for a minimum life of 10 years.

All luminaires must provide certification to comply with the following standards:

1. AS/NZS 60698.1 - General requirements and tests
2. AS/NZS 60698.2 - Particular requirements - Fixed general purpose luminaires
3. AS/NZS 4251 and 4252 - Electromagnetic compatibility
4. AS/NZS 60529 - Degrees of protection provided by enclosures (IP code)

4 Technical Sections

4.1 Lighting

Luminaire Installation

Interior Luminaires

All internal luminaires installed must:

1. Be mounted at a height less than 3m AFFL to mitigate need for accessible lifting devices, or otherwise be located to be readily accessible with safe lifting device
2. Where mounting heights of luminaires are greater than 3m AFFL such as within double height workshop spaces, locate luminaires within readily accessible areas to enable safe lifting devices to be located in close proximity to luminaires for periodic cleaning, repair or replacement
3. Luminaires to be readily and easily accessible to be lifted within ceiling space
4. Be mounted and independently fixed to structure
5. Maintain sufficient space around the luminaire to allow for the removal and replacement of luminaire or associated driver, without damage to ceiling or structure and/or disassembly or relocation of any other equipment or services
6. Minimise cut out size to fit within ceiling trim and allow future replacement of luminaire, associated control and re-wiring without damage to ceiling

External luminaires

All external luminaires installed must:

1. Incorporate reflector to project lighting within a downward forward or side throw to illuminate specific area served
2. Incorporate highly durable primer, dual powder coating and anti-corrosive protective treatment
3. Be located on walls and soffits of awnings
4. Have a secure adjustable mounting bracket arrangement and fixing method of luminaires to accommodate pole, soffit or wall mounting
5. Where located less than 4m AFFL provide vandal resistant IK 10 rated luminaires with anti-tamper fixings
6. Have readily accessible wiring, control gear and associated lighting control assemblies
7. Avoid bollard lighting to building entry areas, footpath, vehicle areas including driveway
8. Avoid up lighting of trees

Exterior light poles

External Lighting Poles must be:

1. Of galvanised steel manufacture. Incorporate highly durable primer, undercoat and dual enamel paint coating and anti-corrosive protective treatment. Black in colour (unless otherwise advised by TAFE NSW)
2. Designed with an appropriate height to achieve uniform lighting at least 4000mm above ground level and less than TAFE NSW neighbouring buildings.
3. Located with footings a minimum 300mm clear from pathways and at least 600mm clear from vehicle trafficable carpark and driveway areas

4 Technical Sections

4.1 Lighting

4. Consistent type throughout the campus
5. Constructed with an accessible access hatch providing clear access to wiring terminals, conduit entry, controls, switchgear and surge protective device
6. Incorporated with a rag bolt assembly and footing detail to structural engineers' requirements

Luminaire mounting

All luminaires must be provided with a reflector and diffuser lanyards are to be secured to luminaire to prevent falling and damage.

All recessed luminaires must incorporate at least a 5mm flange and be designed to allow removable access from below recessed mounted luminaires without damage to luminaire or ceiling.

All luminaires suspended from the ceiling must be provided with suspension mounting accessories and must be designed to allow suitable alignment without any deviation or movement.

Surface mounted Luminaires with wraparound diffuser

Each surface mounted luminaire must be provided with a purpose made prismatic wraparound refractor panel of minimum 2.5mm thick acrylic. Micro prismatic type diffusers with sides must be horizontally reeded. If the refractor is injection moulded the side panels can be prisms.

The refractor panel must be held in place by clips or springs. Fittings that rely on the end caps for retaining the refractor should not be accepted.

Recessed luminaire with diffuser

Each recessed luminaire must have a lay-in prismatic refractor panel. The panel must be clear acrylic with a minimum thickness of 2.8mm. The panel must be a micro prismatic diffuser type lens panels designed to reduce glare. The fitting must be constructed so that the fitting returns on all sides behind the T-bar so that the refractor panel is fully supported by the fitting body and not the T-bar lip. Recessed fittings must be provided with a 1.5-metre lead and three-pin plug.

Fittings designed for installation in panelised ceilings (either perforated panels or timber slats) must provide uniform pressure between the trim and the ceiling so that there is no sagging or gaps.

Recessed luminaire with semi specular reflector

Each recessed luminaire must have a specially designed semi specular reflector to provide a batwing type distribution while achieving a cut off above 35 degrees. The reflector and cross blades must be fabricated from min 0.5mm high purity anodised aluminium manufactured specifically for luminaire reflectors. The aluminium must meet the following minimum requirements:

1. Purity >99.8%
2. Total reflectivity >84%
3. Diffuse reflectivity <70%, > 64%
4. Anodising thickness >2.5µm

The reflector and cross blades must be designed so that there is no visible image of the lamp in the reflector when viewed above the shielding angle.

4 Technical Sections

4.1 Lighting

4.1.4 Deliverables

Design Deliverables

All project types

The consultant, lighting designer, interior designers and architects must undertake a collaborative design approach to achieve the principle requirements and strategies when selecting the luminaire for the area or space.

Each luminaire selected must be presented within a luminaire schedule or cut sheet format indicating the following:

1. Luminaire colour photo image
2. Lamp Source –must be LED
3. Colour temperature
4. Wattage
5. Lumen output
6. Description of luminaire –downlight, oyster, sconce, troffer, batten, extruded linear, pendant, and the like
7. Control device –DSI, DALI, KNX and the like
8. Mounting on wall, ceiling or floor-Recessed, Semi-recessed, surface, suspended and mounting height
9. Selected Luminaire make and model number
10. Room or Area Served

New Build and Major Refurbishments

The following documents are to be developed during the project development for submission to TAFE NSW as follows:

Concept Submission: A qualitative description of luminaires intended for each area in collaboration with the design team must be prepared and submitted within the return services brief document.

Design Development: Upon design development of the ceiling plans the lighting consultant must collaborate with the design team to develop the design with an approach to select luminaires satisfying the aims and objectives whilst satisfying the mandatory and statutory requirements within each space. Liaise and consult with TAFE NSW on procurement of replacement luminaires where luminaires are not of a generic nature. A preliminary completed luminaire schedule or individual luminaire cut sheets must be prepared by the lighting consultant and submitted for review and comment at the design development stage.

Tender Submission: Upon finalisation of coordination of the ceiling and furniture plans, the lighting designer must produce preliminary lighting layouts for review and acceptance with the design team prior to completing layout drawings. Indicate control methodology, circuitry information and luminaire schedule.

4 Technical Sections

4.1 Lighting

Installation deliverables

Construction Phase: Implement any value management initiatives agreed during the tender stage and as required by the project Certifier and BCA consultant. The lighting designer must revise and resubmit all drawings, schedules and documents for review and acceptance including:

1. Photometric lighting layout calculations indicating levels achieved, in grid format and with tabulated summary of design input parameters and resultants for each area or room calculated
2. Submission of samples must include:
 - Specified luminaire samples complete with flex and plug fully operational along with any alternatives proposed for comparison
 - Supportive photometric calculations and section J calculations
 - Technical luminaire specifications and performance data
3. Submission of workshop drawings must include:
 - Final coordinated lighting layouts at scale 1:100
 - Complete lighting control schematic drawings indicating all local control devices and remote interface gateways
 - Task lighting methodologies
 - Linear luminaire manufacture fabrication details including suspension kits, recessed mounting kits and the like
 - Luminaire mounting and fixing details, and seismic restraints to AS1170.4 section 8 as required
 - All technical data sheets
4. Commissioning and testing functional operation of each luminaire within room or area and resultant lux level achieved

All luminaire submissions must be submitted in a timely manner so they may be reviewed and accepted by the Design Team and TAFE NSW prior to order without affecting the construction program.

4 Technical Sections

4.1 Lighting

The designer must incorporate the following lighting design requirements for each area:

4.1.5 Schedules - General Learning Spaces Lecture Theatres

Area	Types of Luminaire	Designated Maintained Illuminance (lux)	Uniformity	Glare	Dimming	Max. Power Density (W/m ²)
Presentation Area	Refer to Audio Visual standard for performance requirements	320 (on presenter)	0.7	19	Yes	5
Seating Area	LED Downlights/ Panels	320	0.7	19	Yes	4.5

General Classrooms

Area	Types of Luminaire	Designated Maintained Illuminance (lux)	Uniformity	Glare	Dimming	Max. Power Density (W/m ²)
Presentation Area	Refer to Audio Visual standard for performance requirements	320 (on presenter)	0.7	19	Yes	5
Seating Area	LED Downlights/ Panels	320	0.7	19	Yes	4.5

Libraries, Group Learning & Breakout Spaces

Area	Types of Luminaire	Designated Maintained Illuminance (lux)	Uniformity	Glare	Dimming	Max. Power Density (W/m ²)
Library Presentation	Refer to Audio Visual standard for performance requirements	320 (on presenter)	0.7	19	Yes	5
Library Reading	Suspended linear or track lighting system	320	0.7	19	Yes	4.5
Library General	Suspended linear or track lighting system	240	0.7	19	Yes	4.5
Breakout Space	LED downlights	240	0.7	19	Yes	4.5
Group Learning Rooms	Refer to Audio Visual standard for performance requirements	320 (on presenter)	0.7	19	Yes	4.5

4.1.6 Schedules - Connected Learning Spaces

Connected Delivery Space

Area	Types of Luminaire	Designated Maintained Illuminance (lux)	Uniformity	Glare	Dimming	Max. Power Density (W/m ²)
Presentation Area	Refer to Audio Visual standard for performance requirements	320 (on presenter)	0.7	19	Yes	5
Workstation	LED Downlights/ Panels	320	0.5	19	Yes	4.5
General	Dependent on environment	240	0.5	19	Yes	4.5

4 Technical Sections

4.1 Lighting

Connected Learning Space

Area	Types of Luminaire	Designated Maintained Illuminance (lux)	Uniformity	Glare	Dimming	Max. Power Density (W/m ²)
Workstation	LED Panels	320	0.7	19	Yes	4.5
General	LED Panels	240	0.5	19	Yes	4.5

Specialist Delivery Space

Area	Types of Luminaire	Designated Maintained Illuminance (lux)	Uniformity	Glare	Dimming	Max. Power Density (W/m ²)
Workstation	LED Panels	320	0.7	19	Yes	4.5
General	LED Panels	240	0.5	19	Yes	4.5
Task Area	Task lighting	600	0.7	19	No	11.5

4.1.7 Schedules - Specialist Learning Spaces

Workshops, Laboratories, etc

Area	Types of Luminaire	Designated Maintained Illuminance (lux)	Uniformity	Glare	Dimming	Max. Power Density (W/m ²)
Presentation Area	Refer to Audio Visual standard for performance requirements	320 (on presenter)	0.7	19	Yes	5
Workstation	LED Panels	400	0.7	19	Yes	6
General	LED Panels	240	0.5	19	Yes	4.5
Task Area	Luminaire dedicated for workshop machinery task lighting	600 (Refer note (1) below)	0.7	19	No	11.5

Workshops with High Ceilings (i.e. Multi-Storey Stack Workshops)

Area	Types of Luminaire	Designated Maintained Illuminance (lux)	Uniformity	Glare	Dimming	Max. Power Density (W/m ²)
Presentation Area	Refer to Audio Visual standard for performance requirements	320 (on presenter)	0.7	19	Yes	5
Workstation	LED Low/high Bay Luminaire subject to beam spread	400	0.7	19	Yes	6
General	LED Industrial type sealed battens/ low bay luminaires	240	0.7	19	No	4.5
Task Area	Luminaire dedicated for workshop machinery task lighting	800 (Refer note (1) below)	0.7	19	No	11.5

4 Technical Sections

4.1 Lighting

Workshops (dust, grease, paint particles etc)

Area	Types of Luminaire	Designated Maintained Illuminance (lux)	Uniformity	Glare	Dimming	Max. Power Density (W/m ²)
Presentation Area	Refer to Audio Visual standard for performance requirements	320 (on presenter)	0.7	19	Yes	5
Workstation	LED Industrial type sealed battens/ low bay luminaires	400	0.7	19	No	6
General	LED Industrial type sealed battens/ low bay luminaires	240	0.7	19	No	4.5
Task Area	Luminaire dedicated for workshop machinery task lighting	800 (Refer note (1) below)	0.7	19	No	11.5

Commercial Kitchens

Area	Types of Luminaire	Designated Maintained Illuminance (lux)	Uniformity	Glare	Dimming	Max. Power Density (W/m ²)
Presentation Area	Refer to Audio Visual standard for performance requirements	320 (on presenter)	0.7	19	Yes	5
General	LED Sealed Panels	240	0.7	19	Yes	4.5
Preparation bench	LED sealed panels	320	0.7	19	Yes	4.5
Rangehood and shelf task lighting	LED pelmet strip lighting	400	0.7	19	Yes	6

Bars and Restaurants

Area	Types of Luminaire	Designated Maintained Illuminance (lux)	Uniformity	Glare	Dimming	Max. Power Density (W/m ²)
General Lighting	LED downlights	240	0.7	19	Yes	4.5
Pelmet/Feature lighting	LED Strip lighting	240	0.7	19	Yes	N/A

Filming/Broadcasting Studios, Stages and Performance Spaces

Area	Types of Luminaire	Designated Maintained Illuminance (lux)	Uniformity	Glare	Dimming	Max. Power Density (W/m ²)
Stage	Refer to Audio Visual Standard Stage performance lighting Requirements	600	0.7	19	Yes	11.5
General	LED Sealed Panels	240	0.7	19	Yes	4.5

4 Technical Sections

4.1 Lighting

4.1.8 Schedules - Staff Spaces

Area	Types of Luminaire	Designated Maintained Illuminance (lux)	Uniformity	Glare	Dimming	Max. Power Density (W/m ²)
Open Office Area General	LED Panels	240	0.7	19	Yes	4.5
Open Office Area Workstation	LED Panels	320	0.7	19	Yes	4.5
Enclosed Meeting Rooms or conference rooms	Refer to Audio Visual Standard for performance requirements	320 (on presenter)	0.7	19	Yes	4.5
Kitchen /Lunch rooms general	LED Panels	240	0.7	19	Yes	4.5
Kitchen /Lunch rooms overhead cabinets	LED Strip lighting	320	0.7	19	No	4.5

4.1.9 Schedules - Ancillary Spaces

Area	Types of Luminaire	Designated Maintained Illuminance (lux)	Uniformity	Glare	Dimming	Max. Power Density (W/m ²)
Main Entrance/ Foyer	Downlights	400	0.5	N/A	Yes	9
Corridor	Downlights/ LED panels	200	0.5	N/A	Yes	5
Plantroom	LED Battens	160	0.5	N/A	No	4
Amenities	Downlights/ LED panels	200	0.5	N/A	No	3
Store Area	LED Battens	160	0.5	N/A	No	1.5

(1) Where the designer or TAFE NSW identify the requirement for practical training or tasks involving high precision and/or manipulation of small or complex materials and equipment, task lighting at 1200lux must be provided.

4 Technical Sections

4.2 Lighting Control

4.2.1 Summary

A smart lighting control system is required to be provided to all works including:

1. New building works
2. Renovations or refurbishment of existing buildings
3. Major lighting replacement programs

The type of lighting control system is required to be selected to suit the room location, project type and scale. The lighting control system may be a 240V lighting control or smart lighting control system for all internal areas.

The lighting control system will incorporate the following components:

1. Lighting control panels in all areas
2. Occupancy detectors in all rooms with the exception of plantrooms and machine workshop areas
3. Automated programmable timer controls in conjunction with occupancy sensors to gradually dim/turn off lighting safely when room space is not occupied
4. Daylight harvesting controls for perimeter large glassed façade areas and skylights
5. External PE cell control in conjunction with time clock to turn off non safety/security lighting such as decorative landscape and façade lighting, or signage to development application conditions
6. Interface lighting control with other building services
7. Be coordinated with any additional security requirements including integration with the intruder alarm panel to activate all lights when the alarm panel is activated

The switching or DALI addressable grouping of luminaires and associated local controls, interfacing with other services and any remote control and monitoring must be configured in accordance with the operational and functional requirements of each room, area or building, in compliance with the design requirements.

4.2.2 Design

Design Requirements

In addition to any statutory or project specific requirements the designer of a lighting control system must incorporate the following:

1. Lighting control panels and switching regimes in accordance with outcomes from user group requirements
2. Ensure full compatibility to achieve fully functional operation within all existing systems

4 Technical Sections

4.2 Lighting Control

Location

A smart lighting control system is to be incorporated within the following areas:

1. General internal areas
2. General learning areas
3. Administration or office areas
4. Specialist areas
5. Multi-function areas
6. External and plantroom areas via low level interface to circuit controls

Where the project is limited to the following areas, the designer must undertake a functional lighting control assessment identifying the feasible use of 240V lighting control switching and occupancy sensor methodologies:

1. An existing room or small area not greater than 300m² that has no existing legacy smart lighting control system
2. A remote small single storey building not easily connected to the main campus
3. For a project that is located in a remote regional community
4. Plantroom areas
5. External areas

4.2.3 Components

The designer must incorporate the following lighting control functional and operational requirements in accordance with the application and scale of the project. Refer to *Table 3 – Schedule of Lighting Control Requirements* to establish the requirements for each type of space.

Switching and Grouping

Light switches are required to be provided at all entry doors to rooms irrespective of the presence of motion detection. Where a room is larger than 40m² the switching must be subdivided so that there is no area >50m² per switch.

Ensure that the selected operating mechanism is robust enough to prevent arcing and carbonizing in the specific environments for which they are designed.

Separate lighting circuits and/or grouping controls, including dimmer channels, must be provide for:

1. All general teaching spaces; to facilitate general learning, presentation or seminar mode, and movable wall partitioning for multi-function spaces
2. All office areas
3. All corridor lighting
4. All workshop, laboratories and other specialty areas
5. All supplementary lighting schemes including demonstration areas, bio box, dais lighting and wall washing
6. Daylight harvesting

4 Technical Sections

4.2 Lighting Control

7. Security lighting
8. All external lighting

An individual control panel must be provided within:

1. Each individual office room, area or other enclosed rooms
2. Where specific Task lighting is provided

Smart lighting Control System

The smart programmable lighting control system must include the following:

1. Offer remote access from TAFE NSW network
2. Software that operates with a DALI protocol
3. User friendly icon-based control system
4. Low maintenance open protocol architecture based
5. Allow energy efficient control
6. Be of modular control components to offer reliable, flexible and adaptable control
7. Allow control individual room, building level or group of areas, or campus wide

The required communication protocol for the luminaires is DALI. The lighting system must be an open protocol to not be limited to maintenance and or programming by a contractor or consultant. The DALI system must be interfaced to the following control systems:

1. Clipsal C-bus suite of products;
2. Philips Dynalite suite of products;
3. KNX based systems;

Where a KNX system is proposed, this system must be expanded and be made compatible with interface modules to be utilised for the standard lighting within existing areas.

The DALI lighting control system must be capable of catering for campus wide, each building and individual DALI zone control to allow lighting control monitoring and management from any remote TAFE NSW connection to access the lighting control software located on a dedicated server.

The DALI lighting control system must be provided with programmable luminaire controllers, local controllers, dimmer controllers, timer controllers, group controllers, interface module and related modular lighting control components to allow flexibility and adaptability to control any of the following areas from a local control device and/or a remote TAFE NSW network-based computer terminal:

1. Any number of scenes within individual rooms
2. Any number of scenes in conjunction with external interfaces within multifunction and seminar rooms
3. An individual common space
4. Individual level of building
5. Any large and multiple common areas within buildings or neighbourhood buildings
6. The campus site wide external lighting areas

4 Technical Sections

4.2 Lighting Control

Dimming

Where required, dimming control systems must utilise DALI/KNX controls available or interface with or utilise compatible existing system controls.

The dimmer programming must incorporate a minimum of 4 programmed pre-set levels.

Dimming systems must operate utilising a local control network including local control panels, occupancy sensors, photo electric cells and interface modules to other building services.

Integration

Where required, integrate the DALI lighting controls with other building services.

All proposed lighting control interfacing must be incorporated within the return services brief at concept stage then must be coordinated with all the respective trades to determine the project specific interface requirements during the design development phase and confirmed prior to tender issue.

Integration of lighting controls may include:

1. Interface with TAFE NSW Security Services or Building Automation and Control System (BACS) to allow for programmable time of day operation (enabling room controls within defined time periods)
2. Interface with the security and BACS systems must be limited to a low-level interface with the remote control of off and on commands and where required, selection of pre-sets
3. Interface with fire system to allow for all emergency operations defined by the fire matrix for each particular campus
4. Interface lighting system with TAFE NSW security intruder alarm panel to activate all lighting when the alarm panel is activated

In the case of a Fire alarm or intruder detection security alarm is raised provide interface for lighting system to activate all lighting to full brightness within the building.

Lighting control systems must be stand-alone systems with programming and pre-sets being set and stored at the local level and high-level interface modules provided to the Audio Visual system for room control.

Wireless Controls

Provide wireless programmable sensor (zigbee) controls incorporating movement sensors and adjustable time delays to all luminaires located:

1. Within fire stairs
2. In covered carpark areas
3. In large storage areas
4. Any other areas where non-frequent occupant traffic occurs

The controls must be configured to operate the individual luminaire and simultaneously operate the next consecutive two rows of luminaires in both directions when motion is detected and must dim down to switch off after at least a 2-min time delay.

4 Technical Sections

4.2 Lighting Control

Daylight Harvesting

Where the project scale does not require daylight harvesting as sustainable initiative then the consultant must demonstrate in the project return brief the projected payback for the system and the sensitivity of the result to the accuracy of the daylight prediction, and seek project team approval to include the scheme in the project.

Automatic daylight harvesting of artificial lighting should be considered in the following areas:

1. Any spaces with skylight
2. Spaces with significant external glazing

The proposed daylight harvesting system must incorporate dimming or multilevel switching.

Occupancy Sensing

Occupancy sensing is required to be provided to all areas which:

1. Are not in constant use
2. Are not required to be constantly lit for safety or security requirements

Occupancy sensing requires the use of presence detectors (passive infrared, microwave or hybrid), selected as appropriate for application, to establish the occupancy of the space and deliver lighting outcomes as required.

As safety requirement, where dimming is utilised, the control system must dim gradually to the selected pre-arranged light level after a period of time. In areas where there is no dimming luminaires required, the occupancy sensor should only be connected to portion of the luminaires, such that the remaining luminaires are to remain on for safety purposes.

Where a Smart lighting control system is proposed, compatible occupancy sensors/ all accessories need to be directly compatible with the control system without a low level interface/ third party product.

4 Technical Sections

4.2 Lighting Control

Passive infra-red detectors

To be used in small type rooms such as an enclosed office space, meeting room, lunchroom, storage area and the like and rooms that should not be subdivided with partitions or other obstructions.

The detectors must be selected based on the design range of the detector. Where a space requires more than three detectors to cover an open area, a unit with a larger range should be specified.

1. PIR detectors must not be used in locations with areas of rapidly changing temperature
2. Detectors can be ceiling mounted or corner mounted to achieve the best coverage of the room
3. The location of the detectors must take into account permanent obstructions
4. The detector must be located so that it is not triggered by external activities
5. The detector must have a switch off delay between 15 and 25 minutes. If the delay is adjustable it must not be able to be adjusted above 30 minutes. If the delay time is not adjustable there must be a walk test setting with a rapid reset
6. The detector must have a photoelectric switch incorporated into the sensor. The photoelectric switch must switch off the lights when the illumination level exceeds a predetermined level. The level s must be adjustable between 50 and 2000 lux

Ultrasonic detectors

Ultrasonic detectors are to be used in rooms that are of sufficient size to require more than three PIR detectors. They are also be used in rooms with extensive divisions and obstructions. In some circumstances the ability for an ultrasonic detector to monitor the space immediately behind it should improve the coverage.

Ultrasonic detectors must not be installed adjacent to air conditioning registers or in areas subjected to air movement or moving objects such as machines or ceiling fans.

1. The detector must be located so that it is not triggered by external activities
2. The detectors must have adjustable sensitivity in the on and off mode
3. The detector must have a switch off delay between 15 and 25 minutes. If the delay is adjustable it must not be able to be adjusted above 30 minutes
4. The detector must have a photoelectric switch incorporated into the sensor. The photoelectric switch must switch off the lights when the illumination level exceeds a predetermined level. The level must be adjustable between 50 and 2000 lux

Wide and narrow distributions must be provided to suit special requirements of the room.

4 Technical Sections

4.2 Lighting Control

Microwave detectors

Microwave detectors are to be used in large areas (typically detection distances between 15 and 60 metres) and areas medium areas with high air movement.

1. The detector must be located so that it is not triggered by external activities including transmission
2. The detectors must have adjustable sensitivity in the on and off mode
3. The detector must have a switch off delay between 15 and 25 minutes. If the delay is adjustable it must not be able to be adjusted above 30 minutes
4. The detector must have a photoelectric switch incorporated into the sensor. The photoelectric switch must switch off the lights when the illumination level exceeds a predetermined level. The level must be adjustable between 50 and 2000 lux
5. Wide and narrow distributions must be provided to suit the special requirements of the room

Microwave detectors must not be used in areas where the frequency of the emission may interfere with equipment in laboratories.

Microwave detectors must not be used in areas with lightweight walls or large expanses of glass as they can detect outside the area.

4.2.4 Construction

Light Switches

Standard: To AS/NZS 3133

General: Construct the face plate impact resin and mechanism so that the mechanism cannot be displaced during normal operation, using retaining screws.

Colour: Generally white in general learning and office areas unless otherwise instructed by design team.

Indicators: Provide red indicators above switch toggles, to be visible with switches "on".

Switch Mechanisms: Rating to be minimum 15 A, 250 V a.c. and rated for reactive load switching. All switch panels must be designed to switch inductive loads and must switch no more than 70% of their rated current.

Environment: Weatherproof (IP56) and impact resistant (IK10) light switch enclosures are to be installed in all workshop areas, plantrooms, switchrooms, external areas, and the like. In addition chemical resistant industrial type light switches should be considered for workshop applications where exposed to chemicals.

Labelling: All light switches greater than three gang should have wax-filled engraved labelling that clearly indicates which area and which light bank is controlled by which switch. Engraving should be in letters 4mm high.

Where a light switch is also to control a separate device (such as a fan) that is not on the same lighting circuit, a double-pole light switch must be provided. The double pole light switch must be rated for the switching of separate phases where necessary.

4 Technical Sections

4.2 Lighting Control

Lighting Control Panels

Type: Proprietary lighting control panels must be selected based on the smart control system.

Finish: The architectural selection of the fascia and rim colour/finish available should be based on matching the interior finishes.

Indicators: The lighting control panel must incorporate integral neon indicators or LEDs that illuminate the buttons or have a backlit faceplate.

Environment: The lighting control panel must not be used within adverse environmental conditions. Restricted use within suitable for areas of low impact, ambient temperatures not greater than 40°C, or where dust and moisture ingress protection not exceeding IP22.

Control Cubicles

DIN mounted lighting control modules must be installed within a switchboard or otherwise within a lighting control enclosure located adjacent to a distribution board or within an electrical cupboard/room.

Refer to the Electrical Switchboard section for construction requirements of switchboard control enclosure.

4.2.5 Deliverables

Design Submissions

Submit lighting control design specification and drawings which must indicate as a minimum:

1. Lighting control system specification including scope of works, functional and operational control requirements
2. Lighting control schematics
3. Layouts indicating switching and grouping arrangements

Installer Submissions

Schematic drawings indicating network configuration of DALI control modules, local room control panels, occupancy detectors and the like, field devices, interfaces to audio-visual system, interface to BACS or other building trades.

Lighting control panel schedules describing the lighting control operation of each pre-set button.

Layout Drawings indicating:

1. Luminaires and associated lighting control devices
2. Circuit grouping referencing circuit breaker number
3. The switching /dimming arrangement
4. DALI addressable grouping configuration

4 Technical Sections

4.2 Lighting Control

Samples and technical data sheets for each of the following:

1. Lighting control panel types
2. Occupancy sensor types
3. Internal and external PE cells

Provide Commissioning and testing data and results demonstrating:

1. Functionality and operation of each local field device within room or area
2. Integrated testing of audio-visual and other building interfaces
3. Remote control and monitoring of lighting control system

4 Technical Sections

4.2 Lighting Control

The designer is to incorporate the following lighting control functional and operational requirements for each area.

4.2.6 Schedules - General Learning Spaces Lecture Theatres

Area	Local Lighting control Panel	Occupancy Sensor Type	Daylight Harvesting Sensor	Time Clock schedule	Dimming	Integration	Notes
Presentation Area	Allow for four pre-set on smart control panel	PIR -Enable/Disable	Locate within skylight or along perimeter glazing wall	Yes	Yes	Audio-visual System	Ability to Enable/Disable PIR
Seating	Allow for groupings front and back to be controlled by presentation pre-sets on smart control panel	Microwave	Locate within skylight or along perimeter glazing wall	Yes	Yes	Audio-visual System	-

General Classroom

Area	Local Lighting control Panel	Occupancy Sensor Type	Daylight Harvesting Sensor	Time Clock schedule	Dimming	Integration	Notes
Presentation Area	Allow for two pre-set on smart control panel	PIR -Enable/Disable	N/A	Yes	Yes	Audio-visual System	Ability to Enable/Disable PIR
Seating	Allow for one pre-set on smart control panel	PIR	Locate within skylight or along perimeter glazing wall	Yes	Yes	N/A	-

Libraries, Group Learning and Breakout Spaces

Area	Local Lighting control Panel	Occupancy Sensor Type	Daylight Harvesting Sensor	Time Clock schedule	Dimming	Integration	Notes
Library Presentation	Allow for two pre-sets on smart control panel	PIR	Locate within skylight or along perimeter glazing wall	Yes	Yes	Audio-visual System	Ability to Enable/Disable PIR
Library General	Allow for one pre-set for every 100m ² on smart control panel	Ultrasonic	Locate within skylight or along perimeter glazing wall	Yes	Yes	N/A	-
Breakout Space	Allow for one pre-set for every 100m ² on smart control panel	PIR	Locate within skylight or along perimeter glazing wall	Yes	Yes	N/A	N/A
Group Learning Rooms	Allow for two pre-set on smart control panel	PIR	N/A	Yes	No	Audio-visual System	Ability to Enable/Disable PIR

4 Technical Sections

4.2 Lighting Control

4.2.7 Schedules - Connected Learning Spaces

Connected Delivery Space

Area	Local Lighting control Panel	Occupancy Sensor Type	Daylight Harvesting Sensor	Time Clock schedule	Dimming	Integration	Notes
Presentation Area	Allow for two pre-set on smart control panel	PIR - Enable/ Disable	N/A	Yes	Yes	Audio-visual System	Ability to Enable/ Disable PIR
Workstation	Allow for one pre-set on smart control panel	PIR	Locate within skylight or along perimeter glazing wall	Yes	Yes	N/A	-
General	Allow for one pre-set on smart control panel	PIR	Locate within skylight or along perimeter glazing wall	Yes	Yes	N/A	-

Connected Learning Space

Area	Local Lighting control Panel	Occupancy Sensor Type	Daylight Harvesting Sensor	Time Clock schedule	Dimming	Integration	Notes
Workstation	Allow for one pre-set on smart control panel	PIR	Locate within skylight or along perimeter glazing wall	Yes	Yes	N/A	-
General	Allow for one pre-set on smart control panel	PIR	Locate within skylight or along perimeter glazing wall	Yes	Yes	N/A	-

Specialist Delivery Space

Area	Local Lighting control Panel	Occupancy Sensor Type	Daylight Harvesting Sensor	Time Clock schedule	Dimming	Integration	Notes
General	Allow for one pre-set on smart control panel	Microwave	Locate within skylight or along perimeter glazing wall	Yes	Yes	N/A	-
Workstation	Allow for one pre-set for every 100m ² on smart control panel	Microwave	Locate within skylight or along perimeter glazing wall	Yes	Yes	N/A	-
Task Lighting	Local on/off control	N/A	N/A	Yes	No	N/A	-

4 Technical Sections

4.2 Lighting Control

4.2.8 Schedules - Specialist Learning Spaces

Workshops, Laboratories, etc

Area	Local Lighting control Panel	Occupancy Sensor Type	Daylight Harvesting Sensor	Time Clock schedule	Dimming	Integration	Notes
Presentation Area	Allow for two pre-set on smart control panel	PIR - Enable/Disable	N/A	Yes	Yes	Audio-visual System	Ability to Enable/Disable PIR
Workstation	Allow for one pre-set for every 100m ² on smart control panel	Microwave	Locate within skylight or along perimeter glazing wall	Yes	No	N/A	-
Task Lighting	Local on/off control	N/A	N/A	Yes	No	N/A	-

Workshops with High Ceilings (i.e. Multi-Storey Stack Workshops)

Area	Local Lighting control Panel	Occupancy Sensor Type	Daylight Harvesting Sensor	Time Clock schedule	Dimming	Integration	Notes
Presentation Area	Allow for two pre-set on smart control panel	PIR - Enable/Disable	N/A	Yes	Yes	Audio-visual System	Ability to Enable/Disable PIR
Workstation	Allow for one pre-set for every 100m ² on smart control panel	Microwave	Locate within skylight or along perimeter glazing wall	Yes	No	N/A	-
Task Lighting	Local on/off control	N/A	N/A	Yes	No	N/A	-

Workshops with Particles that May Interfere with Sensors (Dust, Grease, Paint Particles etc)

Area	Local Lighting control Panel	Occupancy Sensor Type	Daylight Harvesting Sensor	Time Clock schedule	Dimming	Integration	Notes
Presentation Area	Allow for two pre-set on smart control panel	PIR	N/A	Yes	Yes	Audio-visual System	-
Workstation	Allow for one pre-set for every 100m ² on smart control panel	N/A	N/A	Yes	No	N/A	-
Task Lighting	Local on/off control	N/A	N/A	Yes	No	N/A	-

4 Technical Sections

4.2 Lighting Control

Commercial Kitchens

Area	Local Lighting control Panel	Occupancy Sensor Type	Daylight Harvesting Sensor	Time Clock schedule	Dimming	Integration	Notes
General	Allow for one pre-set on smart control panel	Ultrasonic	N/A	Yes	No	N/A	-
Preparation bench	Allow for one pre-set on smart control panel	Ultrasonic	N/A	Yes	No	N/A	-
Rangehood and shelf task lighting	Local on/off control	N/A	N/A	Yes	No	N/A	-

Bars and Restaurants

Area	Local Lighting control Panel	Occupancy Sensor Type	Daylight Harvesting Sensor	Time Clock schedule	Dimming	Integration	Notes
General Lighting	Allow for one pre-set for every 100m ² on smart control panel	Ultrasonic	Locate within skylight or along perimeter glazing wall	Yes	Yes	N/A	-
Pelmet/ Feature lighting	Allow for one pre-set on smart control panel	Ultrasonic	Locate within skylight or along perimeter glazing wall	Yes	Yes	N/A	-

Filming/Broadcasting Studios, Stages and Performance Spaces

Area	Local Lighting control Panel	Occupancy Sensor Type	Daylight Harvesting Sensor	Time Clock schedule	Dimming	Integration	Notes
Stage	Allow for two pre-sets on smart control panel	PIR	Locate within skylight or along perimeter glazing wall	Yes	Yes	N/A	-
Pelmet/ Feature lighting	Allow for one pre-set on smart control panel	Ultrasonic	Locate within skylight or along perimeter glazing wall	Yes	Yes	N/A	-

4 Technical Sections

4.2 Lighting Control

4.2.9 Schedules - Staff Spaces

Area	Local Lighting control Panel	Occupancy Sensor Type	Daylight Harvesting Sensor	Time Clock schedule	Dimming	Integration	Notes
Open Office Area General	Allow for one pre-set on smart control panel	Ultrasonic	Locate within skylight or along perimeter glazing wall	Yes	No	N/A	-
Open Office Area Workstation	Allow for one pre-set for every 100m ² on smart control panel	Ultrasonic	Locate within skylight or along perimeter glazing wall	Yes	No	N/A	-
Enclosed meeting rooms or conference rooms	Allow for two pre-set on smart control panel	PIR	N/A	Yes	No	Audio-visual System	Ability to Enable/Disable PIR
Kitchen & Lunchroom General	Allow for one pre-set on smart control panel	PIR	N/A	Yes	No	BACS	-
Kitchen & Lunchroom Under Overhead bench	Allow for one pre-set on smart control panel	PIR	N/A	Yes	No	BACS	-

4.2.10 Schedules - Ancillary Spaces

Area	Local Lighting control Panel	Occupancy Sensor Type	Daylight Harvesting Sensor	Time Clock schedule	Dimming	Integration	Notes
Main Entrance/ Foyer General	N/A	PIR	Locate within skylight or along perimeter glazing wall	Yes	Yes	BACS	-
Main Entrance/ Foyer Feature Lighting	N/A	PIR	N/A	Yes	Yes	BACS	-
Corridors	N/A	PIR	Locate within skylight or along perimeter glazing wall	Yes	Yes	BACS	-
Plantrooms	One switch	N/A	N/A	Yes	No	BACS	-
Amenities	N/A	Ultrasonic	N/A	Yes	No	BACS	-
Storage	N/A	N/A	N/A	Yes	No	BACS	-
External lighting	N/A	N/A	N/A	Yes	No	External PE cell/ BACS	-

N/A-Not Applicable in accordance with the application space

4 Technical Sections

4.3 Emergency and Exit Lighting

4.3.1 Summary

Emergency and Exit lighting must be provided to all works including:

1. New building works
2. Renovations or refurbishment of existing buildings
3. Major lighting replacement programs

The type of emergency and exit lighting system must be selected to suit the project type and scale. The emergency and exit lighting system should be either a stand-alone or a remote monitoring system for all internal areas.

The emergency and exit lighting system must incorporate the following components:

1. Emergency lighting provided within all rooms or space accessible to the public
2. Exit signage lighting leading to fire stairs or points of egress
3. Test facility located within distribution board or within electrical cupboard
4. Remote monitoring and interfacing with other building services

Emergency and exit lighting must be configured in accordance with the operational and functional requirements of each room, area or building, in compliance with the design requirements.

4.3.2 Design

Design Requirements

The designer of the emergency and exit lighting system must incorporate the following in addition to statutory requirements:

1. TAFE NSW site specific requirements in consultation with project stakeholders
2. Emergency and exit lighting system must be of consistent manufacturer throughout project scope and match existing compliant emergency and exit signage located within adjoining areas
3. Consider luminaire and associated accessories are readily availability from local suppliers and distributors, in particular for regional areas
4. Monitored emergency and exit lighting where required must be fully compatible with the existing campus wide remote monitoring and testing system
5. Local manual/auto/test facilities completed with a 90-minute time clock must be provided for local manual testing. Re-use of existing testing system is acceptable (confirm compatibility with supplier/ manufacturer)
6. All existing systems must be assessed by the designer based on their condition, assessment for compliance with current standards and statutory requirements. It is the designer's responsibility to ensure the project and any neighbouring areas affected are also compliant with current standards following the completion of the design works
7. Special consideration should be given to the systems impacted by the upgrade but not limited to the affected areas

4 Technical Sections

4.3 Emergency and Exit Lighting

8. Where augmentation of the internal layout affects the existing path of egress or emergency lighting strategy, the surrounding areas must also be upgraded to ensure compliance of the complete exit and emergency lighting systems
9. If there is an existing monitoring system on site, emergency and exit lights must be addressable, monitored single point luminaires, incorporating power line carrier controls, including all associated network devices to allow a compatible connection to the existing monitoring system

Location

Lecture theatre

Incorporate black background exit and recessed black emergency lighting.

Connected Learning area, and corridor areas

Incorporate non-maintained recessed emergency luminaires.

Multi-function areas

Emergency non-maintained luminaires incorporated within track lighting system.

Specialist areas

Incorporate self-contained non-maintained recessed or surface mounted luminaires.

Existing ceilings

Luminaires to be retained within existing ceiling must be of LED lamp technology and a further assessment undertaken on their condition, location and relevant application and proposed refurbishment or fitout of the space.

Replace all existing non-LED luminaires with new LED emergency luminaires.

Heritage ceilings

In liaison with the architect and heritage consultant, identify limitations in locating luminaires.

Plantrooms

Incorporate maintained emergency lighting within batten luminaire.

4 Technical Sections

4.3 Emergency and Exit Lighting

4.3.3 Components

The designer must incorporate the following emergency and exit lighting functional and operational requirements in accordance with the application and scale of the project.

Luminaires

All emergency and exit sign luminaires must utilise LED light sources, and lithium ion battery systems to minimise the maintenance burden.

Emergency luminaires located within areas comprised of ceiling voids must be non-maintained, low profile recessed LED emergency luminaires with batteries located in ceiling space rated with a 50,000 hours operation and minimum five year (5) year warranty.

Where located in areas with no ceiling void (plantrooms, fire stairs and the like), incorporate a maintained emergency battery pack to operated general LED luminaire serving the area rated with a 50,000 hours operation and minimum five year (5) year warranty.

Remote Monitoring System

Each project must be assessed on a site by site basis to determine whether a remote monitoring system is feasible. The consultant must submit a feasibility study to implement a remote monitoring system where more than one hundred (100) emergency and exit signs are located within a building, outlining capital costs, maintenance costs and readily available replacement of and flexible extension of the installed monitored system to cater for additional monitored emergency and exit luminaires.

Where an existing remote emergency lighting monitoring system serves all emergency and exit light fittings within the campus, ensure new installations are compatible with existing.

In addition to the remote monitoring system, a manual override bypass key switch complete with 90 minutes timer must also be provided in each electrical distribution switchboard where emergency and exit lights are connected.

Where a new emergency lighting system is to be installed in an area that is controlled by Remote Monitoring system the new light fittings must be connected back to the monitoring system.

Where there is no Remote Monitoring System located within an existing building and a new remote monitored emergency lighting system has been agreed to be provided as part of the project, details of the emergency monitoring system serving the entire site must be provided prior to installation.

4 Technical Sections

4.3 Emergency and Exit Lighting

Connection of Remote Monitoring Communication

The remote emergency lighting monitoring system must be connected back to the TAFE NSW data network to allow access to the “front-end” monitoring PC (location to be confirmed by TAFE NSW). The completed system must be fully tested from the “front-end” monitoring PC.

For connection to remote monitoring, coordinate and arrange with TAFE NSW for access, allocation of IP port number and connection to campus wide network.

Emergency Lighting System - Database

All new build installations including additions and modification to existing system details must be programmed for a complete new database or added to the existing database at the “front-end” PC computer.

Commissioning

On completion of the installation, engage and pay all charges to incumbent supplier (to be confirmed with TAFE NSW) to commission and update database of the existing emergency and exit lighting monitoring system.

Deliverables

Design submissions

Submit emergency and exit lighting specification and drawings which must indicate as a minimum:

1. Emergency and exit lighting luminaire layouts
2. Emergency lighting testing facility
3. Circuit grouping

Installer submissions

Layout Drawings which must indicate as a minimum:

1. Unique emergency luminaire number and location on a plan
2. Emergency lighting testing facility location and circuit schematic
3. Circuit grouping referencing circuit breaker number
4. Address for remote monitoring and

Samples and technical data sheets for each of the following:

1. Emergency luminaire types
2. Exit luminaire types

Commissioning and testing reports on functionality and operation of each emergency and exit luminaire identified within each room or area and remote monitoring systems.

All emergency and exit luminaire submissions must be submitted in a timely manner so they may be reviewed and accepted by the Project Design Team and TAFE NSW prior to order without affecting the construction program.

4 Technical Sections

4.4 Work Health & Safety

4.4.1 General Requirements

The "Common Work Health & Safety Concerns" table identifies common Work Health & Safety concerns arising from lighting services that have been identified from past TAFE NSW projects. Each project team must demonstrate that all safety concerns raised have been addressed as part of their involvement with any project to which this Design Standard applies. The safety concerns listed in the table must be included in project-specific Safety-in-Design Registers to ensure that project teams demonstrate how they have been addressed through all phases of any project.

Please note the information in the table is:

- For guidance only,
- Not exhaustive and does not take into account specific circumstances and should not be relied on in that way, and
- Does not alleviate the respective TAFE NSW team, designer, supplier or contractor from their own Work Health and Safety obligations and duties.

Legend	Level of Risk	Action Required
H	High	Implement cost effective risk control measures, and formalise procedures or management responsibility for reducing risk. Amend design to reduce risk, or seek alternative option. Only accept option if justifiable on other grounds.
M	Moderate	Incorporate cost effective risk control measures within the scope of long-term planning. Management responsibility must be specified. Check that risks cannot be further reduced by simple design changes.
L	Low	Manage by routine procedures. Check that risks cannot be further reduced by simple design changes.

4 Technical Sections

Work Health & Safety

4.4.2 Common Work Health & Safety Concerns

Safety Concern Raised	Potential Control or Treatment measure	Reference to Design Standard/ Statutory Requirements	Level of Risk	Phase - Project Delivery	Phase - Design	Phase - Construct, Supply, Install	Phase - Operation and End use
Light switches overloaded, fan controls failing or not working	All switches to meet design and Australian Standards requirements.	AS/NZS 3000, AS/NZS 3133	M	-	Y	-	-
Areas found too bright Lighting too much glare	Design to Australian Standards.	AS/NZS 1680	M	-	Y	-	-
Stairways underlit	All stair areas to be lit to Australian Standards as a minimum.	AS/NZS 1680	M	-	Y	-	-
Workshop equipment missing task lighting	Task lighting design to be developed to meet design standard and Australian Standards.	AS/NZS 1680	M	-	Y	-	-
Maintenance issues lights flickering, broken, damaged, falling diffuser	LED technology luminaires to be incorporated in accordance with Design Standard and Australian Standards.	Clause 4.1	M	-	Y	-	-
Lack of external security lighting due to lighting not present, being damaged or automatic control not working	External pathway and carpark lighting to be developed in accordance with Australian Standards.	AS/NZS 1158	M	-	Y	-	-
Prevent water leaks within luminaires	Luminaires design selection with suitable IP rating.	Clause 4.1 AS/NZS 60529	M	-	Y	-	-
Prevent vandalism of luminaire	Luminaires design to be selected with suitable IK rating and anti-tamper screws	Clause 4.1	M	-	-	-	Y
Risk of fire due to heat from downlight	Heat from units is significantly reduced with new technology. Designer to reference OEM requirements.	Clause 4.1	M	-	Y	-	-
Luminaire access for ongoing maintenance or replacement	Location of luminaire to allow safe access for cleaning & ongoing maintenance or replacement.	Clause 4.1	M	-	Y	-	-
Impact of high temperatures on longevity	Lighting design to consider luminaire location and environmental conditions to avoid or mitigate exposure to high temperatures.	Clause 4.1	M	-	Y	-	-
Insufficient lighting at night time/after hours for safety	All external lighting to be meet minimum Australian Standards.	AS/NZS 1158	M	Y	Y	-	-



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