Digital Solutions Division

ACT Government | ACT Health

St-10 Digital Lighting Control System

Version 2021.1.1 Approved

User Support: 02 5124 5000 | Division Administration: 02 5124 9000

Please Read

IMPORTANT COMPLIANCE REQUIREMENTS

Note: The following instruction applies to all documents in this library.

This is a controlled document and is reviewed every two years. The last review was carried out in March 2021. If you are viewing this document after March 2023, you will need to contact the sender to confirm you are working from the latest revision.

1. It is the responsibility of the contractor/vendor to read and adhere to the procedures, processes and guidelines set out in the following document when quoting for or carrying out work for the ACT Public Health System Sites.
2. If you have questions or require clarification of any of the procedures, processes or guidelines in the following document please contact the sender of the document in writing with your questions so that a formal response can be provided. If any specific requirement is unclear, it is expected that clarification will be sought from the ACT Public Health System's Digital Solutions Division (DSD) Critical Systems Infrastructure (CSI) Hub - Information Communications and Technology (ICT) architect(s), rather than a decision made and a design implemented and based on unclarified assumptions.
3. These standards are applicable to ALL ACT Public Health System Sites or any work funded by ACT Health Directorate (ACTHD) (e.g. Calvary, ACTHD provided NGO sites) unless specifically exempt.
4. All Greenfield ACT Public Health System Sites are expected to be fully compliant with all appropriate standards.
5. Brownfield ACT Public Health System Sites undergoing refurbishment should be fully compliant unless an exemption is provided by DSD's CSI Hub.
6. In the event of any design non-compliance issues, a Departures document must be completed and submitted to DSD's CSI Hub. These issues should be resolved, in consultation with DSD's CSI Hub, as soon as possible within the project process and explicitly prior to site handover.

While some test cases have been cited within these documents as examples, the list is not exhaustive, and all appropriate test procedures shall be formulated, approved prior to testing. Testing shall be performed by the client system administrator/s before full acceptance can be signed off by the Senior Director CSI Hub.

IMPORTANT:

Any departure from the standard, whether intentional or in error shall require a completed Departures Document to be submitted to DSD's CSI Hub for approval.
Any non-compliant designs without a pre-approved Departures Document by completion of the project or a nominated milestone or gateway, will require remediation by the Head Contractor at the Head Contractors cost.

Document Control

(to review detailed document updates click here)

Version	Summary of Changes	Author	Date
5.5	Update 'Compliance Requirements' page. Review the document and update as necessary.	Nitin Saxena	21/10/2019
2019.1.0	Sent to the CIO for approval to release	Mark Moerman	23/10/2019
2019.1.0	CIO Approval for release	Sandra Cook a/g CIO	24/10/2019
2020.1.1	Review-make doc consistent with PO's comments of other docs	Alkesh Hemrajani	22/12/2020
2021.1.1	Rewrote document to remove DALI	David Richards	04/03/2021
2021.1.1	Document reviewed for finalisation and onward ratification by MarkM prior to CIO approval	Mitchell Jamieson Curran	15/03/2021
2021.1.1	Rechecked document prior to CIO final review and approval by Technology Steering Committee for release	Alkesh Hemrajani & Mark Moerman	30/03/2021

Document default review cycle

Date	Version	Comments
October 2019	2019.1.0	release date of updated version
October 2020	2020.1.1	Updated but unreleased
March 2021	2021.1.0	Annual Review. Next Review March 2023

Document Owner

Name	Location
Senior Director, CSI Hub	CSI Hub, Technology Operations, DSD ACTHD

Document references

Document	Version	Location
ACT Health Lighting Control Specification	2019.1.0	FMI&HSS

Contents

1. Introduction

This document forms part of a suite of documents that describe ICT specifications and standards for the ACT Public Health System's, Business, and Infrastructure support systems. It provides the ICT Specifications for Digital Lighting Control System applicable to green-field and refurbished brown-field sites. This document has been revised to ICT only related requirements and a separate Digital Lighting Control System standard relating to the actual building and electrical requirements of lighting installs is available from the Facilities Management (FM), Infrastructure & Health Support Services (IHSS) Canberra Health Services.

1.1 Assumed knowledge and document dependencies

A general understanding of lighting systems and ICT networking is assumed. Relevant documents must be accessed from IHSS and must be followed in conjunction with this Specification.

1.2 Disclaimer

The following document **provides ICT ONLY specifications and requirements** for the designated system –Digital Lighting Control System, and is by no means intended to cover all the comprehensive business requirements for the system. Additional business and user requirements will be presented in project specific documentation such as Business Requirements, Solution and Detailed designs.

1.3 Vendor Requirements

The head contractor(s), vendor(s) or their representatives must review these specifications and provide a Departures document for any non-compliance with these specifications. The Departures document must be provided prior to commencing any work including design, implementation, configuration and testing for DSD's CSI Hub's approval.

2. Executive Summary

A Digital Lighting Control System was adopted by ACT Public Health System for the Capital Project Delivery (CPD)/Health Infrastructure Project (HIP) redevelopment in line with requirements to meet sustainable development parameters, and best practice.

2.1 Cost Savings

Significant operational cost savings can result from the implementation of a Digital Lighting Control System. The savings are direct (electricity) energy savings from programmed and sensor-controlled lighting, e.g. automatic day time and night-time (dimmed) lighting modes are programmed. Further significant savings result from a digital system's ability to provide area lighting re-programming to suit change of building usage, which can be done without physical re-wiring of lighting groups.

Probably the biggest cost benefit of a Digital Lighting Control System is the maintenance labour saving. The control system can monitor all individual light fittings[1] and to run a computer-generated report from a central/ or remote location, without maintenance staff having to physically check operational status of the light fittings in the buildings over many floors. This is especially a labour cost saving for emergency and exit lighting which is mandatory to be checked for operability every six months (by legislation).

Apart from these obvious and tangible savings, there are some intangible benefits for Health and wellbeing. There are now scientifically backed studies that show the positive effects provided to night time shift workers, by slowly controlling the intensity of lighting up and then down during the shift period to emulate natural daytime cycles and thus provide a more natural and healthier environment for the body's Circadian[2] rhythm adjustments. Studies have shown improved health and fewer days off as a tangible outcome.

2.2 Standardisation

A new and comprehensive building and electrical specification has been developed and conformance to the Facilities standard is particularly important for ensuing future works are implemented correctly to provide the greatest ongoing savings **and a** desirable workplace environment.

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[1] This is true when individual Digital lighting ballasts are used per light as recommended, allowing individual lights to be programmed and monitored. In cost cutting measures, multiple lights are often grouped on a single run for one Digital lighting ballast, with the result that lights can only be programmed to act as a single entity for dimming etc and not individually. E.g. ***the recommended way will allow precise reporting of specific lighting position failure.***

[2] Circadian rhythms are physical, mental, and behavioural changes that follow a roughly 24-hour cycle, responding primarily to light and darkness in an organism's environment. They are found in most living things including Humans. Although circadian rhythms are endogenous ("built-in", self-sustained), they are adjusted (entrained) to the local environment by external cues called Zeitgebers, commonly the most important of which is daylight or lighting closely followed by temperature.

3. Enterprise Architecture

The architecture presented within this document complies with the Enterprise Architecture Principles outlined in the latest "ICT Enterprise Architecture Principles" document. The architecture principles are as follows:

- **Control technical diversity** to minimise the non-trivial cost of maintaining expertise in and connectivity between multiple systems.
- **Maintaining interoperability between systems** to conform to defined standards that promote benefit to the business.
- Commissioning systems to a defined **level of availability**, recognising increasing demand for services to be provided outside of traditional office hours. The system availability also considers the lack of tolerance for system outage over longer periods of time.
- The systems must be **manageable** and be **monitored**.
- Use of **common systems** for head-end and building concentrator layers throughout the ACT Public Health System is preferred rather than use of separate vendor systems performing identical tasks.
- The **user interface layer** of the architecture must provide devices that are supported by the building concentrators; and
- The systems must be able to **adapt for change and growth**. The architecture modularity allows for individual components to be upgraded without replacing the entire system.

The following technology principles are also applicable:

- Interface between head-end and building concentrator shall be IP over Ethernet; and
- Interface between edge devices and the concentrator shall follow known standards; however, it can be a mixture of analogue, dry contact, or data protocol compliant cabling.

The preferred architecture model implemented at ACT Public Health System uses a three-tiered modular approach. The tiered model is based on the principles of hierarchy, modularity, resiliency, and flexibility.

This model consists of three tiers, head-end servers/appliances, building based concentrator and edge devices, which support hierarchical and modular approach. The head-end and building concentrator tiers within this model are intended to provide high levels of resiliency and availability. The model also provides the flexibility of leveraging existing infrastructure, where practical, which is expected to be used within various onsite or off-site buildings.

The Digital Lighting Control System must be compatible with IP networks for the top two tiers of the architecture i.e. at Head-end and building concentrators. Additionally, it should be able to leverage the layer-3 network commissioned by the ACT Government.

The Digital, Data and Technology Solutions (DDTS) network architecture has been provisioned to comply with the Medical Grade Network (MGN) architecture which supports

the principles outlined previously, providing a robust and resilient network that supports all the security systems mentioned in this document.

The following diagram, Figure 1, illustrates at a conceptual level the expected architecture for the Digital Lighting Control System. Each architecture layer is described in the following sections.

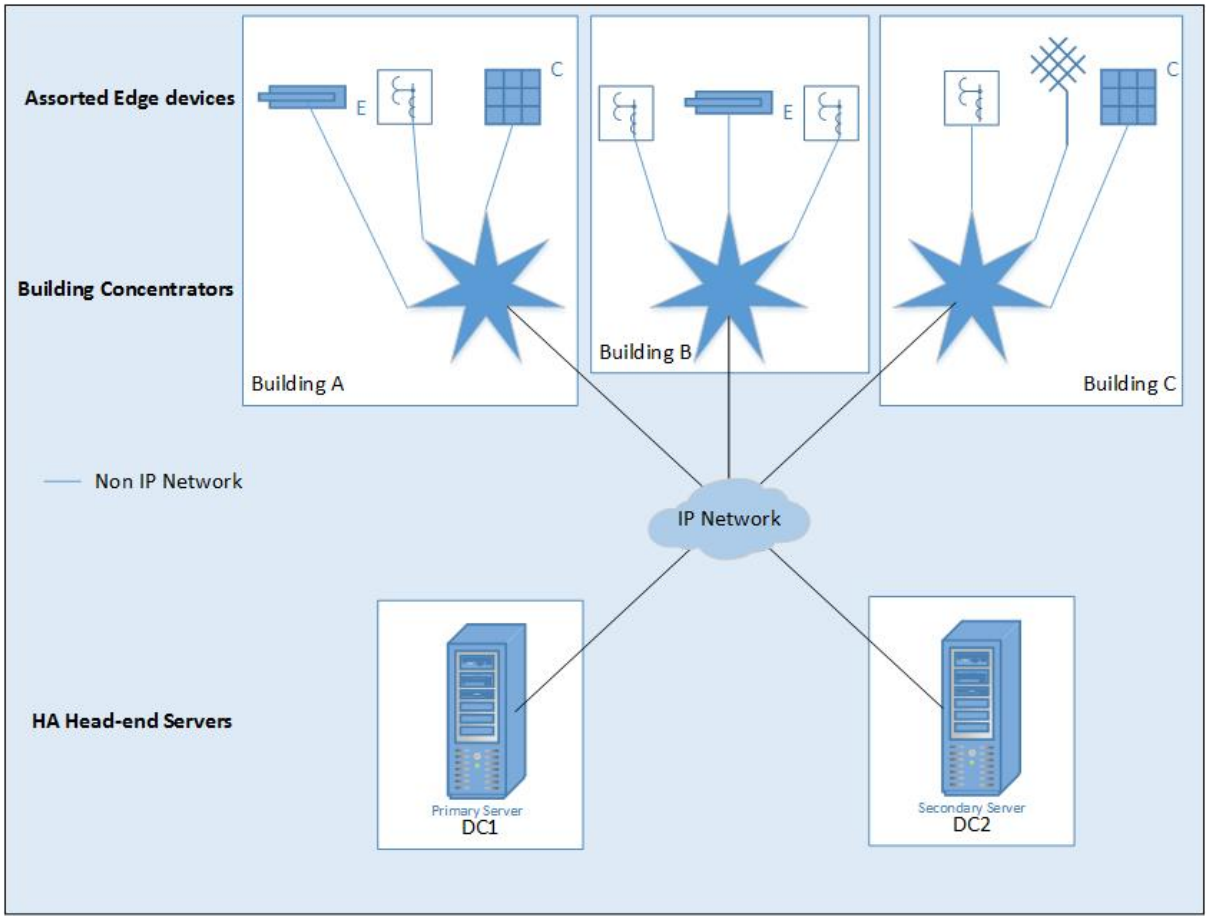

Figure 1 - Three-tiered Architecture model

The building concentrators of the for Digital Lighting Control System shall connect directly to the DDTS Ethernet switches, which provide connectivity over the network to the head-end infrastructure. The head-end infrastructure is expected to comply with the standards and specifications previously outlined for the three-tiered architecture and the **relevant IHSS specification on Digital addressable Lighting Interface (DALI).**

4. Digital Lighting Control System

4.1 Introduction

The scope of work for the Digital Lighting Control System is to provide a consistent approach to the integration of all building control and management systems and provide secure and robust access via the ACT Government network.

The Digital Lighting Control System connects via Ethernet to the ACT Public Health System network and resides in a virtual network called BMCS VRF that can be directly accessed by devices, also configured on that VRF or by other designated (and configured) ACTGov PC's via a protective Firewall.

The local building BMCS (Building Management and Control System) PC will be configured to reside on the same VRF and serve as a workstation/remote configuration PC for both the BMCS and Digital Lighting Control System .

The main central controlling Workstation PC will also be configured to reside on that VRF.

Other designated ACTGov PC's may be configured to have access via the Firewall to this VRF.

Any virtual main backup storage device shall reside in a data centre and will either be configured to reside on the VRF or directly on the ACTGov network and then access Digital Lighting Control System databases via the firewall for backup purposes.

4.2 Cabling and Data point Requirements

4.2.1 Separation

To separate mains voltage from low voltage and Ethernet cabling, any IP Controllers are to be in the switchboard but separated from their associated line power supplies as per Australian Standard ST-009.

4.2.2 Data port count

At each cabinet/switchboard group of more than one IP controller, **Ethernet data outlets** required shall be calculated by the following formulae:

N+2

Where N = number of controllers within a cabinet.

A local hub or switch is NOT to be used for IP connection. All IP device ethernet ports shall be structured cabling back to the nearest Floor Distributor (FD) room as specified in ACT Health Standard ST-02.

Note: the 2 additional data points are designated as one for expansion and the other for support personnel to locally access the controllers with a laptop for testing and programming.

4.3 Time Clocks

All IP devices that provide time schedules shall be programmed for automatic clock control to allow automatic time updates via the ACT Government NTP server over the Ethernet network.

The Device shall be able to receive automatic **daylight savings** adjustment and **leap year correction** via the ACT Government NTP time server.

4.4 Maintenance

Maintenance and Ethernet network fault finding shall be consistent with standard DSD's CSI Hub and DDTS support contract. All non-IP faults shall be handled by FM IHSS and the incumbent lighting contractor

4.5 Design and integration

4.5.1 High Level Vendor Design

Digital Lighting Control System High Level Vendor Design (HLVD) is to be submitted via the project manager to DSD's CSI Hub for sign off by the final sketch plan (FSP) submission. It shall include drawing(s) of controller locations, stating lighting controller name/ID and their IP numbers. The design shall show how the system interfaces the IP network and explain all IP port numbers and protocols used. The Vendor shall also explain any remote access provisions.

4.5.2 New Integrations

If the system provides new equipment, protocols or functionality previously not present on the ACT Health Network, a complete Conceptual Solution Design (CoSD) for the new system components shall be required and shall be prepared by the DSD's CSI Hub Architects for lodgement with DDTS Design Review Panel (DRP). This will include an ACT Government digital security risk assessment. New Integrations into the main central critical nonclinical systems will also need to be included in the design through the DSD CSI Hub architects. These requirements will be established after reviewing the High-Level Vendor Design (HLVD) provided by the contractor.

4.5.3 IP Addressing

All controllers IP addressing shall be obtained from DDTS via the DSD's CSI Hub Project Manager (PM). This will require an excel spreadsheet to be provided, with each controller identification, location, and a blank cell for IP address allocation. The spreadsheet will need to be provided by the contractor before the DSD's CSI Hub conceptual solution design (CoSD) stage. At this time DSD's CSI Hub Architects will obtain appropriate IP addressing range, VLAN and VRF requirements from DDTS as part of the CoSD and on DDTS DRP approval return these through the DSD's CSI Hub Project Manager well before site programming is required.

Note: *It is critical that the contractor only uses those IP numbers supplied and does not add additional at any time without the prior approval of DDTS as this could result in the dire circumstance of existing Digital Lighting controllers being overwritten with incorrect lighting schemes. This is not relevant where 802.1x is implemented*

4.5.3 Wireless Devices

As per the New Integrations section above, the use of remote wireless devices shall not be deployed without previous permission, and design assessment by the DSD's CSI Hub Architects until:

a) a frequency spectrum analysis to determine the possible disturbance and effect on or to other wireless devices both Critical clinical and Critical nonclinical devices.

b) a digital security assessment for possible backdoor attacks; and

c) an approved CoSD through the DDTS DRP process.

5. Digital Control, Self-Contained Emergency and Exit Lighting System

5.1 General

Emergency luminaires and exit signs shall be provided and installed throughout the building in compliance with the requirements of AS/NZS 2293 and the Building Code of Australia (BCA).

The Self-Contained Emergency and Exit Lighting System shall comply with all IP requirements, planning and installation as discussed in the previous sections.

Provision shall be allowed for Telecommunications Outlets (TO) at each point where IP devices are to be located.

5.2 IP based Emergency Luminaires

5.2.1 Single Point Emergency Luminaires

All self-contained, non-maintained, single point fittings shall be provided with one Cat6$_A$ Systemax ®; data point, 3' yellow, "Mino" patch lead and 3' Fly lead.

5.2.2 Integral Type Emergency Luminaires

Where shown on the engineering drawings, normal lighting luminaries shall be provided with one Cat6$_A$ Systemax ®; data point, 3' yellow, "Mino" patch lead and 3' Fly lead.

5.3 Addressing and Identification

All emergency luminaires and exit signs **shall** be addressed with other luminaires on the digital lighting Lines.

The **luminaires shall be identified by their unique Line and fitting address**. The address shall correspond with the report identification and the as-installed drawings.

IP devices shall be labelled with their ID name/number and the allocated IP number.

Appendix A. References

Standards and Compliance

- All Australian Standards that are relevant to this system.
- ICT Enterprise Architecture Principles_v0 2_2013_03_20.docx

A.1. Glossary of terms

Term	Definition
BCA	Building Code Australia
BMCS	Building Management and Control System
CosD	Conceptual Solution Design
CSI Hub	Critical Systems and Infrastructure Hub
DALI	Digital Addressable Lighting Interface
DDTS	Digital, Data and Technology Solutions
DLP	Defect Liability Period
DME	Durasuite Messaging Engine
DRP	Design Review Panel
DSD	Digital Solutions Division ACT Health Directorate
FD	Floor Distributor
FSP	Final Sketch Plan
HIP	Health Infrastructure Program
HLVD	High Level Vendor Design
ICT	Information Communications and Technology
IHSS	Infrastructure and Health Support Services
IP	Internet Protocol
LAN	Local Area Network
MPLS	Multi-Protocol Label Switching
NTP	Network Time Protocol
PoE+	Power over Ethernet Plus
RFID	Radio Frequency Identification
RVA	Remote Vendor Access
TCH	The Canberra Hospital
VLAN	Virtual Local Area Network
VPN	Virtual Private Network
VRF	Virtual Routing and Forwarding
WLC	Wireless LAN Controller

A.2. Amendment history

Version	Summary of Changes	Author	Date
2015.1.0	Initial version	David Richards	06/03/2015
2015.2.0	Peer Review	Manfred Halton	06/03/2015
2015.3.0	Accept review changes & additions to Glossary	David Richards	06/03/2015
2015.4.0	Reformat to SSICT document	David Richards	06/03/2015
2015.5.0	Committee updates and reformat to B&I Spec.	David Richards	20/03/2015
2015.5.1	Updated new approved switch models	David Richards	20-05-2015
2015.5.2	Reset formatting, reviewed, amended.	David Richards, Tulio Losanno	22-10-2015
2015.5.2.1	Minor changes accepted. Second review	Tulio Losanno	22-10-2015
2015.5.2.2	Peer Review	Nitin Saxena	27-10-2015
2015.5.3	Approved version	Tulio Losanno Nitin Saxena	16-11-2015
2018.5.4	Template Update	Raj Mohan	11/05/2018
2018.5.5	ACT Health DSD template update	Raj Mohan	12/11/2018
2019.1.0	Revamp of Doc to ICT only and new Template	David Richards	21/10/2019
2019.1.0	CIO Approval to release	Mark Moerman	24/10/19
2020.1.0	Review -make doc consistent with PO's comments of other docs	Alkesh Hemrajani	22/12/2020
2021.1.1	Updated to remove references to DALI control	David Richards	04/03/2021
2021.1.1	Final review prior to MarkM's review and onward approval	Mitchell Jaimeson Curran	15/03/2021
2021.1.1	Final review and updated non-technical language prior to MarkM's review and onward approval	Alkesh Hemrajani	16/03/2021

Appendix B. Details of Changes

Version	Last Modified date	Author Name	Summary of changes	Section No.	Section Details	Page. No.	Revision/Changes Made
2019.1.0	24/10/2019	Sandra Cook a/g CIO	Approval for release		CIO Approval		Approval for release
2020.1.1	22/12/2020	Alkesh Hemrajani	Reviewed as per PO				Reviewed the docs as per PO's comments
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments		Main Page with picture	1	Removed page footer words
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments		Blank page removed	2	Blank page has been removed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments		Please Read	3 & 4	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments		Document Control	5	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments		Document Default Review Cycle	5	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments		Document Owner	5	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments	1	Introduction	7	Non-Technical words has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments	1.1	Assumed Knowledge and Doc	7	Non-Technical words has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments	1.2	Key Stakeholder	7	Tabular Coolum has been removed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments	1.3	DALI Contractors	8	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments	1.5	Vendor Requirements	8	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments	2	Executive Summary	9	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments	2.1	Cost Savings	9	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments	2.2	Installed DALI Systems	9 & 10	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments	2.3	DALI Standardisation	10	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments	3	Enterprise Architecture	11 & 13	Technical words and Fig-2 formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments	4.1	Lighting Control Systems	14	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments	4.4	DALI Line Controllers	17	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments	4.4.4	Maintenance	18	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments	4.6.1	DALI Vendor Design	19	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments	5.1	General	20	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments	5.5	Building DALI Database	21	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments		Appendix D	27	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments		Appendix F	33	Author Name Added
2021.1.1	30/03/2021	Mitchell Jamieson-Curran	Technical Update	3	Enterprise Architecture	8	Technical words updated and DALI Specific Image has been removed
2021.1.1	30/03/2021	Mitchell Jamieson-Curran	Technical Update	4	Digital Lighting Control System	10	Technical data had been updated
2021.1.1	30/03/2021	Mitchell Jamieson-Curran	Technical Update	5	Digital Control Self-Contained Emergency and Exit Lighting System	13	Technical data had been updated
2021.1.1	30/03/2021	Mitchell Jamieson-Curran	Technical Update	Appendix-B	Typical DALI Line Components		Picture and Table has been removed
2021.1.1	30/03/2021	Mitchell Jamieson-Curran	Technical Update	Appendix-C	DALI System Architecture		Picture and Table has been removed
2021.1.1	30/03/2021	Mitchell Jamieson-Curran	Technical Update	Appendix-D	Sample DALI System Integration Scenario		Picture and Table has been removed
2021.1.1	30/03/2021	Mitchell Jamieson-Curran	Technical Update	Appendix-E	DALI Profile Configuration Template		Picture and Table has been removed