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LIGHTING INDUSTRY ASSOCIATION

How To Specify
Smart Lighting Controls
## January 2022

THE LIGHTING INDUSTRY ASSOCIATION

Why specify?

Specifying lighting controls is not as easy as it may seem. We have all experienced or heard about presence detectors taped over, controls on walls with handwritten markings on them, and the time favourite "dancer in the dark" routine inside a bathroom stall.

What went wrong? Someone surely specified a presence detector to be installed. And indeed, a presence detector was installed.

You get what you ask for, not what you want.

The hardest thing about specifying lighting controls (and anything really) is not **"what"** the system does, but **"how"** the system does it and more importantly the **"why"**
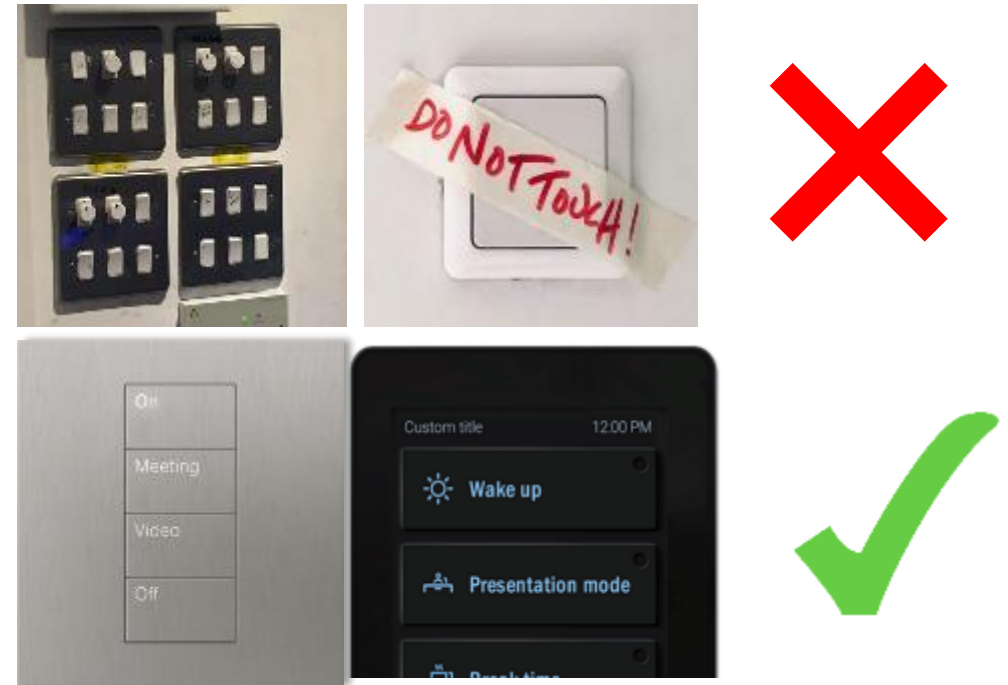
Why specify?

Detailed specifications enable developers and consultants to define expectations, and the language and criteria to assess proposals put forward by those executing the works.

- A developer will want to maximise the appeal of their property in order to attract tenants.

- A consultant may require that the building reaches a BREEAM Excellent rating.

- A main contractor may define the parameters that a lighting control system must meet in order to achieve said BREEAM Excellent rating.

The further down the value chain, the more detailed the specifications and requirements become.

Ultimately a clear specification enables all the key stakeholders to get what they want, meet their stated goals, and hold each other accountable.

Look beyond energy efficiency
Human Centric Lighting increases the vision, performance and well-being of people

90% Staff costs in salaries and benefits
1% Energy costs
9% Rental costs

Examples of benefits: up to
+4,5% Productivity
-2% Errors
-1% Absence
-2% Accidents

Source: Report 'Quantified Benefits of Human Centric Lighting' by LightingEurope & ZVEI, April 2015

Introduction

What makes a system work?

- A lighting control system is more than a collection of components.

- What makes a control system work is the actual control logic that binds and decides how the components should behave.

- A lighting control company is not the same as a lighting company.

A control system, like the brain in a person, is what makes lighting smart and work for humans.

SYSTEMS OF THE HUMAN BODY
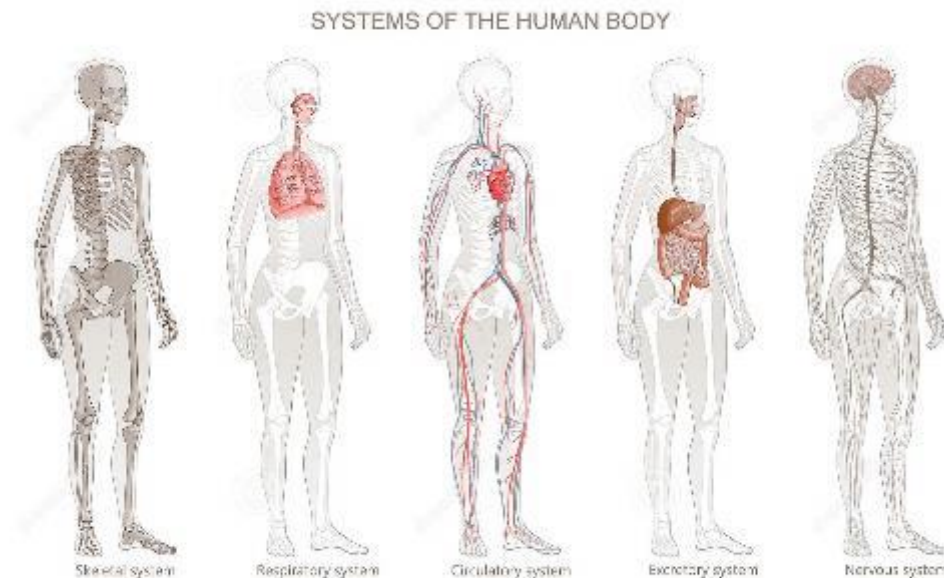
Structural   Ventilation   Electrical   Energy   Control system

Smart building as a human body

Systems approach to energy savings

- A lighting control system is greater than the sum of its parts and can unlock further savings by combining these strategies.

- Installations can have presence detectors, daylight sensors, timers, etc…

- A control system can decide whether or not to turn the lights on depending on the time of day, time of the year, external conditions like a sunny day.

- A lighting control system combines and optimizes the use of energy saving strategies to greater effect that any individual one could achieve.
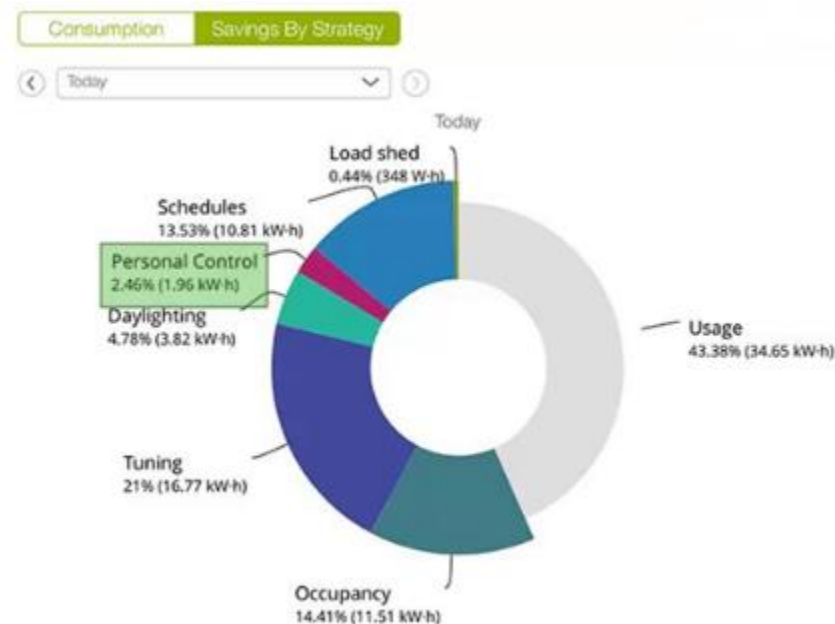
Energy Saving Strategies used by a Lighting Control System

Anatomy of a Lighting Control System

The vast majority of lighting control systems available in the market can follows this simple structure.
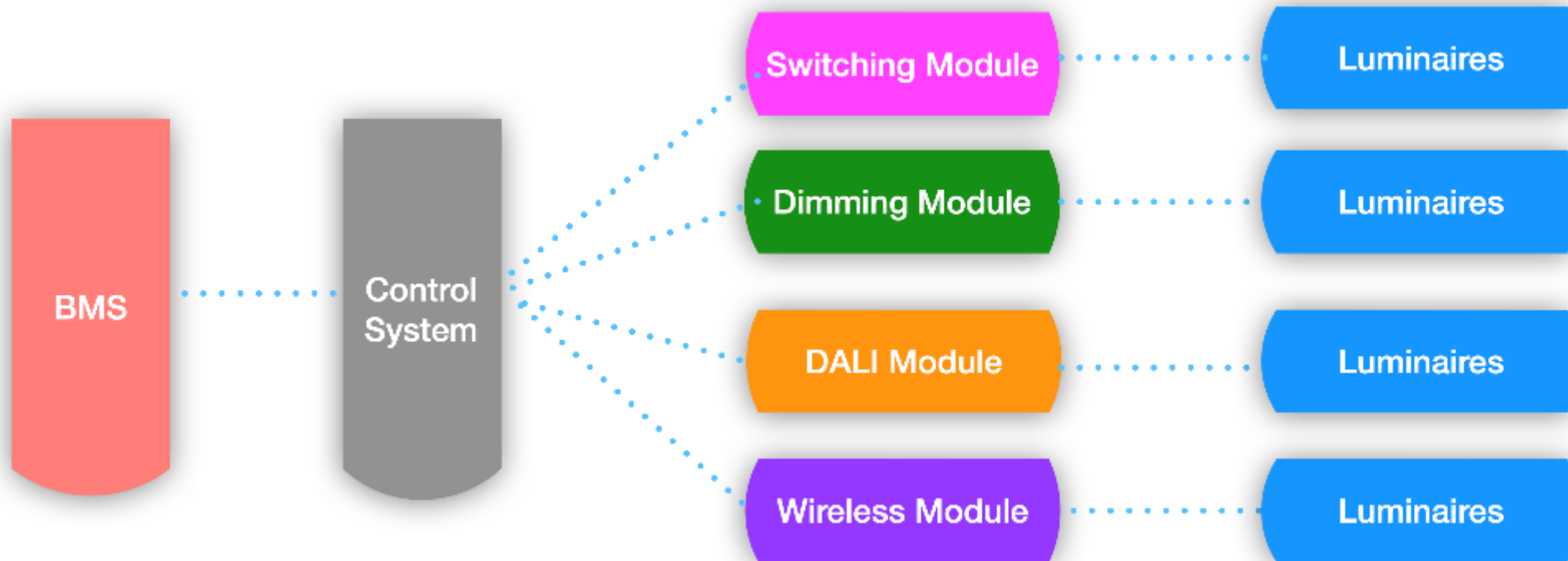
It is worth noting that thanks to the convergence of wireless technologies and smart devices, some companies opt for moving the control modules inside the luminaire, but functionally it is the same.

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Types of specification

Technical Specification

- A technical specification defines WHAT the control system needs to do in order to deliver the desired outcome

    - *"The control system shall be DALI-2 certified"*

    - *"The control system shall provide the means to test emergency lighting fixtures and provide the necessary test reports"*

- They are **quantitative** and **binary** in nature

    - The devices are either DALI-2 certified or they are not

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Types of specification

Performance

- A performance specification provides requirements about the desired outcome of the control system

- They are about the WHY and the HOW

- They are **qualitative** in nature

  - *"When I walk into the room, I want the lights to fade to on over a 2 second period"*

  - *"The luminaires shall provide smooth continuous dimming, without noticeable steps or dead travel"*

  - *"The lights need to all turn on at the same time, without popcorning"*

- If a developer wants to get BREEAM Excellent status, they have to specify accordingly.

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How to Specify Lighting Controls

Ask the right questions

- Size of the project will determine many things such as the level of control, the complexity of the control system and its ability to evolve.

- Small projects may also be complex if we consider an auditorium or theatre, so size doesn't necessarily dictate the sophistication of the control. A small office or retail space may have a different approach.

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How to Specify Lighting Controls

Ask the right questions

- Medium projects, are often the most difficult to specify as these are generally projects where the end use of the building is likely to evolve over time.

- Large scale projects often have the biggest budget and will embrace technology providing the budget is tightly managed. These projects are likely to have the controls strategy fixed for long period so need to be well designed from the outset.

Always understand what the intended result is, and do not assume that the size of the project always determines the sophistication of the system.

How to Specify Lighting Controls

Ask the right questions

- Is the space rented or owned?
    - This will impact infrastructure costs.
- If rented, how long will you be occupying that space, Short, Mid or Long term?
- What do you need from your control system? This can be broken down as follows:
    - Essential (Minimum requirements, on / off, dimming and energy saving)
    - Desired (As above with Scene Setting, Colour control, Automated Emergency testing, Data)
    - Aspirational (Connected so lighting is part of a smart building control platform)

How to Specify Lighting Controls

Documenting the desired outcome

- Follow a plan of works such as the one offered by RIBA.

- Set the prime focus for the controls (Energy/ Performance/ Wellbeing)

- Mark up the installation drawings with the location of devices

How to Specify Lighting Controls

Documenting the desired outcome

- Allow for future expansion and change.

- Agree on controls nomenclature.

- Pre-approve and Sign off design documentation.

- Avoid performance only specifications as they are open to interpretation.

How to Specify Smart Lighting Controls

Upgradable / Scalable / Flexible

- Consider the number of devices in the space and allow for expansion.

- Choose a technology platform that is open and isn't limited by features or manufacturer.

- Accept buildings will evolve so plan for this

- The use of spaces change so make sure the control system can be easily reconfigured.

How to Specify Lighting Controls

Software – the brain of the control system

- Lighting is a complex process that requires software dedicated to its operation and management.

- The software should as a minimum provide Daylight harvesting, occupancy as well as scene selection, group and building control.

- Automated Emergency testing and reporting should be a prerequisite of any smart lighting system

How to Specify Lighting Controls

Software

- Interface to other building services, directly or via a smart hardware interface. Services such as Audio Visual, Blinds, Air conditioning, Heating, Alarm and Security systems.

- Interface to other software services via IP (Internet Protocol)

- Share data with BMS systems via recognised formats.

- Allow for cloud-based services.

BUILDING MANAGEMENT SYSTEM

How to Specify Smart Lighting Controls

Data and Hardware

- Scalability is essential in any Smart Lighting Control System.

- At a device level use an open protocol such as DALI, specified by IEC 62386, so addressing and operation is standardised.

- Look for certification to underwrite interoperability through the DALI Alliance.

How to Specify Smart Lighting Controls

Data and Hardware

- Specify certain functions such as power monitoring or Colour control.

- Define data that can be obtained from the hardware as well as the software such as Status of Devices, Critical Alarms etc.

- Use a dedicated lighting control component whenever possible to fully integrate to lighting software and provide local control.


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Choosing the right technology

- Components based on open and interoperable standards.

- Confirm compliance to standards such as IEC-62386.

- Provide a mechanism for the system to evolve over time.

- Future proofing the lighting installation with replaceable components.

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Why DALI?

DALI is not the be-all end-all answer to everything. By nature, open protocols developed by collaboration of multiple companies evolve at a slow pace. But there are two core benefits that DALI provides, that no other available open protocol can claim.

1. The technical specifications define what the light output needs to be for any given command input.

2. Luminaires from multiple manufacturers can be controlled in a predictable way thanks to DALI **certification**.
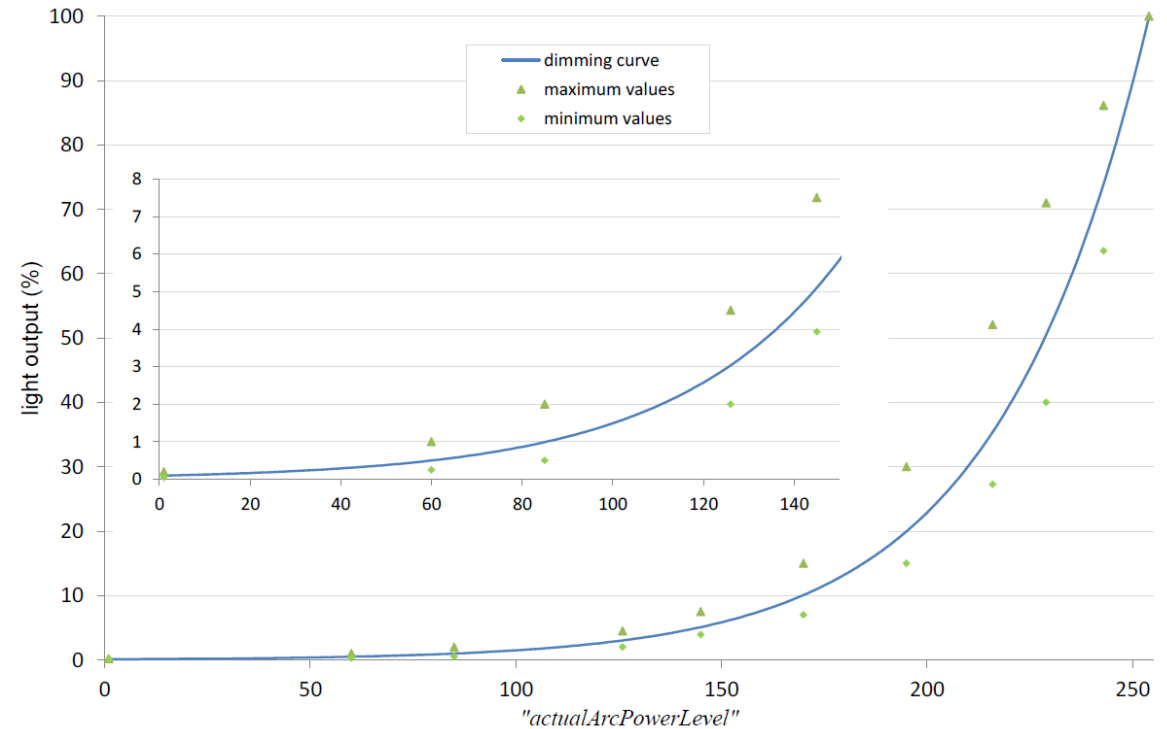
Total cost of ownership

- Use Circular Economy based processes.

- Consider the whole life cost of the product / project.

- Design for upgrade / recycling through life.

- Make data driven decisions so products can be optimised for the application.

- Lighting as a service.

Emergency Monitoring

- Maintain system integrity and functionality
- Performs and registers all tests
- Provides a full audit trail of testing and maintenance
- Compliant with IEC 62034 Automatic testing of Self Contained Emergency Luminaires
- Optimises the life of the emergency lighting components.
- Interface to Fire Alarm System
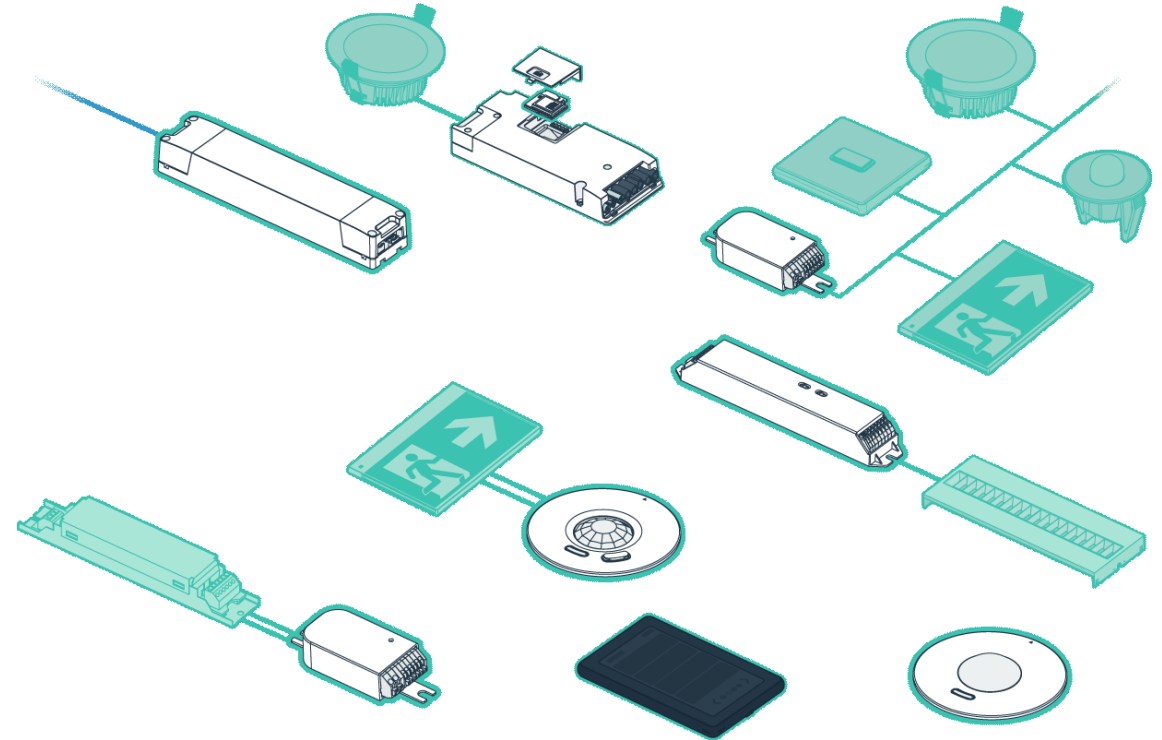
Emergency Monitoring

- Manages Risk

- Maintain life safety system integrity and functionality

- Automate all tests

- Provides a full audit trail of testing and maintenance

- Compliant with IEC 62034 Automatic testing of Self-Contained Emergency Luminaires

- Optimises the life of the emergency lighting components.

- Interface to Fire Alarm System

Alerts

98 — Last Week
120 — This Week

Ballast Failures	24
Devices Not Responding	20
Battery Failures	5

Specification Framework

Optimise for the application

1. Office
2. Warehouse
3. Industrial
4. Retail
5. Hospitality
6. Education
7. Health care
8. Street lighting

	Office	Retail	Warehouse
Selectable Lighting Scenes	√	√	
Presence/absence detection	√		√
Daylight Harvesting	√		√
Light level tuning	√	√	√
White tuning	√	√	
Blind control	√		
Partitioning	√		
Time clock events: out of hours cleaning etc	√	√	√
Audio visual Integration	√		
Energy monitoring	√	√	√
Space utilisation	√		
Fire alarm integration	√	√	√
Safety over-rides		√	√
Emergency lighting monitoring	√	√	√
BMS Integration	√	√	
Remote access and management	√	√	√

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Keys to success

1. Work with experts in lighting and lighting control.

2. Have a clear understanding of the design intent.
   - Just having a laundry list of specs that are met say nothing about what the outcome is going to be.
   - Define what and why the system needs to do per space or space type.

3. Communication.
   - Avoid unclear deliverables "You get what you ask for, not what you want"
   - There is never enough time to finish a construction project. Investing a bit more time at the beginning will save you exponentially more time at the end.

4. Think about the outcome and specify the system, not the components.
   - Buying all the components that constitute a computer does not get you a computer.
   - What makes a lighting control system work is the control logic (software) inside the "brains" of the system.

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