IEA-SHC Task 50

Advanced Lighting Solutions for Retrofitting Buildings”

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Daylight control in renovated buildings

Challanges when renovating buildings

Control concepts

Pro/cons

Technology

Room indicators

What is different when renovating a light installation in a building

You start with

An existing installation

- wiring
- light fixtures

An existing building construction

- Windows
- how the building is located in the terrain.

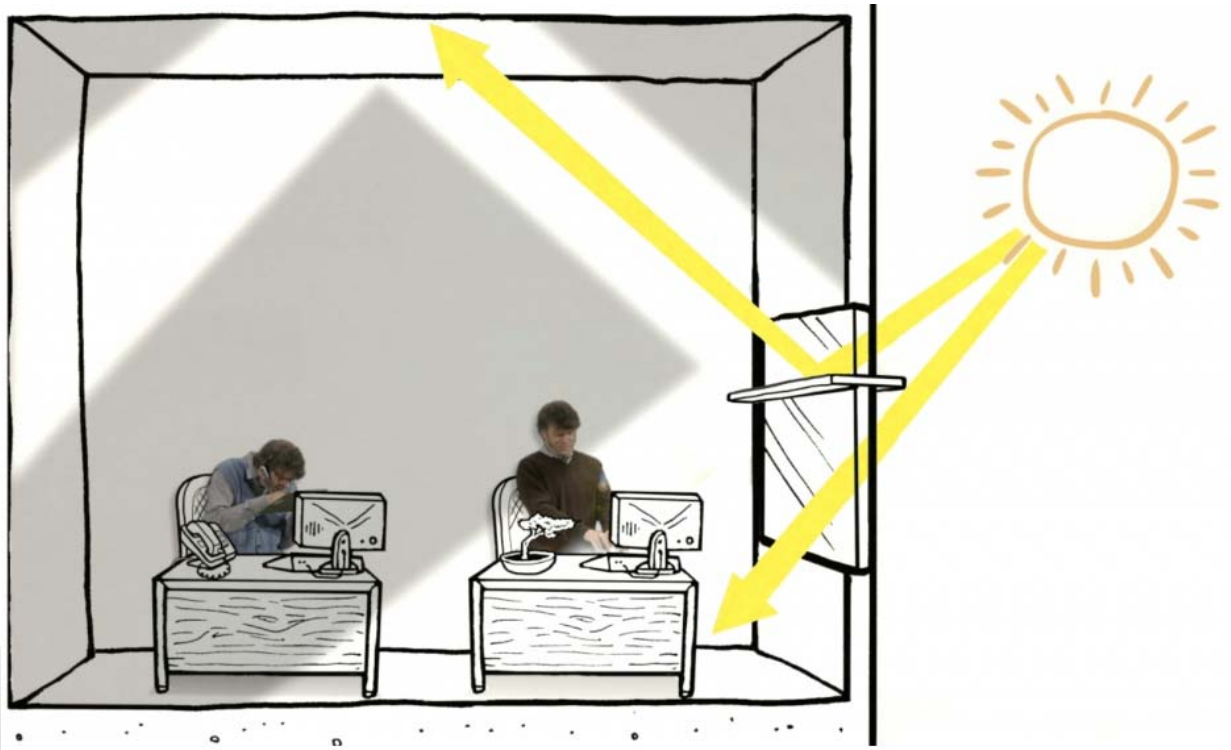
Challenges on daylight control in retrofitting buildings

- Most challenges are related to cost
  - Do we keep the existing wiring.
  - Can we keep the existing luminaires
  - Can we do something with the building construction
- What changes gives the best pay back time
  - This may vary from project to project depending on your starting point
- On the light technical solution there are no special challenges apart from does mentioned on top

Easy adaption in construction

- Solar panels in the form of a simple shelf placed high on the window will be a simple way to increase the utilization of daylight on.

- This shelf can also be set up inside



Control concepts

On / Off daylight control system

Turns the artificial light off when the total light level reach a predefined level.

Can be used on most existing installations.

Using a daylight sensor that sets a relay / switch.

Constant light control system

Trying to regulate the light level to a predefined level.

Can be used towards a dimmable light installation

Using a daylight sensor with an output that is converted to the lamp/driver dimming input.

On / Off daylight control system

- Can be used in most existing light installations. (When used instant restart light source)
- Low cost installation.

- The drop in lux level that occurs when the artificial light is turned off is so big that this solution cannot be used in primary working areas without receiving a lot of complaints.
- Lower energy savings because the predefined level must be set at a level that take in to account the light level made by the artificial light.
- If existing installation is kept you will only get the benefits from daylight regulation not the reduced energy consumption caused by new technology on light source, drivers etc.

On / Off daylight control system

- Lower energy savings because the predefined level must be set at a level that take in to account the light level made by the artificial light.
  - Required light level = 500 lux
  - Measured light level with no daylight = 850 lux
  - Security factor = 10%
  - Predefined level > 1485 lux
- This means that you will have no energy saving before the sensor reads 1485 lux.

Constant light control system

- Can only be used in with dimmable luminaires.

- Optimize energy savings.
- The best and easies systems available today are based on digital communication protocols between sensor and driver/light-source.
- Recommended to change the complete light installation.
- When changing the existing light installation you will also get the benefits from new technology on light source, drivers etc. This new technology might give the same energy savings as the daylight control system. Depending on the age of the existing installation.

Constant light control system

- External sensor/system control unit
  - Benefits. Sensor can be placed in the most relevant area in the room.
  - Need new wiring
  - Commissioning can be more complex/risky.
- Stand alone unit. (Integrated in a luminaire)
  - One luminaire with build in daylight sensor that only controls 1 luminare
  - Benefits are that existing wiring installation can be kept and little commissioning is necessary.
  - The downside is that luminaires are in the same position and that all luminaires must have a sensor.
- Master / Slave unit. (Integrated in a luminaire)
  - One master that can control a larger system (slaves)
  - Benefits are a lower cost on the installation, easier commissioning and normally you can place the sensor where people are working.

What to look for when installing a Constant light control system

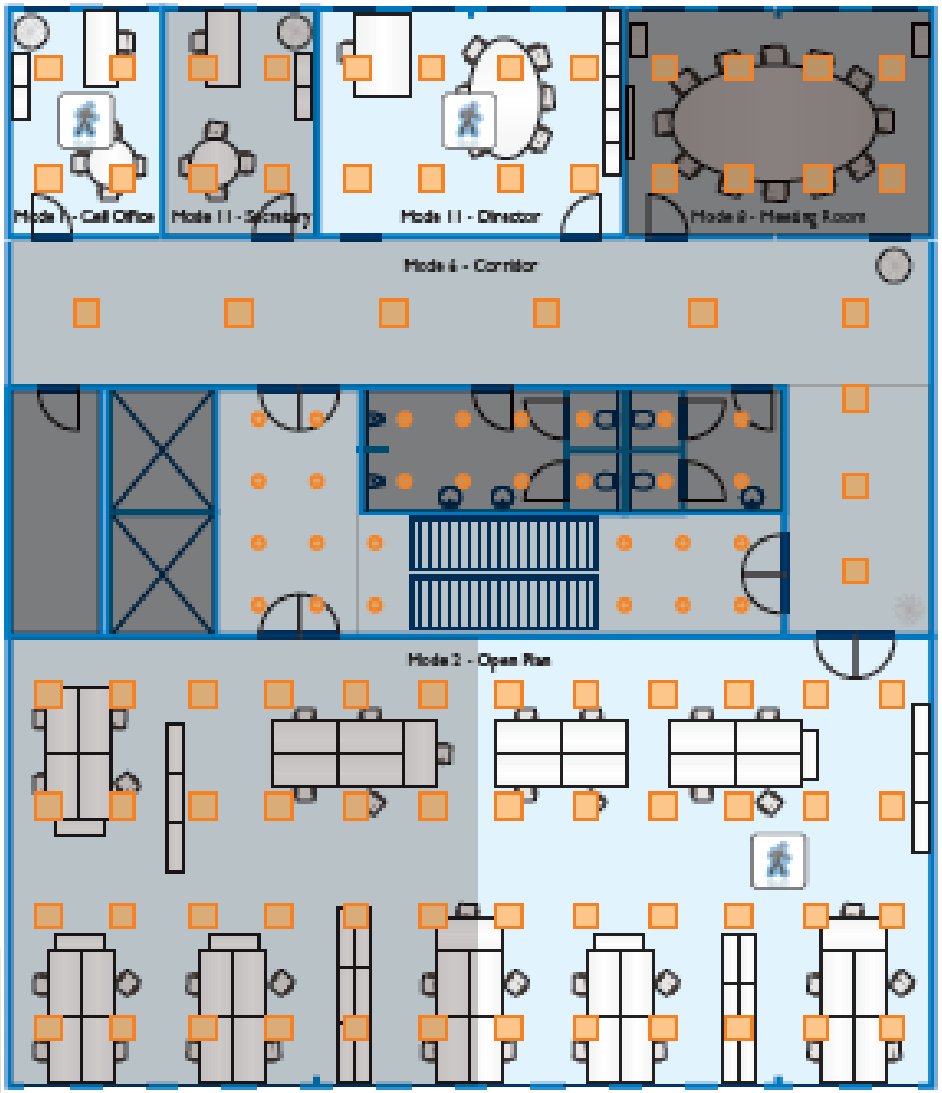
- Where to place the sensor
  - The input to a daylight sensor is based on the luminance (cd/m2) that it reads in the covered area.
  - Surfaces with different reflectance will give different results.
  - Make sure that the surface has a relatively constant reflectance over time.
  - Do not place the sensor close to the window

What to look for when installing a Constant light control system

- Setting the light level
  - Remember that your eye adapts to the background luminance as well as the luminance from the work area.
  - If the background luminance gets higher (more daylight coming in) and the luminance from the work area stays the same (artificial light is dimmed down) it will appears as the work area has less light.

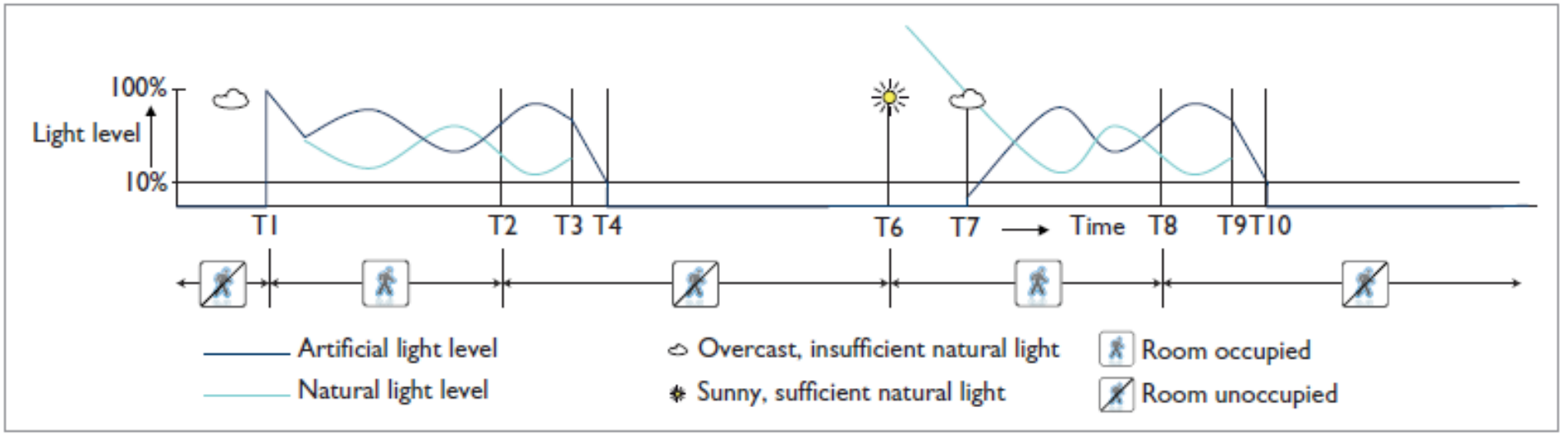
What to look for when installing a Constant light control system

- In larger areas
  - In larger areas always use a system that can be divided in to several daylight zones depending on the amount of incoming daylight..



A combined light control system

- Normally when using a constant light system a movement detector is added.
- A typical appearance of this type of system is showed below



What about LED

- LED will make it easier to use constant light systems
  - On fluorescent light sources there has to be an burn in period of 100 hour before you start dimming them. This is related to the life time of the light source.
  - On LED there is no need for a burn in period.
- LED does not have any changes in colour temperature or colour rendering when they are dimmed
- When LED systems based on tunable white technology becomes more available and more efficient there will also be other benefits apart from energy saving

Thank you for your attention