

CYPELUX

CYPELUX is a free to use tool developed to carry out the **design of normal and emergency lighting installations**, as well as their evaluation in accordance with current national and international standards.

This product includes Radiance software (<http://radsite.lbl.gov/>) developed by the Lawrence Berkeley National Laboratory (<http://www.lbl.gov/>).



Configuration of the lighting requirements of the installation

CYPELUX allows users to establish limits for the lighting parameters that are calculated by the application. This way, the program can verify the requirements of the main codes. The levels that can be configured by users are:

General requirements of the project

- Total maximum power (W/m²)

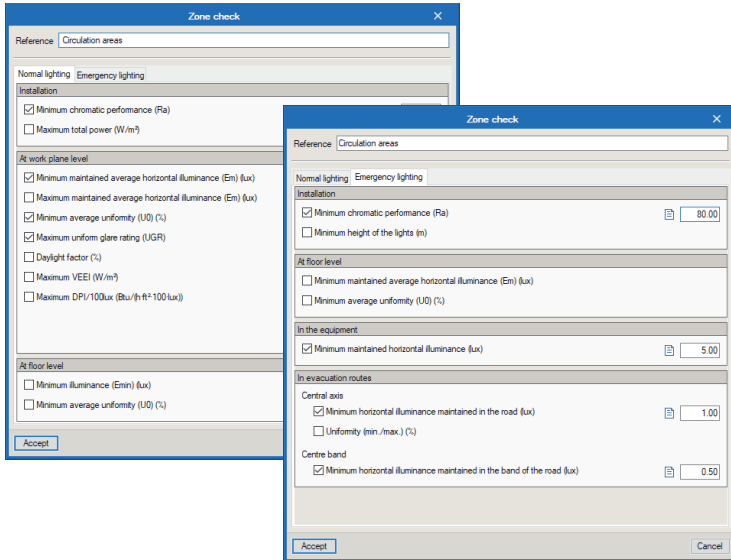
Specific requirements of each zone

- Normal lighting
 - Installation
 - Minimum color rendering index (Ra)
 - Maximum total power (W/m²)
- At work plane level
 - Minimum maintained average horizontal illuminance (E_m) (lux)
 - Maximum maintained average horizontal illuminance (E_m) (lux)
 - Minimum average uniformity (U_o)
 - Maximum unified glare rating (UGR)
 - Daylight factor
 - Maximum VEEI (W/m²)
 - Maximum DPI/100lux (W/(m²*100*lux))
- At floor level
 - Minimum illuminance (E_{min}) (lux)
 - Minimum average uniformity (U_o)
- Emergency lighting
 - Installation
 - Minimum color rendering index (Ra)
 - Minimum height of the lights (m)
 - At floor level
 - Minimum maintained average horizontal illuminance (E_m) (lux)
 - Minimum average uniformity (U_o)
 - In the equipment
 - Minimum maintained horizontal illuminance (lux)
 - In evacuation routes
 - Central axis
 - Minimum horizontal illuminance maintained in the road (lux)
 - Uniformity (min/max)
 - Centre band
 - Minimum horizontal illuminance maintained in the band of the road (lux)

Since this configuration does not depend on the geometry or specific properties of a project, it may be saved to be used in future projects.

Import standard lighting requirements

As has been indicated in the previous point, users can establish the lighting requirements that the installation has to meet. It is also possible to import the lighting requirements corresponding to certain codes. This way, users can verify that the code requirements are met without having to introduce the corresponding limits one by one.



EN 12464-1 (module)

Users can import the lighting requirements of the **EN 12464-1** code (Light and lighting – Lighting of workplaces. Part 1: Indoor workplaces) to the general parameters of the application.

CTE DB HE 3 and CTE DB SUA 4 (module)

CYPELUX allows users to import the requirements stated in the “Código Técnico de la Edificación” (CTE) of Spain. These are included in the following “Documentos Básicos” and Part 1 of the EN 12464 code:

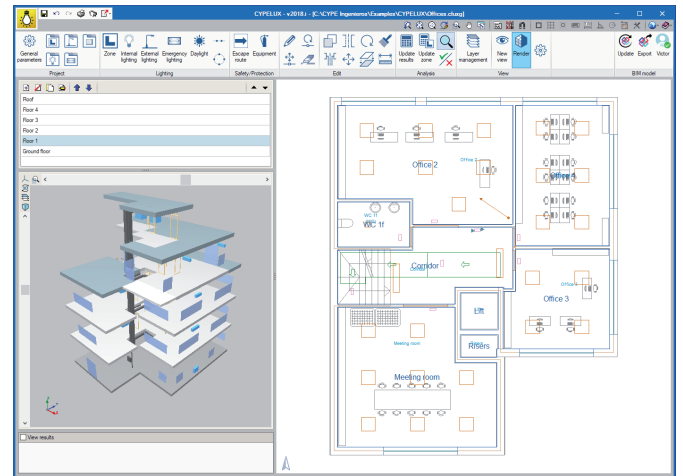
- **CTE DB HE 3 (Spain)**
“Código Técnico de la Edificación. Documento básico de Ahorro de energía. Sección 3 – Eficiencia Energética de las Instalaciones de Iluminación”.
- **CTE DB SUA 4 (Spain)**
“Código Técnico de la Edificación. Documento básico de Seguridad de utilización y accesibilidad. Sección 4 – Seguridad frente al riesgo causado por iluminación inadecuada”.

RECS (module)

It is also possible to import the lighting requirements of point 9 of the Portuguese code “**Regulamento de Desempenho Energético dos Edifícios de Comércio e Serviços**”. The application will verify the Lighting Power Density limit levels every 100 lux (DPI/100lux) in each zone whilst bearing in mind the control factors due to occupancy and availability of natural light.

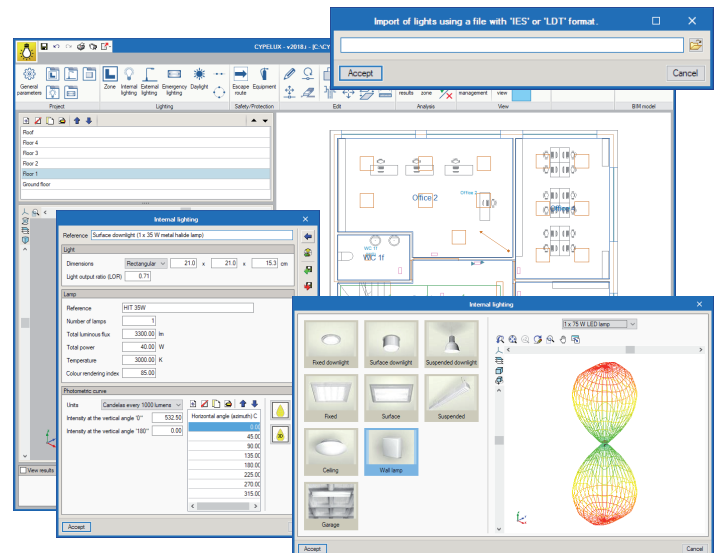
User interface

CYPELUX has an intuitive and friendly working environment that allows the completion of lighting projects in a simple way without losing control of the application.



Import luminaires from “IES” and “LDT” files

In addition to inputting photometric data from luminaires or using the CYPELUX library, it is possible to import luminaire files in **EULUMDAT** format (standard format in Europe for photometric data - “ldt” extension) and **IES** (standard format in North America for photometric data - “ies” extension). These files are supplied by the manufacturers and the user can import them without having to enter the parameters of the luminaire manually and with the certainty that they are those offered directly by the manufacturers.



Maintenance factor calculation according to CIE 97:2005

CYPELUX contains an assistant to calculate the maintenance factor of luminaires located in indoor enclosures from the method proposed in **CIE 97:2005** (Guide on the maintenance of indoor electric lighting systems). Loss factors related to the type of lamps, the luminaires used and the environment are taken into account for this

calculation. These can be introduced directly by the user or determined automatically according to the characteristics of the installation, as indicated in the standard.

CIE 97-2005

The method proposed by the CIE 97-2005 to determine the maintenance factor of the installation, depending on the representative parameters of the room and lamps, can be used.

Recoverable loss factors

To determine the maintenance factor, the recoverable loss factors can be calculated based on the method provided by the code, or the values can be introduced manually.

Calculated factors

Environment

Activity: Very clean environment

Reflectance (Ceiling/Walls/Floor): 0.70/0.50/0.20

Maintenance interval: Half yearly

Luminaires

Type of light: A - Bare batten

Lamp type: Incandescent

Burning hours: 1000

Flux distribution: Direct

Cleaning interval: 1 year

Spot replacement of lamps.

Loss factors

Non-recoverable factors (NRF): 1.00

Lamp lumen maintenance factor (LLMF): 0.93

Lamp survival factor (LSF): 0.50

Luminaire maintenance factor (LMF): 0.96

Room surface maintenance factor (RSMF): 0.98

Accept Cancel

Typical annual operating hours (burning hours)

Below is table 3.1 of the CIE 97-2005 code with the most common lamp operating hours for premises depending on their type of activity.

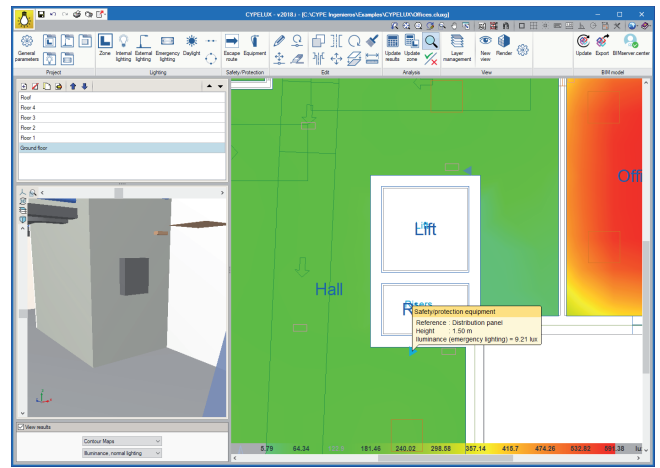
Lamps replacement time

The exchange interval will be used to find the total number of hours of activity of the lamps based on the annual usual operating hours provided by the code.

Yearly

Activity	Period of occupancy No. of days Hours/day	Daylight link controls Yes/No	Operating hours Hours/year	Choice
Industrial				
Continuous	365	24	No	8760 <input checked="" type="checkbox"/>
Process	365	24	Yes	7300 <input type="checkbox"/>
Two shifts	310	16	No	4960 <input type="checkbox"/>
Six days/week	310	16	Yes	3720 <input type="checkbox"/>
Single shift	310	10	No	3100 <input type="checkbox"/>
Six days/week	310	10	Yes	1760 <input type="checkbox"/>
Single shift	258	10	No	2580 <input type="checkbox"/>
Five days/week	258	10	Yes	1550 <input type="checkbox"/>
Retail				
Six days/week	310	10	No	3100 <input type="checkbox"/>
Five days/week	258	10	No	2580 <input type="checkbox"/>
Five days/week	258	10	Yes	1550 <input type="checkbox"/>
Schools				
Five days/week	190	10	No	1900 <input type="checkbox"/>
Five days/week	190	10	Yes	1140 <input type="checkbox"/>
Hospital				
Seven days/week	365	16	No	5840 <input type="checkbox"/>
Seven days/week	365	16	Yes	3504 <input type="checkbox"/>

Accept Cancel



Escape routes

It is possible to introduce escape routes in order to check the minimum levels of illumination produced by the emergency lighting. Illuminance and uniformity values are calculated on the layout of the paths so that compliance with the limits defined in the general project parameters can be guaranteed.

Zones

The program allows the user to define interior and exterior areas, as well as the main characteristics necessary to justify compliance with the different normative documents.

Zones can be added into the program directly by the user or by importing an IFC format file generated by CAD/BIM programs. In the case of manual insertion, drawing file templates in DXF, DWG, DWF, JPG or BMP format can be used to facilitate the insertion of zones into CYPELUX.

Once the zone type has been defined, the program allows you to save its properties in a file so that they can be imported directly into another CYPELUX project.

Types of zones (Type 1)

Reference

Type of zone

If the zone intervenes in the lighting calculations, its situation external zones, the glare index is not calculated nor is reflected in the lighting calculations.

Internal

Description Analysis Checks

Height of the workplace (normal lighting)

The height of the workplace is used in the lighting of normal artificial lighting and daylight. For emergency lighting at floor level.

For illuminance: 0.70

For glare: 1.00

Marginal band

The marginal band is the area which surrounds the out. The values of the variables obtained of the post ignored when the lighting calculation is carried out.

☒ With marginal band

Accept Cancel

Types of zones (Type 1)

Reference

Type of zone

If the zone intervenes in the lighting calculations, its situation external zones, the glare index is not calculated nor is reflected in the lighting calculations.

Internal

Description Analysis Checks

Maintenance factor

It is coefficient between the average illuminance on the work surface and the average illuminance on the work surface of a lighting installation and the average illuminance on the work surface of a lighting installation.

For normal lighting: 0.80

For emergency lighting: 0.80

Reflectance

It is the ratio of the radiant or reflected luminous flux to the incident luminous flux.

For floors: 0.20

For ceilings: 0.70

For walls: 0.50

Accept Cancel

Types of zones (Type 1)

Reference

Type of zone

If the zone intervenes in the lighting calculations, its situation must be selected. For external zones, the glare index is not calculated nor is reflected light taken into account in the lighting calculations.

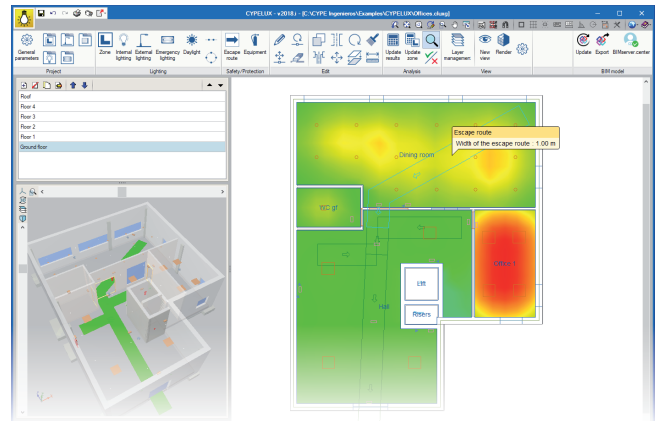
Internal

Description Analysis Checks

Reference

EN12464-1:2.1: General areas inside buildings - Rest, sanitation and first aid rooms - C

Accept Cancel



Automatic luminaire distribution

CYPELUX includes the option of generating luminaire distributions automatically so that a greater degree of illuminance uniformity is achieved on the work surface and savings can be made on installation costs. The user can select distributions that follow circular or linear patterns, and choose the parameters that define the selected layout; such as the number of luminaires or their orientation.

The screenshot shows the CYPELUX software interface. On the left, there's a 3D perspective view of a room with a lift and a hall. On the right, there's a 2D floor plan view showing the layout of the room. A color-coded heatmap is overlaid on the floor plan, indicating the distribution of light intensity. A legend on the right side of the heatmap shows a color scale from blue (low intensity) to red (high intensity). A text box on the floor plan indicates a 'Lift' and a 'Hall'.

Linear distribution

Type of lighting

Light

Surface downlight (1 x 35 W metal halide lamp)

Height

2.70 m

Axis direction

Alignment

Analysis

Number of lights

4

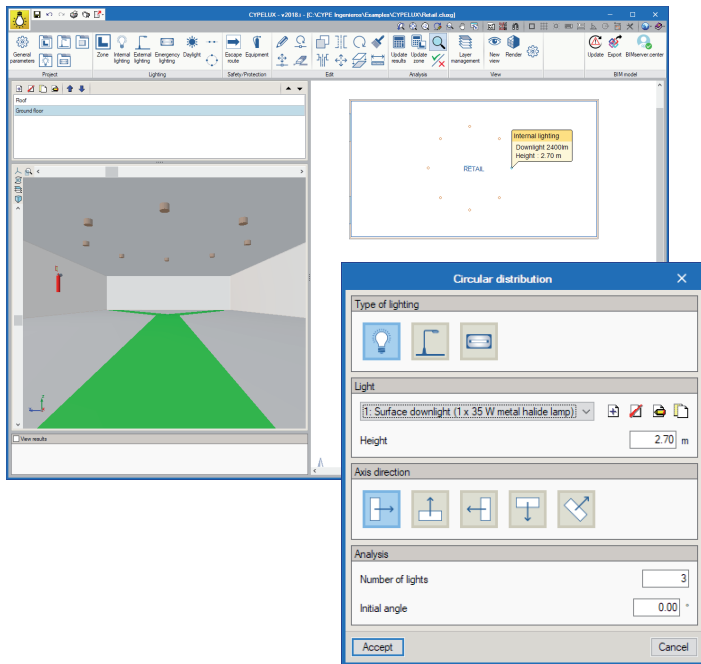
Distance between centres

2.05 m

Accept Cancel

Safety and protection equipment

The safety and protection equipment is in accordance with the emergency equipment standard on which the horizontal light provided by the emergency lighting is calculated, so the minimum required values are guaranteed to be met. This is usually security equipment, fire protection installation equipment, lighting distribution panel, etc.

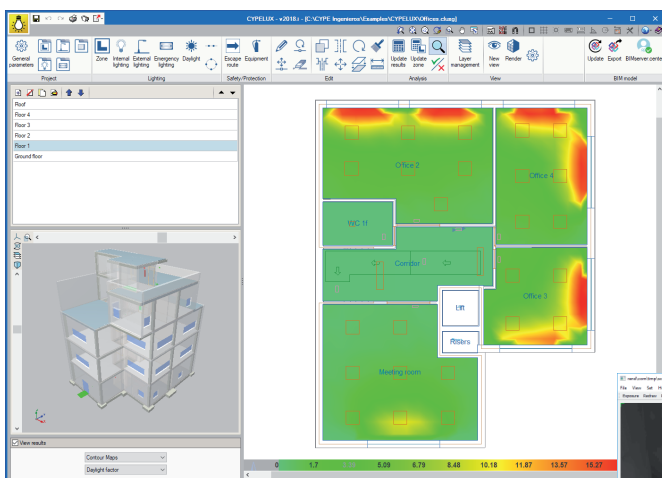


Calculation of the illuminance produced by daylight

CYPELUX incorporates the calculation of the illuminance produced by natural light and the daylight factor. To obtain these values, the CYPELUX project must be linked with a BIM model containing, at least, the geometric definition of the building.

A library is also included in the program, which can be accessed from the toolbar, and contains the types of windows and skylights that are present in the project. Users can define the "Transmission grade" and "Refraction index" of the glass.

To be able to run the analysis, as well as having to specify the properties of the glazed openings, the light conditions must be described using the "Daylight" option in the toolbar of the program. Specified in this panel are the daylight parameters such as the type of sky based on the CIE standard and the location of the building and its orientation which can be obtained from the BIM model if it has been defined in it.

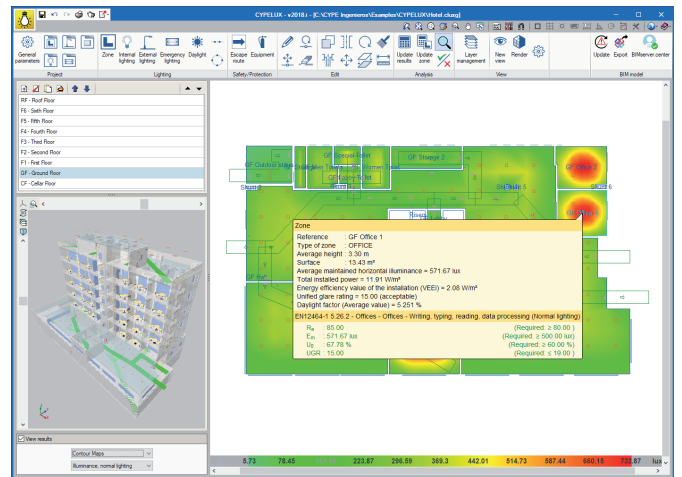
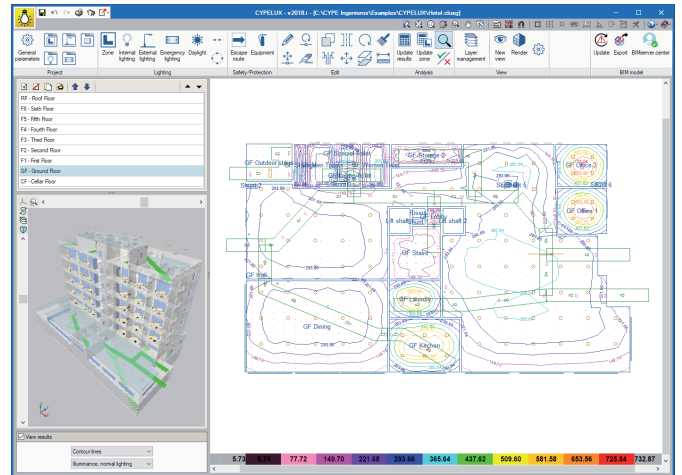


Display of results

Once the installation design process has been completed and the calculation performed, CYPELUX offers a variety of ways to view the results.

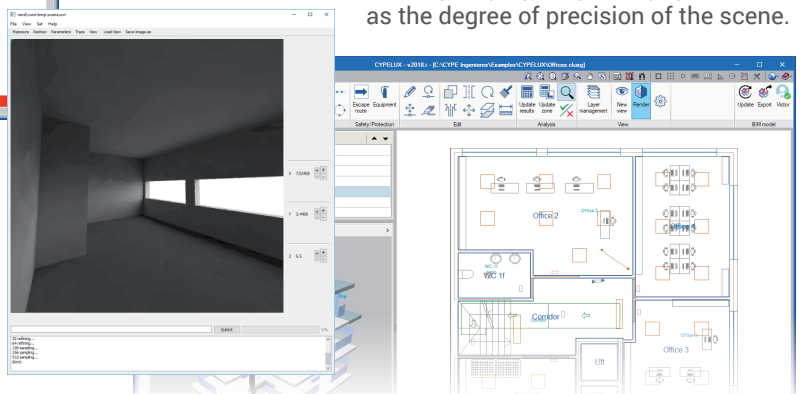
From the "View results" option, the isovalues and isolines at the height of the working plane, the horizontal illuminance maintained (produced by normal or emergency lighting) and the glare UGR are shown in each zone.

In order to see the calculation results and check whether they are within the ranges required by the standards applied, the program allows you to quickly display the values obtained in each zone.



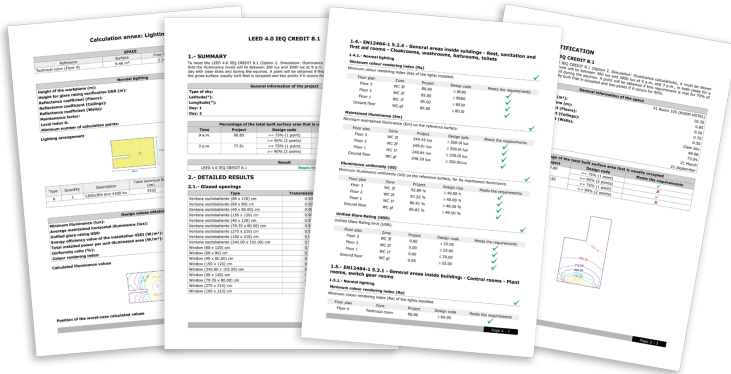
Scene rendering

Users can represent the lighting effects in an image of a realistic scene thanks to the inclusion of the Radiance analysis motor in CYPELUX. When rendering takes place, users can choose whether the lighting to be viewed is normal (internal and external), emergency lighting or daylight, as well as the degree of precision of the scene.



Project reports

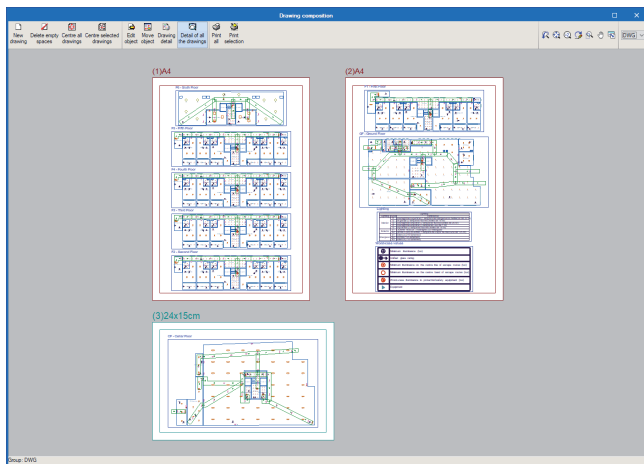
Having defined the general parameters of the project and obtained the results, the application generates a detailed report of the project. This report is divided into two chapters, the first contains the general checks of the project and the second contains the specific requirements of each zone. Additionally, the application generates a calculation annex detailing, as well as the design values, the properties of the rooms and the normal and emergency lighting installations used.



Drawings

The program automatically generates the detailed drawings of the lighting installation and provides the user a configuration tool in order to select the elements that must appear in each drawing (types of luminaires, escape routes, equipment, etc.).

Besides being able to print the plans directly, CYPELUX is able to export them to several formats (DWG, DXF, PDF, XPS).



Export to BC3 format file

CYPELUX generates a file with the quantity of the materials used in the lighting installation (interior, exterior and emergency luminaires) in standard format FIEBDC-3 (BC3), which can be imported by budget calculation programs such as "Arquimedes".



Integration into the Open BIM workflow through the BIMserver.center® platform

Using the **BIMserver.center®** platform, members communicate directly with the applications that form part of a project integrated in the Open BIM workflow. This integration is achieved using IFC information interchange files with a previously defined BIM model:

• Link to BIM model

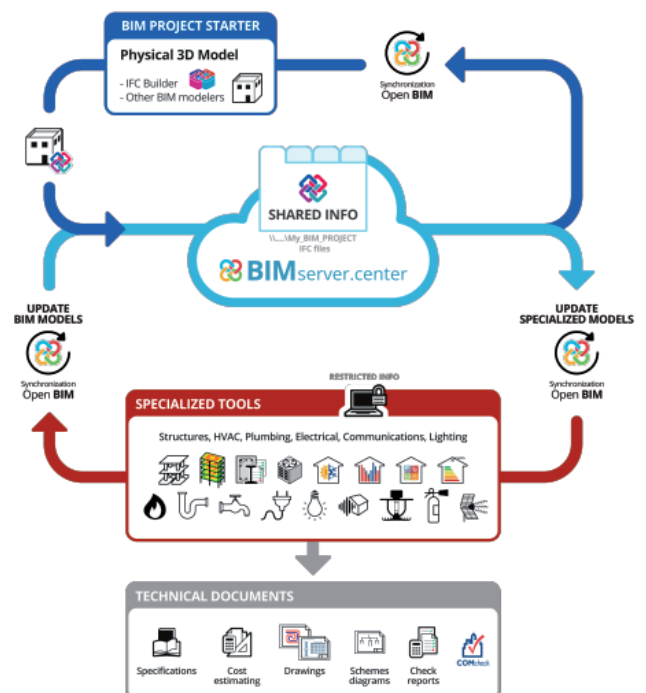
A BIM model can be read using IFC format files generated by CAD/BIM programs such as IFC Builder, Allplan, Archicad or Revit. This function allows CYPELUX to automatically incorporate elements such as floor plans and spaces. The application can also read other IFC files with complementary information such as the location of evacuation routes and safety and protection equipment. For example, CYPEFIRE Design (Design and verification of the building and fire safety installations) is able to export this information to the BIMserver.center project.

• Synchronisation with the BIM model

Each time the BIM model is modified, the program can incorporate the changes into the CYPELUX project, so users can work in parallel with other technical specialists on the most up to date model.

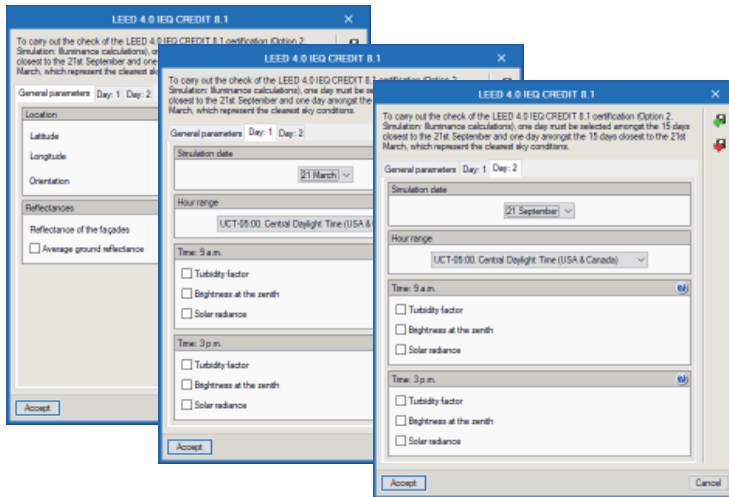
• Information sharing

Once the lighting installation has been calculated, CYPELUX is able to export the data relating to the luminaires used so that they can be introduced into other programs working with this technology. Additionally, the PDF reports, the measurement file .bc3 and a .gltf file with 3D information of the luminaires will be exported as attachments to the IFC. This updates the BIM model of the project and closes the Open BIM workflow.





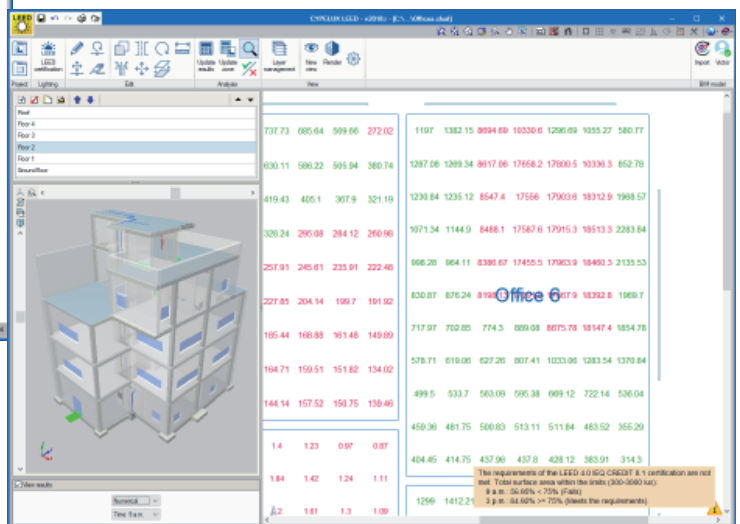
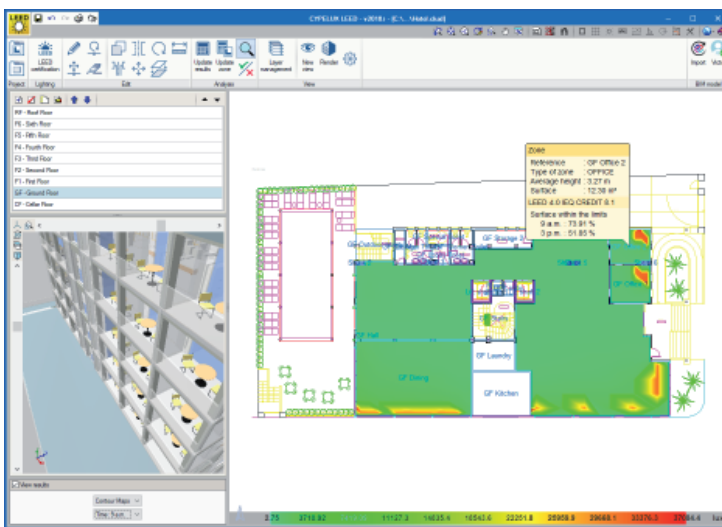
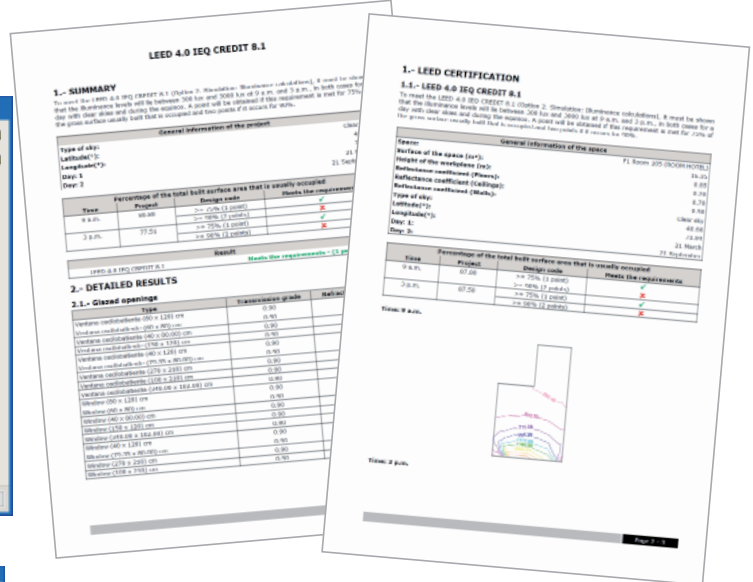
CYPELUX LEED is an application designed to help users comply with the Indoor Environment Quality requirements regarding natural light of the **LEED certification (Leadership in Energy and Environmental Design)**. Specifically, the program verifies the LEED v4.0 CAI CREDIT 8.1 using option 2 (Simulation: Lighting calculations). In order to carry out this calculation, a BIM model that contains, at least, the geometric information of the building must be imported.



LEED project reports

Once the calculation is done, CYPELUX LEED is able to automatically generate the necessary lists and drawings to justify compliance with LEED certification.

CYPELUX LEED composes a document justifying the LEED v4.0 CAI CREDIT 8.1 for the complete work in which the characteristics of the building and the calculation are detailed, as well as the results obtained.



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