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/m^2)

Specific requirements of each zone

- Normal lighting
  - Installation
  - Minimum color rendering index (Ra)
  - Maximum total power (W/m^2)

- At work plane level
  - Minimum maintained average horizontal illuminance (E_m) (lux)
  - Maximum maintained average horizontal illuminance (E_m) (lux)
  - Minimum average uniformity (U_0)
  - Maximum unified glare rating (UGR)
  - Daylight factor
  - Maximum VEEI (W/m^2)
  - Maximum DPI/100lux ($W/(m^2*100*lux)$)

- At floor level
  - Minimum illuminance (E_{min}) (lux)
  - Minimum average uniformity (U_0)

- 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_0)*

  - 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.
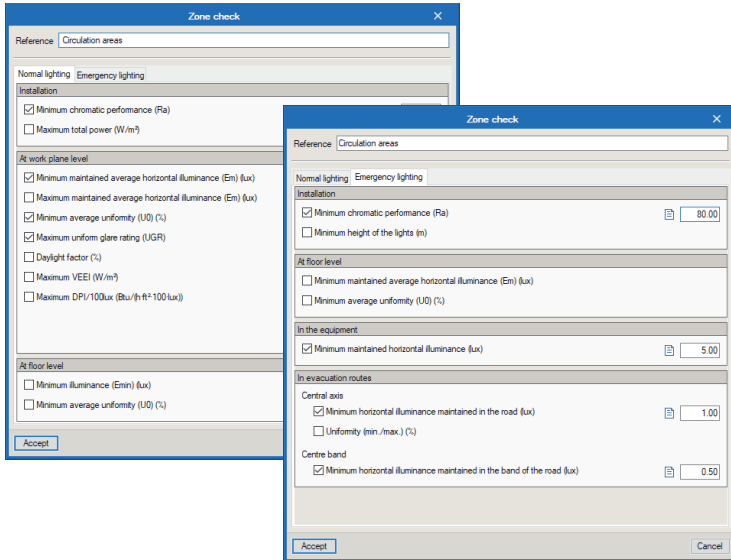
EN 12464-1 (module)

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.
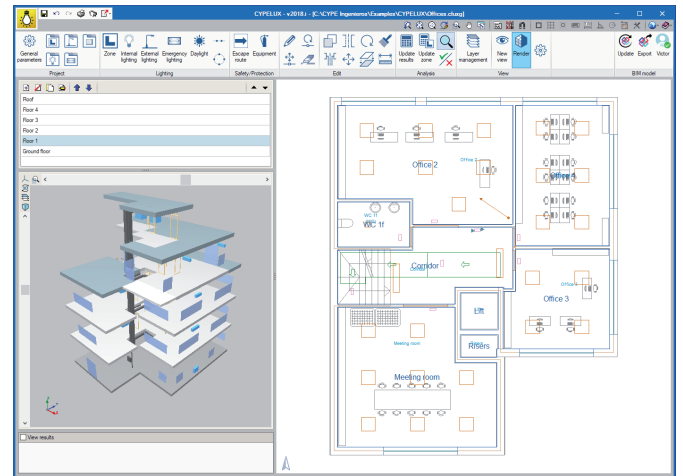
Import luminaires from "IES" and "LDT" files

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.
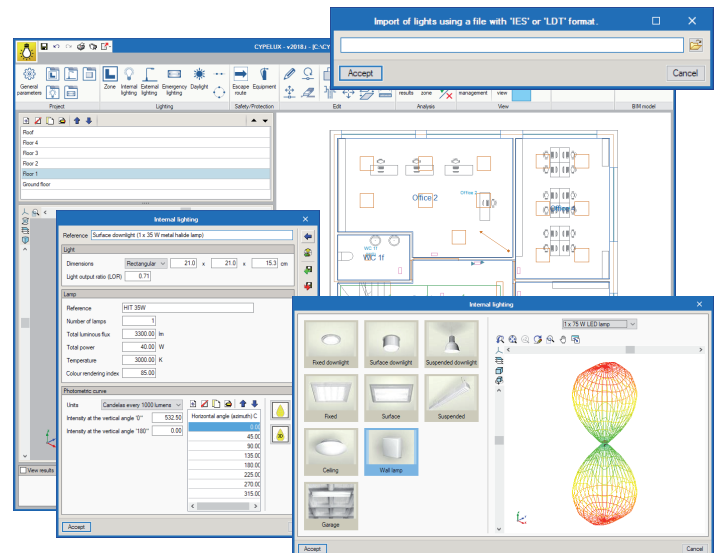
Maintenance factor calculation according to CIE 97:2005

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.

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.

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.

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.

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.
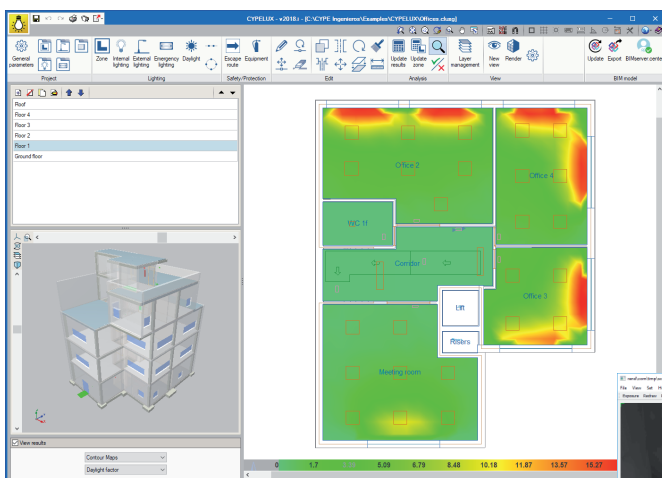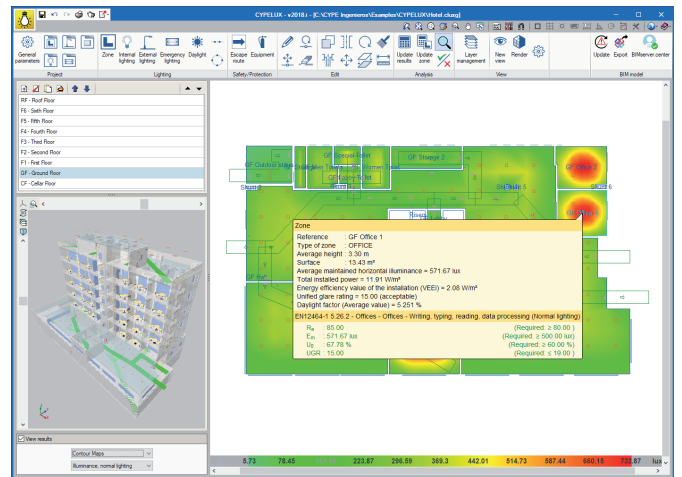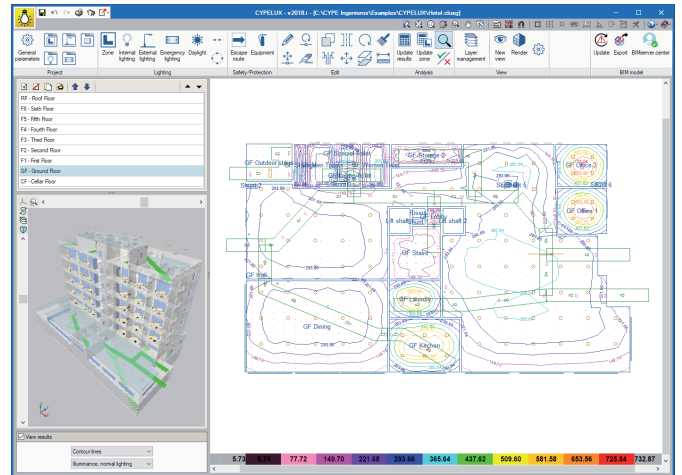

Calculation of the illuminance produced by daylight

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.

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.
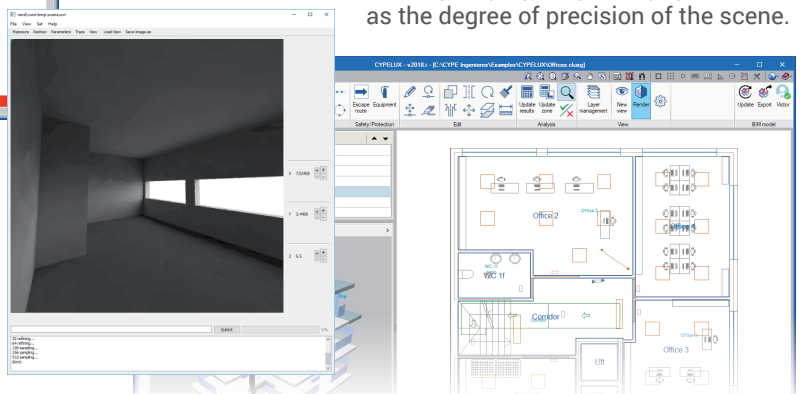
Project reports

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.
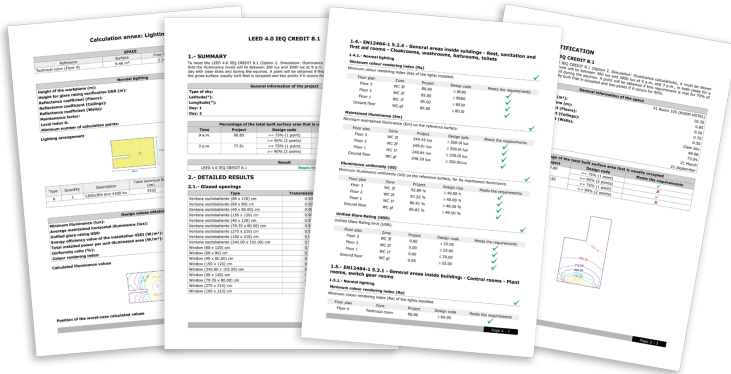
Drawings

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**).
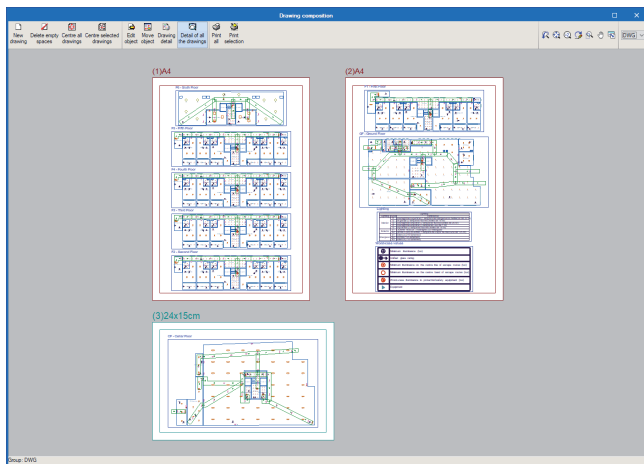
Export to BC3 format file

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.

CYPE | Software for Architecture, Engineering and Construction
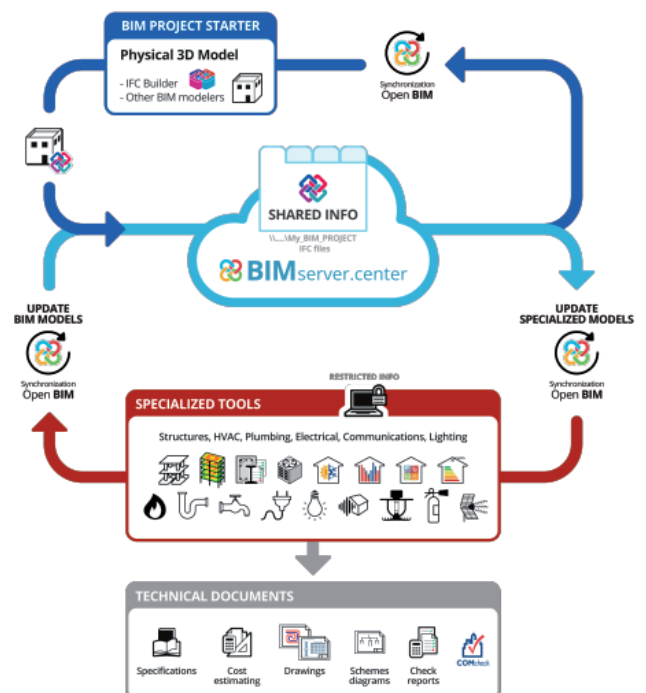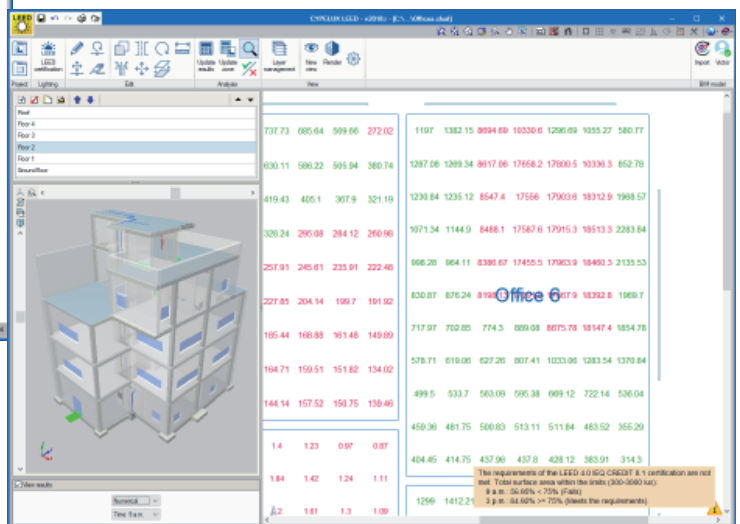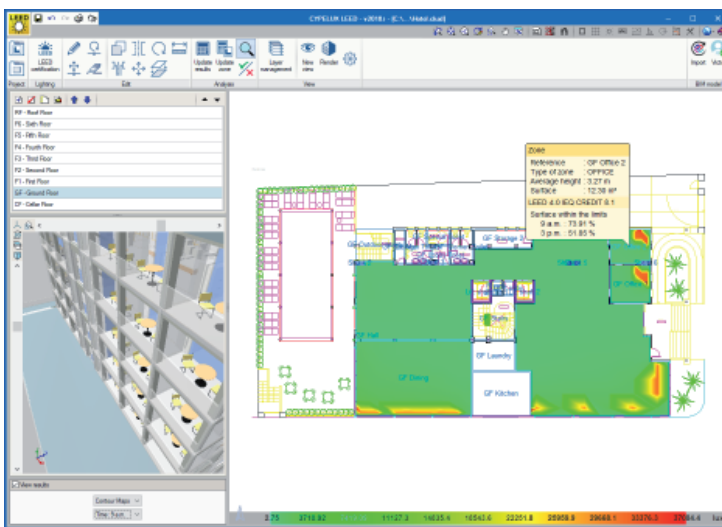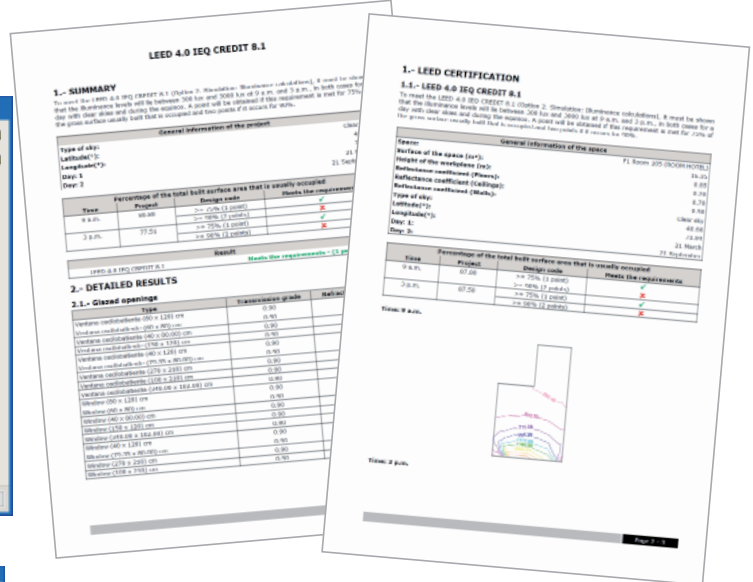
CYPELUX LEED

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.
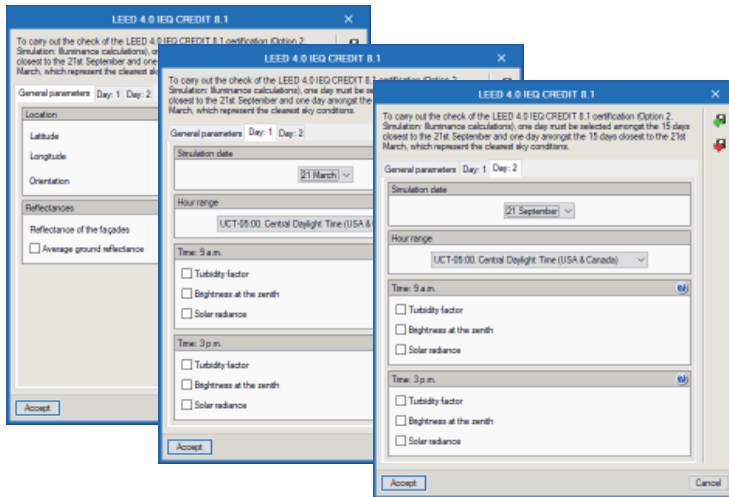
LEED project reports

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.

Software for **Architecture**, **Engineering** and **Construction**