LITESTAR 4D v. 4.00

User Manual

Litecalc - Lighting Design Module

October 2016

Index

LITESTAR 4D 7
Configuration 8
Minimum computer configuration 8
Program limits 8
To start 9
Program installation and start up 9
Program start 9
Data structure and updating 10
The project step by step 11
Free project 12
Drag&Drop 14
Introductory Notes 15
Basic Concepts 15
Cartesian references and luminaire aiming 16
Cartesian axes and design grid 16
Relative Cartesian Axes and Luminaires 16
The photometric solid 17
Main screen 18
Dropdown menu bar and icon bar 19
File Menu 19
File icon bar 19
Mode Menu 20
Mode icons bar 20
Edit Menu 20
Edit icon bar 21
Modify Menu 21
Vertical icon bar 22
Create Menu 23
Create icon bar 24
Calculation Menu 24
Calculations icon bar 25
Results icon bar 25
Tools Menu 25

View Menu 26
Vertical icon bar 26
Link Menu 27
Help Menu 27
Menu bar in the design area 28
View Menu 28
View Menu 28
Result Menu 28
Project lists TAB 29
Scenes 29
Luminaires 29
Materials 30
Results 30
Libraries and properties TAB 31
Properties 31
Object and Luminaires Layers 31
Library 32
Shortcuts 33
Rapid selection keys for modifications 33
Rapid selection keys for managing the operative design area 33
Rapid selection keys for area design 33
Operative design zone 34
Creation of calculation area 35
Creation of an interior/exterior environment 35
Inserting a curved wall 36
Definition of room parameters 36
Insertion of a 2D .DXF file 37
Creating a working plane 38
Creating a rectangular or irregular working plane 38
Modifying the area, extruded objects and working planes 39
Insertion of a window 40
Insertion of an object 41
3D files management window 42
Objects and materials editor 43
Object Editor 43
Material Editor 44

Texture 45
Insertion of a luminaire 46
Substituting several luminaires simultaneously 47
Luminaire and Light Filter Editor 48
Light Editor 48
Change lamp 49
Creating a list of favorite luminaires 50
Linking an .OXL file to the 3D model of the luminaire 51
3D Coordinates 51
Faces 52
OXL Editor 52
Wizard for interiors/exteriors 53
Setting the room parameters 54
Inserting luminaire groups 55
Add luminaires by rows and columns 56
Total flux method 57
Transformations 58
Move 58
Rotate 59
Scale 60
Aim 61
Object Duplication 62
Duplicate 62
Grid position 62
Position in circle 63
Position in line 64
Calculation of natural light 65
Orient North 65
Insertion of a sensor 66
Calculations 67
Calculation Setup 67
Inserting an observer 68
List of available calculations 69
Results visualization 71
Rendering 72

Dynamic Rendering....72
Ray Tracing....73
Emergency lighting calculation....74
Emergency parameters settings....75
Inserting project elements....76
Results calculation and visualization....77
Automatic luminaire insertion (only with Emergency Plus license)....78
Roads calculation....79
Guided roads....79
Advanced Roads - Roads....82
Advanced Roads - Luminaires....84
Roads calculation....86
Results....86
Indicator of energy performance in accordance with EN13210-2015....87
Tunnels calculation....88
The project step by step....88
Guided project....89
Advanced Tunnels - Roads....94
Advanced Tunnels - Luminaires....96
Results....98
Luminance curve....99
Adrian diagram....99
File Menu....100
Operations Menu....100
Project Data TAB....101
Image TAB – Adrian diagram....103
Inserting an image....104
Calculating the veil luminance....105
Situation TAB – Luminance curve....106
Printing the curve....107
Print....108
Customizing printouts and choosing the logo....109
Scripting....110
Line structure....110
Creation instructions....112
File instructions....112

Layer intructions....112
Positioning instructions....113
Output instruction....114
Property instructions....115
Visualization instructions....115
Calculation instructions....115
Example....116
Bibliography – printed books....117
Bibliography – open source material....117

LITESTAR 4D

LITESTAR 4D is a Suite of programs that includes the following modules:

Litecalc is the lighting engineering calculation program for interior and exterior environments (large areas, roads, tunnels) with view functions of results tables, graphs and photo-realistic images of the environment from different viewpoints, by means of dynamic rendering and ray Tracing.

Liswin is the estimate and operative catalog, where both commercial and photometric data can be found, with functions of parametric and tree product search, updating via Internet, management of data sheets of products and accessories in various languages exportable in PDF and RTF format.

Lisdat is the catalog data management module, and foresees manual entry or database import

Photoview is the photometry visualization module, with view and print functions for photometric tables and graphs in different languages.

Webcatalog is the catalog management module via internet

LITESTAR 4D is supplied in 2 license forms, **Open**, freeware (free of charge) downloadable from WebOxy, the OxyTech site and **Professional**, on payment.

LITESTAR 4D Open is the freeware version (free of charge) of LITESTAR 4D, downloadable from the site, which excludes certain functions present in the Professional version, such as:

- Advanced roads and tunnels module
- Complete Ray Tracing calculation
- Electricity lines for road installations
- Structure management (example: floodlight masts)
- Calculation of vertical, cylindrical, semi-cylindrical illuminances and those in the direction of the TV camera
- Manual entry of photometric data
- Photometric data import from OxyTech goniophotometers types T1,T2, T3 and T4

Notes

The Link menu, or icon bar, present in each of the modules allow access to the various programs.

When Litecalc is opened, the Liswin module opens automatically since the latter is necessary to ensure the correct functioning of the calculation program.

Configuration

Minimum computer configuration

It is advisable, before carrying out program installation, to verify that the configuration of your computer is at least of the following type (minimum configuration):

Computer:	PC Pentium of latest generation with Open graphic libraries GL 2.0 or greater
RAM Memory:	1 Gb
Hard Disk:	With at least 100 Mb free for the program. The space for archives depends on the number of products loaded
Video:	Resolution preferable 1024x768 pixel
Mouse:	Windows compatible
Operating System:	Windows7® - Windows® Vista - Windows XP®

Program limits

The program has been configured according to the following limits:

Room/environment plan:	any with polygonal chain also used to approximate curved elements
Maximum dimensions:	X=5,000 m Y=5,000 m Z=5,000 m
Maximum number of luminaires:	Unlimited depending on RAM memory limits
Maximum number of luminaire types:	Unlimited depending on RAM memory limits

Notes

To start

Program installation and start up

In the case of customized programs distributed from companies to the market, the activation of the program, photometric and catalog files is automatic.

On the contrary, if the software has been downloaded from internet, run the program:

- When the menu window appears, select the language of installation
- Follow the on-screen instructions
- When installation is complete, enter the program and type in the activation code received from Oxytech in the window that opens at start up. To carry out this operation the computer must be connected to internet:
  - The Activation Code can only be used on one PC at a time. To use the program on another PC first you must deregister by selecting Register + Deregister + Ok and repeat the Registration operation from the other computer
  - Should the computer be broken, leaving you unable to carry out the Deregistration operation, please contact OxyTech's Customer Service
- Exit the program and relaunch to activate the new configuration: the program is now ready to use

Notes

During installation both the program destination folder and that of the data required for project development will have to be defined.

Should these folders not be modified, the program will use the default folders, visualized at the time of installation.

More precisely, definition of the following folders is required:

- DATA, which is an installation folder with write permission, for those operative systems (e.g. Windows 7) that do not include the possibility of writing in the PROGRAMS folder
- DOCUMENT, where data related to the projects and manufacturers' catalogs is gathered

Program start

The simplest way to launch the program is to double click on the LITESTAR 4D icon directly from the desktop.

Alternatively you can:

- Select the Litecalc program from the window Start/All programs/Oxytech
- Select Start/Run and type d:\Directory Name\LTS.EXE finally pressing Enter

When Litecalc is opened, the Liswin module will also open automatically since it is necessary for the correct functioning of the calculation program and for selection of the manufacturers' luminaires in the Plug-ins.

It is advisable never to close the application, but to minimize it as an icon in the applications bar.

Data structure and updating

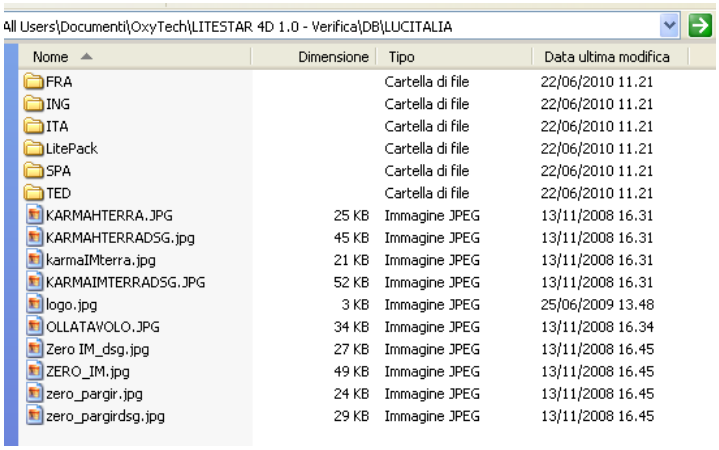
LITESTAR 4D is equipped with a single database (Oxydata.MDB), differently from LITESTAR 10 in which there were 2 databases, one catalog (MDB Access type) and one photometric (Fotom.FDB).

The LITESTAR 4D database is the evolution of the LITESTAR 10 catalog database in which the functions for managing the photometric files in the new OxyTech OXL format have been integrated.

The OXL files are obtained by converting the photometric files into international formats (e.g. EUL or IES), by means of the Photoview module or using the Lisdat module.

For a more detailed explanation please refer to the Photoview manual.

The MDB database is created by downloading the manufacturers' Plug-ins (unmodifiable data) by means of the Liswin module or by directly inserting the luminaire technical data into Liswin by means of the Lisdat module, which can also be used to link the photometries in OXL format to the sheets.



Inside the …\DB folder are found the data relating to each individual manufacturer subdivided into subfolders.

The data structure consists of the following elements:

- A series of non language sensitive documents, such as product images
- A group of folders named with the abbreviation of the language (FRA for French, ING for English, ITA for Italian ….) inside which all language sensitive files are saved, such as catalog sections, instruction modules etc.
- A Litepack folder inside which the OXL files are saved

Notes

What **OXL** files are

The **OXL** file is an XML type file (files used in many applications for data exchange) inside which the following information is found:

- the general lighting device data
- the lamps data, including color
- the dimensions and, if available, 3D file of the luminaire

The technical data (catalog and photometries) of the individual manufacturers present as Plug-ins, are updated by means of the Liswin module, with the command

Parametric product search via internet.

If the products you intend using are not present in the Plug-ins, but you wish anyway to prepare a catalog of your own, the Lisdat module should be used to manually insert the data and link the photometries.

The project step by step

The program allows essentially two project settings, as described below:

Free project: where each parameter is freely determined by the designer.

In this case the designer is free to follow the project procedure that he deems most suitable:

- Create a calculation scene, that could be represented by any object, such as:
  - An environment (interior/exterior), drawn in plan or in 3D view
  - An environment “traced” from a 2D .DXF imported as background
  - A working plane, or a number of working planes
  - An object (furniture) inserted from the list
  - A complete 3D model imported from outside
- Enter and define the characteristics of the objects (materials, reflectances, etc.)
- Insert luminaires
- Perform calculations, setting the parameters to be verified
- Visualize the results and renderings
- Configure the print outs

Guided project: where the main parameters are “guided” by the software and entered in the window.

This is the method used when for example it is necessary to perform a calculation in accordance with the norms in force, as in the case of tunnels and roads, or when simple, regular areas are to be calculated.

In this case the procedure is as follows:

- Select the type of calculation to be performed. The program will then open a window to be completed
- Enter the parameters required for the calculation
- Choose the luminaires
- Carry out calculations. In this case the software will automatically set the parameters to be calculated
- Visualize the results and renderings
- Configure the print outs

To access the various guided projects click on the relative icons:

To access the roads module

To access the interiors module

To access the exteriors module

To access the exteriors module

Notes

To carry out calculation it is no longer necessary, as in the past, to draw a specific environment (interior or exterior), where furniture and luminaires are to be inserted.

More precisely, it is no longer necessary to have a ceiling and a floor to verify a scene.

From this version of the program it is sufficient to insert an object (furniture, working plane or room) and a luminaire to be able to launch calculation.

All the objects belonging to the scene are in fact evaluated in the same way, for example in the visualization of Properties, and permit the same transformations.

The project step by step

Free project

Once the program has been launched, to create a new **calculation scene** it is essential to:

Select this icon if you wish to define an interior environment.

By clicking with the left mouse button inside the operative area of the design, it will be possible to draw the boundaries of the area point by point and, using the Enter key, to close the room. The program will then open a window in which to set the height of the room and working plane, automatically extruding the walls and ceiling. The reflection coefficients will be attributed in standard mode but can always be modified by the user (for a more detailed explanation see the chapter: Creation of an interior/exterior area).

Select this icon if you wish to define an exterior area.

By then clicking inside the operative area of the design, it will be possible to draw the boundaries of the exterior area point by point with the mouse and, using the Enter key, to close the perimeter. In this case the program automatically removes the walls and ceiling of the room, attributing standard reflection coefficients (for a more detailed explanation see the chapter: Creation of an interior/exterior area).

N.B.:

Once the area has been created, by selecting the area with the right mouse button in the *Scene TAB,* on the left of the screen, select *Modify* to access the Object Editor, where the surface characteristics and reflection coefficients can be modified (for a more detailed explanation see the chapter: Object Editor).

The **objects** may be inserted as:

Furniture present in the library. Insertion is made by selecting the object and dragging it into the design area (Drag&Drop)

3DS or OBJ Objects, created by the user, present in an external folder. Also in this case insertion is made using the Drag&Drop function

For a more detailed explanation see the chapters: Drag&Drop and object insertion.

There is a third way of inserting objects:

By clicking on the extrude icon it is possible to extrude a plan view object.

In this case, after selection the icon, click inside the operative area of the design, the outlines of the plan view object can be drawn, subsequently defining the height in the window which opens after pressing the *Enter* key to close the object.

Also in this case, once the objects have been inserted it is possible to access the Object Editor, by selecting the name of the object with the right mouse button and selecting *Modify.*

Notes

The program allows you to create an area by “tracing“ a 2D DXF, imported into the design area with the Drag&Drop function.

In this case once the .DXF file has been inserted, you need to click on the icon corresponding to the type of area you wish to create and trace the base DXF (for a more detailed explanation see the chapter: Insertion of a 2D .DXF file).

The project step by step

At this point, to insert the **luminaires** with which to verify calculation, one of the following operations is possible:

Select the icon and drag the luminaire from the list of favorites

Select the Liswin icon and drag into the project a luminaire present in the list to which a photometry is associated (FOT flag, in the relative column)

Select the Webcatalog icon and, after choosing the manufacturer, drag the selected luminaire into the project. In this case the luminaire will also be inserted automatically into Liswin

Select the external folder icon and drag the photometric file (.EUL or .IES)

Each luminaire may be rotated, moved, aimed and duplicated by selecting the relative icons.

It will be possible at any time to edit a luminaire, so as to replace it with another, change the flux, lamp or color filters, by selecting it with the right mouse button inside the *Scene TAB,* on the left of the screen, and selecting *Modify* (for a more detailed explanation see the Chapter: Luminaires and color filters Editor).

Finally launch **calculations** and view the **results**:

By clicking on the icon, the parameters to be calculated can be set (with a flag) and then calculation can be launched.

Once calculations are complete and the window is closed, the results summary table automatically appears.

By selecting the individual items with the left mouse button and clicking on the relative keys, the various graphs can be viewed.

The selected results will be inserted in the *Results TAB* on the left of the screen.

Selection of *View-Results* in the design area will instead visualize the dynamic rendering of the project .

By clicking on the *Ray-Trace* icon static images can be created, and these will be saved in the *ImpExp* folder.

Finally, upon conclusion of the project, after all results have been viewed and the renderings saved, the print module can be accessed, using *File/print*, where the print logo and company data can be set; select with a flag the data to be printed and view the print preview.

For a more detailed explanation see the relative chapters: Calculations, Results View, Rendering e Printouts.

Notes

As far as calculating luminaire **flux** is concerned, it is important to underline that:

- The luminaires inserted using the Liswin lists are associated with a lamp. In this case therefore the flux used in the calculation will be that of the lamp (viewable in the part related to lamps in the luminaires editor)
- For photometries inserted as .IES or .EUL instead, the program will use as default the flux present in the photometric file

It will however be possible at any time to change the flux, in the *Luminaires Editor*, either by typing a new flux in the appropriate box, or by selecting another lamp among those present in Liswin (for a more detailed explanation see the chapter Change lamp)

Drag&Drop

The term **Drag&Drop** means that it is possible to click on an object and drag it into another position, where it will be released.

This means for example that if an icon corresponding to a document is dragged from one folder to another, this will bring about the transfer of the document.

To facilitate the use and make data insertion faster, LITESTAR 4D includes extensive use of Drag&Drop.

This means that the files in the other modules or in other folders can be selected, with a click of the left mouse button, and dragged (keeping the button pressed) from the environment in which they are situated into the design area.

“Environment in which they are situated” means:

Luminaires present in the Webcatalog

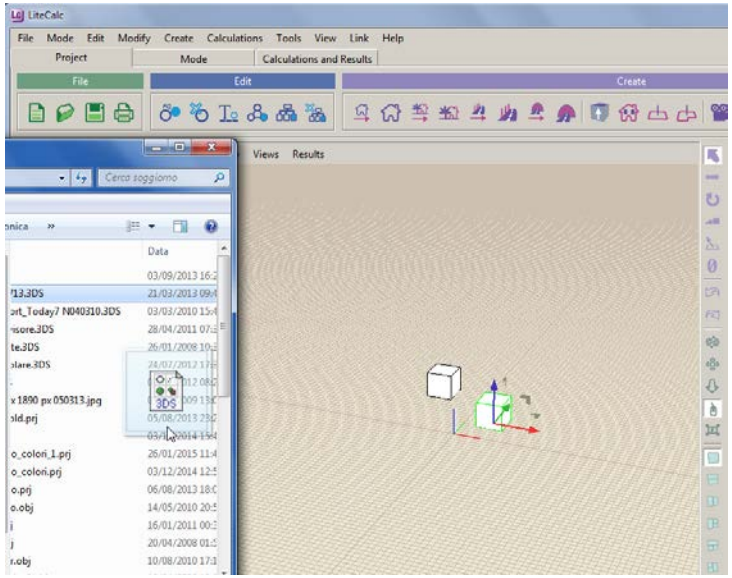
Luminaires present in the Liswin module

Luminaires and objects present in a folder in the computer

Luminaires and objects internal to the program, such as the luminaire catalog or object catalog, stored in the *Library TAB*, positioned on the right of the main screen

The formats that can be used with Drag&Drop in the software are:

- For photometric files:
  - .OXL, proprietary format of Oxytech
  - .EUL, standard European format
  - .IES, standard American format
- For objects:
  - .3DS, open format of 3D Studio
  - .OBJ, open format of Wavefront
- For plans:
  - .DXF, open format of Autodesk



Notes

On an operative level to perform Drag&Drop you need:

To open the origin environment (for example, as in the figure alongside, a folder).

To select the file and keeping the left mouse button pressed, drag it into the design area until the forbidden sign becomes a broken line rectangle.

As far as import of external objects is concerned it is necessary to verify the accuracy of the **3D models**, before proceeding to import checking:

- The orientation and conformity of the perpendiculars (adjacent polygons must have perpendiculars in the same direction [in-out)
- The topological accuracy
- The absence of superimposed faces and vertices
- The presence of uv coordinates in the case of texture applications

Furthermore, it is always advisable:

- Not to import as a single file blocks of objects that you want to manage separately, but to separate them at origin.
- To maintain the lowest number of polygons possible with respect to the object you want to represent.
- In the case of conversion from parametric objects (nurbs) to verify the accuracy of the mesh generated and the number of polygons generated

Introductory Notes

The *Litecalc* program is designed for the calculation of lighting engineering parameters for lighting installations with luminaires measured according to the C-Gamma system of CIE24 and CIE 27 Recommendations (road lights) and V-H (floodlights). The program calculates the illuminances and luminances on all the surfaces present in the calculation area, taking into consideration the shadows created by them and natural light (if configured).

Calculation can be effected for interior and exterior environments, roads and tunnels in accordance with the different norms.

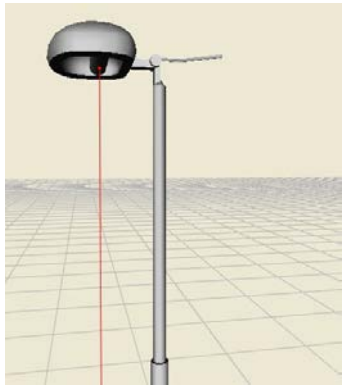
Basic Concepts

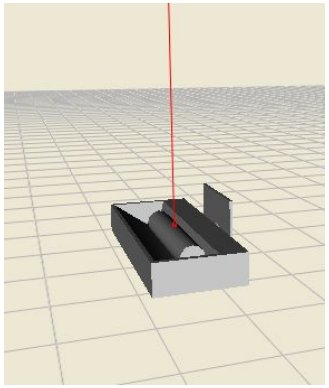
Direct and Indirect Luminaires: A luminaire is normally measured with the light emission plane perpendicular to the luminous axis (Gamma 0°). The new data format instead allows the composition of different photometric curves in the same product and each of these can present an emitting surface directed independently of the others.

To avoid mistakes of aiming, therefore, before use it is recommendable to verify the type of data available.

Bounding Box: This is the parallelepiped box that encloses the element under examination, whether a piece of furniture or a lighting device. The environment itself can be visualized as a bounding box.

Reflections: By reflection is meant the ability of the material to re-emit the light it receives. In this program the reflections are no longer evaluated only according to the Lambert method (perfectly diffuse reflections), but also by means of the real functions of material behavior BRDF (reflection, absorption, transmission) or using the R and C reduced reflection factor tables (e.g. road surfaces).





Notes

Calculation is based on the new, innovative method of **Photon Mapping,** which replaces the old method of Radiosity and is described in the University of California site where it was developed. For further information please consult the site: http://graphics.ucsd.edu/~henrik/.

In the figures alongside two luminaires are shown. The red line represents gamma 0°. The origin of this line represents the photometric barycenter.

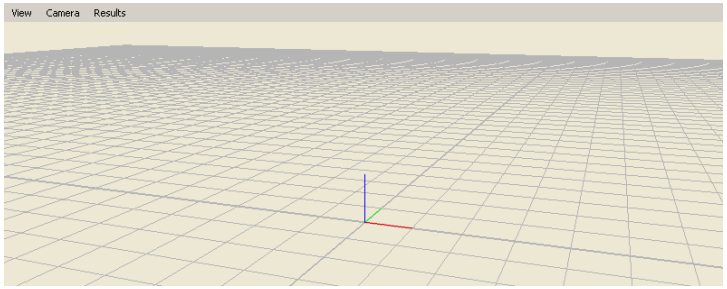
Cartesian references and luminaire aiming

Cartesian axes and design grid

Objects are always associated with a triplet of Cartesian axes X, Y, Z identified with the colors X=red Y=green and Z=blue which is found in the center of the design area.

The area is characterized by a grid in which the space between one intersection and the other is established as 1 m and at the center of which the absolute origin of the Cartesian axes is fixed.

The snap step of the grid is fixed at 0.5 m by default, but may be modified accessing the ***Settings*** window from the *Tools* menu.

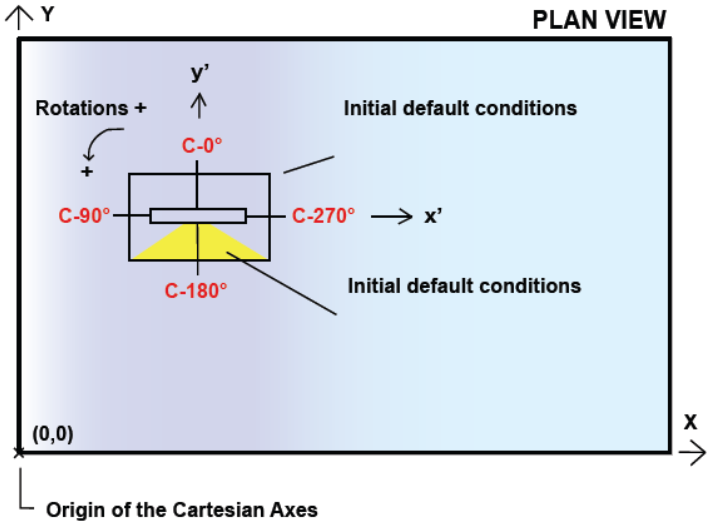


Relative Cartesian Axes and Luminaires

Each luminaire is associated to its triplet of intrinsic Cartesian axes x', y' and z' relative to the absolute triplet X, Y and Z, on which movements, rotations or aimings are based.

The photometric system of C- semiplanes, according to which the photometry is referred, is integral with the system of intrinsic axes x',y', and z' of the luminaires, where the semiplane C-0° corresponds with the plane formed by the axes z' and the positive part of y'. Each rotation around the intrinsic axes brings about the rotation also of the group of C- planes.

The semiplane C-0° is, generally, perpendicular to the lamp.



Notes

Transformations (movements and rotations) of individual objects are achieved using the absolute axes of the object (these do not change as a result of the rotations, but always remain oriented as the absolute axes of the design).

If however the object should be rescaled, this transformation would be carried out on the x', y' and z' axes related to the object itself.

Therefore, should an item of furniture be rotated on the absolute X axis by 90° and subsequently rescaled on the relative z' axis, the new measurement would correspond graphically to the absolute Y axis, by virtue of the previously effected rotation.

The rotations of a luminaire or of an object around the axes is considered positive when the observer sees them take place in an anticlockwise direction, seen from the positive side of the axis.

Cartesian references and luminaire aiming

The photometric solid

To facilitate luminaire aiming, the program allows the photometric solid of the single object to be viewed.

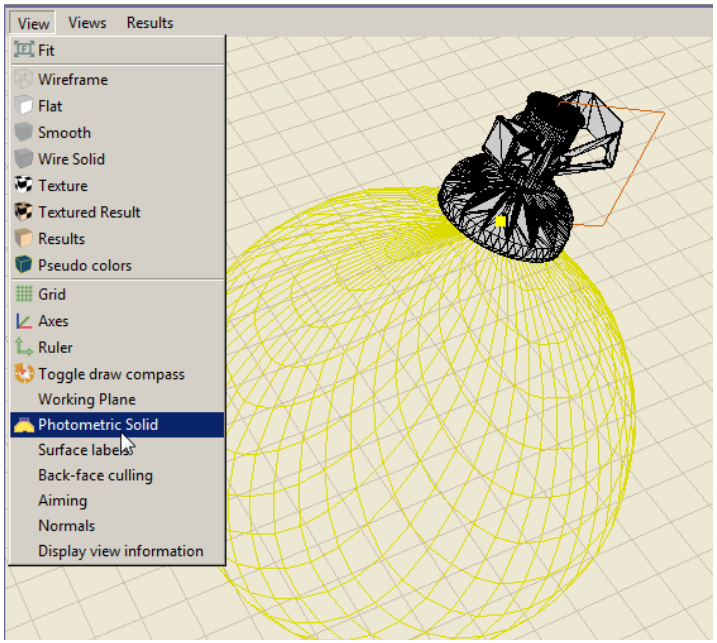
The photometric solid is the representation in 3D space of the photometric emission of the luminaire. For this reason any asymmetries can be represented.

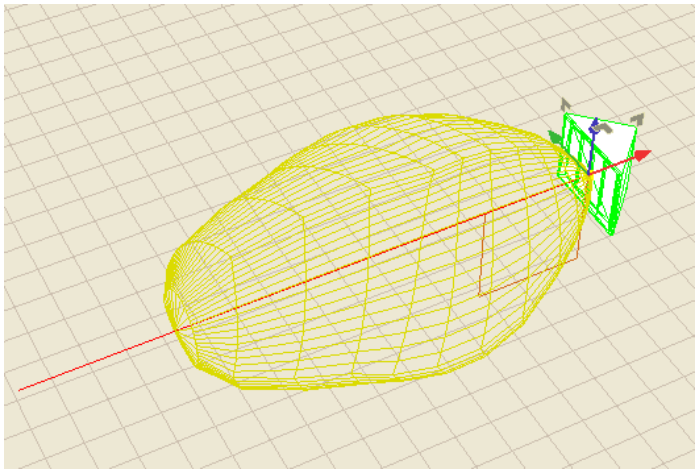
The photometric solid on the left, shown in the illustration below, represents a symmetrical photometry, whereas that on the right an assymetrical photometry. In both cases the emission is downward.

The red line represents the direction of emission of the photometry. The origin of this line is the photometric barycenter.

To view the photometric solid just click on the *View* menu (situated on the left of each design frame) and select ***Photometric solid***.

In the same menu by selecting ***Aiming***, the direction is shown in red.





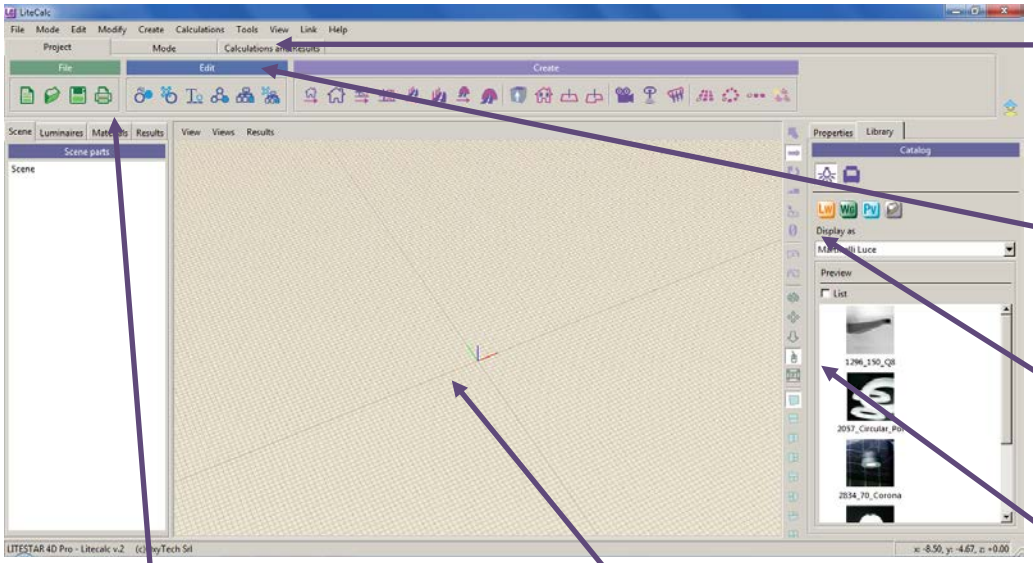
Notes

Main screen

Program launch opens the main operative area, from which it is possible to access all the tools necessary for modeling and viewing the project. The central area, dedicated to graphic representation, allows four windows to be opened, for viewing the objects from the different angles (front, side, top, perspective). The two side windows on the other hand contain all the elements and commands for managing the project.

Everything that concerns the construction of the calculation area is considered an “element”: the elements, even if differing in nature and geometry, maintain the same logical representation.

Thus whether they are environments, furniture or lighting devices, the tools for handling them (properties table, transformations, editor, etc.) will always be the same.



Dropdown menu bar

Operative area TAB and icon bar

Module access

Project lists TAB

Operative design area

Object insertion and properties TAB (dimension and position)

Notes

Dropdown menu bar and icon bar

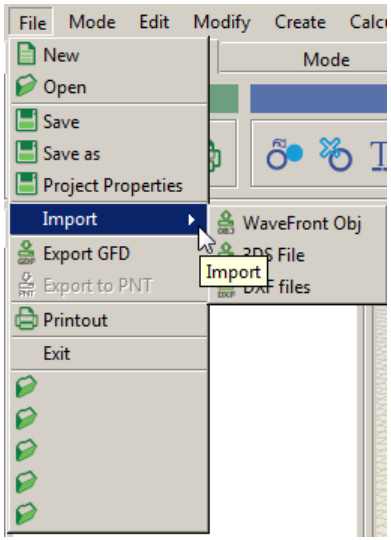
The main operations can be performed by means of:

- **Dropdown menu bar**: a click with the left mouse button on the reference menu (File, Edit, Modify, Create, Calculations, Tools, View, Link, Help) and after scrolling with the pointer on the items (which will be highlighted in blue), a click on the command to be carried out
- **Icon bar**: a click with the left mouse button on the command icon

File Menu

For all operations linked with opening, exporting and saving a project:

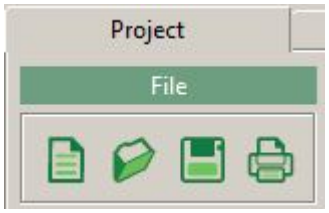
- ***New*:** to start a new project
- ***Open:*** to open a project chosen from the archive
- ***Save*:** to save the current project
- ***Save as:*** to save the current project with name in a folder of the computer
- ***Project Properties***: to insert the data related to the project and the roads energy certification data
- ***Import*:** to import 3d models, such as .OBJ or .3DS, or to import a .DXF file
- ***Save as package*:** to export a group of objects in a single file
- ***Export GDF*:** to export the project in the proprietary format of the Politecnico of Milan
- ***Export to PNT*:** to export the project and use the data in the estimate module
- ***Printout*:** to print the project
- ***Exit*:** to exit the program



File icon bar

From left to right the commands are:

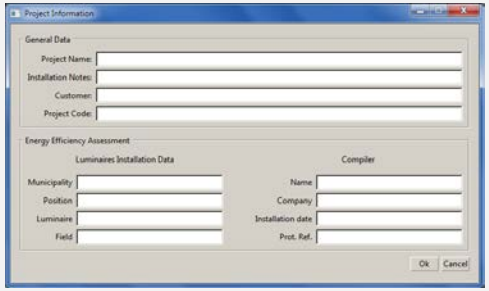
- ***New*:** to start a new project
- ***Open:*** to open a project chosen from the archive
- ***Save*:** to save the current project in a folder of the computer
- ***Printout*:** to print the current project



Notes

Icon bar: to view which commands are represented by the icons on the bar, just position the mouse pointer on them for a few seconds.

In the lower part of the menu, the recent projects are shown. Select one of the lines to open the corresponding project.



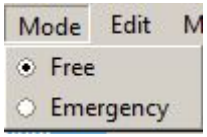
Selection of Project Properties opens a window in which you can insert the general data and the roads energy certification data related to the project

Dropdown menu bar and icon bar

Mode Menu

To choose the program operation mode:

- ***Free*:** to realize lighting engineering projects for interiors or exteriors
- ***Emergency:*** to realize emergency lighting engineering projects in accordance with norms



Mode icons bar

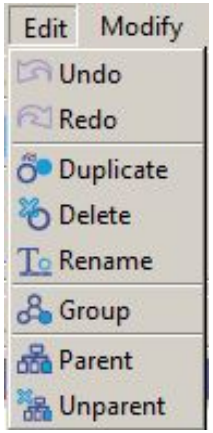
From left to right the commands are:

- ***Free*:** to realize lighting engineering projects for interiors or exteriors
- ***Emergency:*** to realize emergency lighting engineering projects in accordance with norms

Edit Menu

For the general management functions of the project:

- ***Undo*:** to cancel one or more operations (for example, to return a luminaire to its original position after moving it etc.)
- ***Redo*:** to refresh the project state after 1 or more cancellation operations
- ***Duplicate*:** to duplicate the selected object
- ***Delete*:** to delete the selected objects
- ***Rename*:** to change the name of a selected object
- ***Group*:** to create a group of one or more objects, even of different types (lighting devices or furniture). In this way the transformation of one or more objects will depend on a virtual element (broken line), in whose barycenter the origin of the group axes is positioned
- ***Parent*:** to associate two or more objects, in such a way that their transformation depends on the object with which they have been associated and on which the origin of the axes is positioned
- ***Unparent*:** to separate the objects linked by the parent command



Notes

Rename: another way to rename the selected object is to type the new name directly in the properties window, on the right of the design area.

Duplicate: the object is duplicated and superimposed on the original. To move it just select it with the move command.

Undo/Redo: the command is shown as an icon also on the right part of the screen between the design area and the properties window.

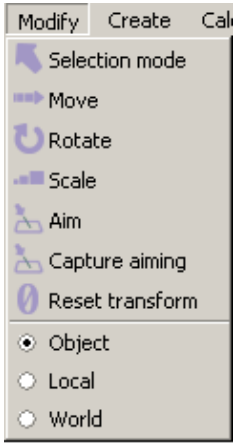
Dropdown menu bar and icon bar

Edit icon bar

From left to right the commands are:

- ***Duplicate*:** to duplicate the selected object
- ***Delete*:** to delete the selected objects
- ***Rename*:** to change the name of a selected object
- ***Group*:** to collect a number of objects in a group
- ***Parent*:** to make the transformation of an object dependent on another object
- ***Unparent*:** to separate the objects linked by the parent command

Modify Menu



For all operations connected with modifying the objects (environments, luminaires, furniture, etc.):

- ***Selection mode*:** to select an object
- ***Move:*** to move an object on the three Cartesian axes (x',y', z')
- ***Rotate:*** to rotate an object on the three Cartesian axes (x',y', z')
- ***Scale:*** to rescale an object on the three Cartesian axes (x',y', z')
- ***Aim:*** to orient the object in a direction (x',y', z')
- ***Capture aiming*:** to capture an object and orient it directing its axis to the destination
- ***Reset transform*:** to cancel all transformations performed on the object
- ***Object, Local, World*:** these represent the transformation reference system

Notes

By selecting a number of objects present in the tree, you can create a group by pressing the G key or Parent by pressing the P key. In the second case the reference object will be the first in the list.

The modify commands can also be selected with the keyboard:

W: translation

E: rotation

R: scale

Q: selection

T: aiming

Dropdown menu bar and icon bar

Vertical icon bar

The same commands of the *Modify* menu are shown on the right of the screen between the design area and the properties window. From top to bottom the commands are:

- ***Selection mode:*** to select an object
- ***Move:*** to move an object on the three Cartesian axes (x',y', z')
- ***Rotate:*** to rotate an object on the three Cartesian axes (x',y', z')
- ***Scale:*** to rescale an object on the three Cartesian axes (x',y', z')
- ***Aim:*** to orient the object in a direction (x',y', z')
- ***Reset transform*:** to cancel all transformations performed on the object
- ***Undo*:** to cancel one or more operations
- ***Redo*:** to refresh the project state after one or more cancellation operations
- ***Tumble*:** to rotate the perspective view
- ***Track*:** to move the work area inside the window
- ***Zoom in - Zoom out*:** to zoom in and out inside the window
- ***Toggle*:** to deselect the three previous commands (Tumble, Track, Zoom in - Zoom out)
- ***Rescale*:** to fit the work area inside the window

Notes

Once the command has been selected:

Track: is obtained by pressing the left mouse button in the design area. By moving the mouse the drawing can then be moved in all directions.

Zoom in - Zoom out: is obtained by pressing the left mouse button in the design area. By moving the mouse upwards the drawing enlarges, by moving it downwards it reduces.

Tumble: is obtained by pressing the left mouse button on the design area. By moving the mouse the drawing can then be rotated in all directions.

Alternatively the commands can be performed with the mouse and keyboard:

Track: CTRL + left mouse button, or mouse wheel pressed.

Zoom in - Zoom out: SHIFT + left mouse button or mouse wheel zoom.

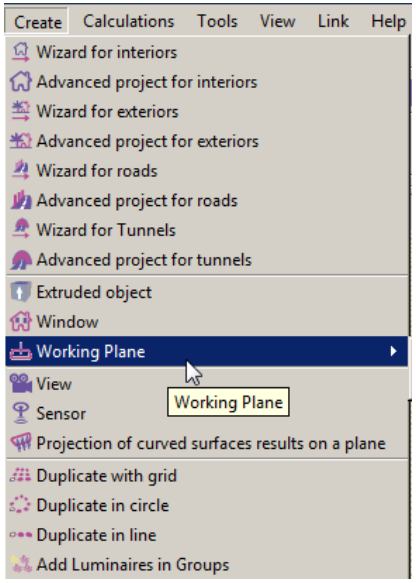
Tumble: ALT left mouse button.

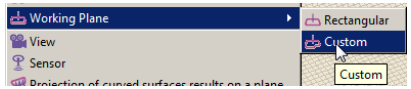
Dropdown menu bar and icon bar

Create Menu

For all operations connected with creating a project:

- ***Wizard for interiors*:** to create an interior environment (floor, walls, ceiling)
- ***Advanced project for interiors***: to open the wizard for creating an interior environment
- ***Wizard for Exteriors*:** to create an external environment (floor)
- ***Advanced project for exteriors***: to open the wizard for creating an exterior environment
- ***Wizard for roads*:** to perform a guided calculation in accordance with the norms in force for simple roads (one or two carriageways, plus sidewalks)
- ***Advanced projects for roads***: to perform a guided calculation in accordance with the norms in force for complex roads
- ***Wizard for tunnels*:** to carry out a guided calculation in accordance with the simplified tunnels norms in force
- ***Advanced project for tunnels***: to carry out a guided calculation in accordance with the tunnels norms in force including Adrian diagram
- ***Extruded furniture:*** to create a solid starting from the outline and extruding it upwards
- ***Window:*** to open a window along a wall of the environment
- ***Working plane:*** to add a working plane created by the user, of rectangular or irregular shape
- ***View: to create an*** independent view to visualize inside one of the windows
- ***Sensor*:** to simulate a light sensor positioned inside an environment
- ***Projector*:** to read the results on irregularly shaped surfaces. In this way the points are projected on a reference surface grid
- ***Duplicate with grid*:** to duplicate an object on the basis of a preset grid
- ***Duplicate in circle:*** to duplicate an object on the basis of a preset circular grid
- ***Duplicate in line:*** to duplicate an object on the basis of a preset line
- ***Add luminaires to groups:*** to add the luminaires in tabular form or with the total flux calculation method



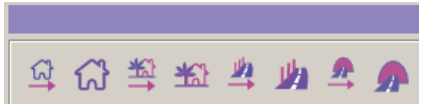


Notes

Dropdown menu bar and icon bar

Notes

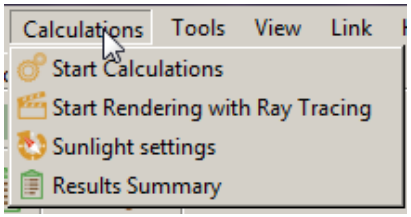
Create icon bar



From left to right the commands are:

- ***Wizard for interiors***: to carry out a guided calculation of regular interior areas
- ***Interior:*** to create an interior environment
- ***Wizard for exteriors:*** to carry out a guided calculation of regular exterior areas
- ***Exterior:*** to create an exterior environment
- ***Roads Wizard***: to perform a guided calculation in accordance with the norms in force for simple roads (one or two carriageways, plus sidewalks)
- ***Advanced Roads***: to perform a guided calculation in accordance with the norms in force for complex roads
- ***Extruded furniture:*** to create a solid starting from the outline and extruding it upwards
- ***Window:*** to open a window along a wall in the environment
- ***Working plane, Custom:*** to insert a rectangular or irregular virtual working plane
- ***View***: to create an independent view to visualize inside one of the windows
- ***Sensor***: to simulate a light sensor positioned inside an environment
- ***Projector:*** to read the results on irregularly shaped surfaces
- ***Grid Duplication***: to duplicate an object on the basis of a preset grid
- ***Circular Duplication:*** to duplicate an object on the basis of a preset circular grid
- ***Linear Duplication:*** to duplicate an object on the basis of a preset line
- ***Add luminaires to groups:*** to add the luminaires in tabular form or with the total flux calculation method

Calculation Menu



For all operations connected with calculating the lighting engineering values of a project:

- ***Start Calculations:*** to launch value calculations (illuminances and luminances)
- ***Start Rendering with Ray Tracing:*** to launch a rendering with Ray Tracing
- ***Set North:*** to orient North in the calculation of natural light
- ***Results Summary:*** to visualize the results summary table

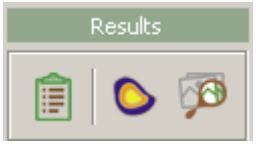
Dropdown menu bar and icon bar

Calculations icon bar

From left to right the commands are:

- ***Start Calculations:*** to launch calculation of the values (illuminances and luminances)
- ***Cancel Calculations:*** to cancel previously calculated results
- ***Start Rendering with Ray Tracing:*** to launch a rendering with Ray Tracing
- ***Set North:*** to orient North in the calculation of natural light
- ***Capture image:*** to save an image of the area in .BMP format. The image will be saved in the ImpExp folder of the program

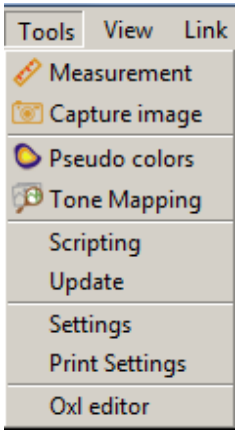
Results icon bar



From left to right the commands are:

- ***Results Summary:*** to visualize the results summary table
- ***View Pseudo Colors:*** to visualize rendering in color scale
- ***Tone Mapping:*** to modify the perception of the image. This allows correction of any discrepancies between what is expected and what the monitor or printer are able to represent

Tools Menu



For all operations connected with the creation, opening, export and saving of a project:

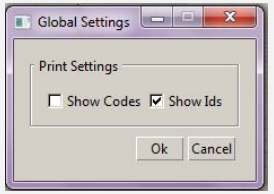
- ***Measurement***: to measure the length of a segment in the design area
- ***Capture image:*** to save an image of the area in .BMP format
- ***Pseudo colors:*** to visualize the rendering in color scale
- ***Tone Mapping:*** to modify the perception of the image. This allows correction of any discrepancies between what is expected and what the monitor or printer are able to represent.
- ***Scripting:*** to automate certain operations, by means of the Python language
- ***Settings:*** to set the default working modes such as dimension, step and color of the design grid
- ***Print Settings:*** to set visualization of luminaire references in the print phase. These references will shown in the paragraph 2D plan View with references.
- ***Oxl Editor***: to link a photometric solid to the luminaire 3D

Notes

Selection of Print Settings opens the window shown below where, by flagging the box alongside, the following can be selected:

Show codes: to visualize the codes set by the user relating to the luminaires, using the *Rename* command

Show Ids: to visualize the codes automatically given by the program

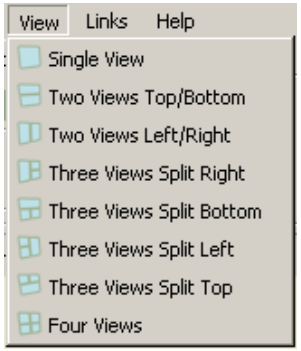


Dropdown menu bar and icon bar

View Menu

For all operations connected with the visualization of windows in the work area.

It allows selection of the number and layout of the windows (vertical or horizontal) in the area relative to the design, up to a maximum of four.



Vertical icon bar

The same *View* menu commands are shown on the right of the screen between the design area and properties window, so as to always be visible.

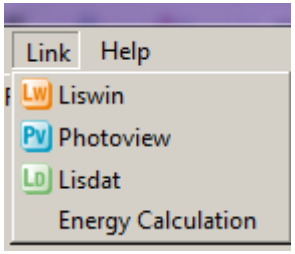
Notes

Dropdown menu bar and icon bar

Link Menu

To access the other program modules:

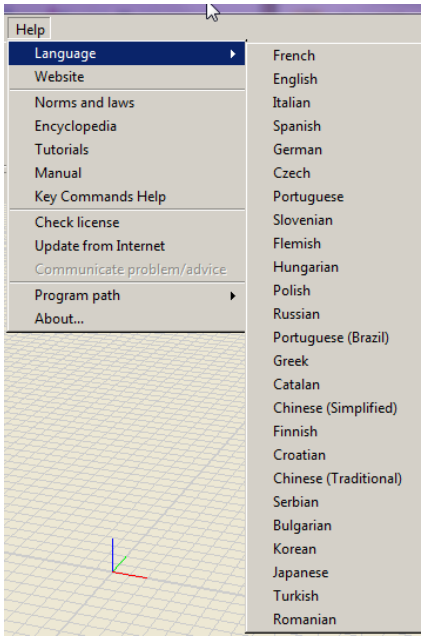
- ***Liswin:*** to access the catalog module
- ***Photoview:*** to access the photometry view module
- ***Lisdat:*** to access the data insertion module
- ***Energy Calculation:*** to access the energy calculation window of the installation under design



Help Menu

For all operations that may be of help in designing the project:

- ***Language:*** to select the program language
- ***Website:*** to access the OxyTech internet site
- ***Norms and laws:*** to consult norms extracts on the OxyTech site
- ***Encyclopedia:*** to access the concepts relative to lighting engineering measurements on the OxyTech site
- ***Tutorials:*** to download from Internet the automatic demonstration of the main program functions
- ***Manual:*** to download manuals from the Oxytech site
- ***Key Commands Help***: to view the options that can be activated using key commands
- ***Check license:*** to check license status
- ***Update via Internet:*** to download the software updates via Internet
- ***Communicate problem/report:*** to communicate a problem or report to OxyTech
- ***Program Path***: to open the folders relative to the program and the manufacturers' data
- ***About:*** for access to the window indicating the program version and any notes on copyright



Notes

It is also possible to access the individual modules from the icons on the right of the screen in the Libraries TAB

By selecting *Program Path* you can open three different folders:

- ***Program:*** to visualize the folders that contain the files relating to program function
- ***Configuration Data***: to visualize the folders that contain the files relating to program configuration
- ***Data:*** to visualize the folders that contain the manufacturer data (.../DB) and the files saved by the program (.../ImpExp e .../project)

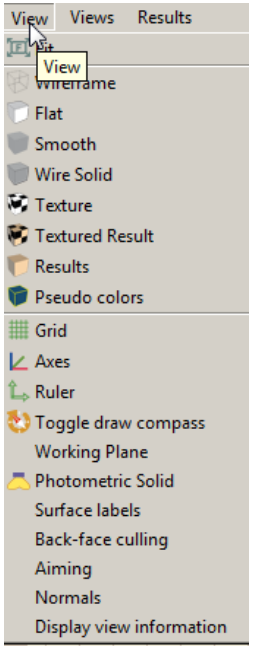
Menu bar in the design area

These are the menus situated on the top left, in the window relating to the design views

View Menu

For all operations connected with viewing the project:

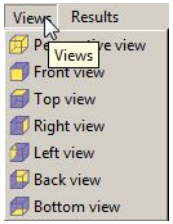
- ***Fit View:*** to fit the view within the window
- ***Wireframe***, ***Flat, Smooth, Wire Solid:*** to view the design according to various graphic options
- ***Texture, Texture Result:*** to view the design and rendering complete with textures, if connected
- ***Results, Pseudo color:*** to view the rendering without texture or color scale once calculation is complete
- ***Grid, Axes, Ruler,Toggle draw compass:*** to view the grid, axes, ruler, or compass
- ***Working Plane:*** to view the reference working plane
- ***Photometric solid:*** to view the photometric solid of the luminaires
- ***Surface labels:*** to view the number associated with each surface
- ***Back-face-culling:*** to view the back-faces of an object
- ***Aiming:*** this activates a red line on the luminaires that indicates where gamma 0° is located
- ***Normals:*** to view the normals of the objects' surfaces
- ***Display view information:*** this activates the view information on the bottom left



View Menu

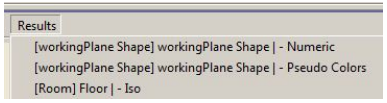
To set the environment views:

- ***Perspective:*** to view the design in three-dimensional perspective view
- ***Front:*** to view the design in front view
- ***Top:*** to view the design in plan view
- ***Right, Left, Back, Bottom view***:: to view the design in side views

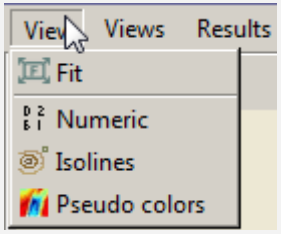


Result Menu

In this window you can choose the results graphs previously selected in the results summary window.



Notes



If a graph is visualized in the design area, click on the View menu to select the other graphs available for the surface under examination.

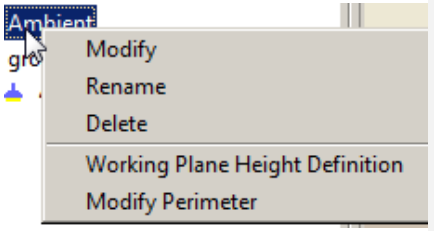
Project lists TAB

Situated to the left of the work area, is shown all the information regarding the objects inserted in the project:

Scenes

In this window, all the elements making up the environment (furniture, working planes, luminaires, etc.). are found with tree structure

- On selection of an object from the list with the left mouse button, the model in the design area will be highlighted, while in the *Properties* window (to the right of the design area) the properties regarding the object itself will appear
- On selection of an object in the list with the right mouse button, it is possible to edit its properties (*Modify*), change its name (*Rename*), or completely eliminate (*Delete*). If the selected element is the area, it will also be possible to modify the height of the working plane (*Working Plane High Definition*), and to modify the perimeter of the room (*Modify perimeter*). The latter function can also be applied to extruded furniture.



Luminaires

This allows the list of the different types of luminaires inserted in the project to be visualized

- in the lower part of the window the characteristics of the luminaires are highlighted
- the *Select* key allows selection of all the luminaires of the same type present in the project

Notes

Another way to **rename** the selected object is by means of the Edit/Rename menu.

By using the **CTRL key plus the left mouse button** a number of objects can be selected simultaneously.

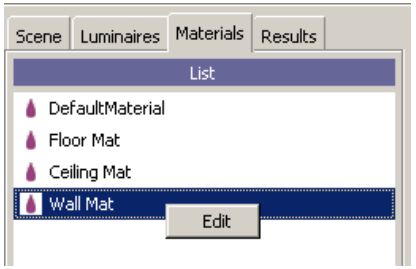
By selecting a number of objects present in the tree, a Group can be created by pressing **G** or a Parent can be created by pressing **P**. In the second case the reference object will be the first in the list.

Project lists TAB

Materials

This allows the list of the materials present in the project assigned to the various surfaces of the objects to be visualized.

- Selecting a material present in the list with the right mouse button makes it possible to edit its properties (*Edit*)



Results

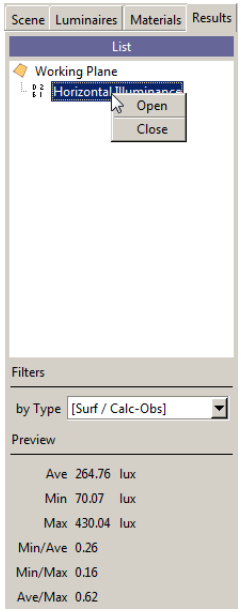
This allows a list of the various results obtained through calculation to be visualized.

- By selecting a result in the list with the right mouse button it is possible to open the relative graph (*Open*), or close it (*Close*)
- By clicking twice on the result the corresponding graph will be shown in the design area

The dropdown menu ***By Type*** allows you to choose the order of viewing:

- ***Calc:*** for type of calculation performed (luminance, illuminance, etc.)
- ***Obs:*** for observer, where calculations require the observer's position
- Surf: for the selected surface

In the lower part of the window the summary data relating to the calculated parameters are visualized.



Notes

By modifying the characteristics of a single material, automatically all the surfaces that refer to that material will be updated, even if they belong to different objects.

For example if the "Default" material is connected to a surface of object A and to a surface of object B, both present in the project, the two surfaces will change their characteristics automatically according to the modifications made on the "Default" material.

Once calculation is complete, the Results Summary automatically opens.

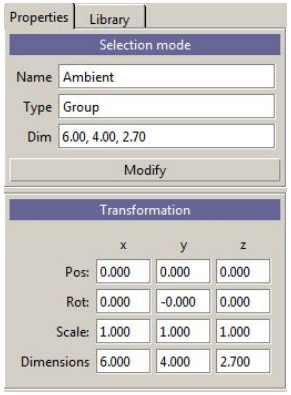
To insert the results obtained in the Results TAB just select those of interest with the left mouse button (to select more than one surface at a time keep the CTRL button plus the left mouse button pressed on the individual items) and click on the keys of the graphs you wish to view.

Libraries and properties TAB

Properties

This allows the layers and properties of the selected object to be visualized and modified.

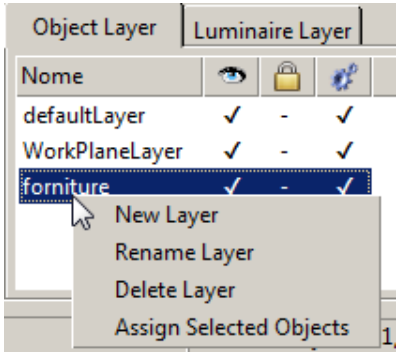
- The ***Selection*** window permits the name of the object to be modified by typing the new name directly in the box
- The ***Modify*** key opens the window relating to the material characteristics of the object
- The ***Transformation*** window allows modification of the dimensions, position and rotations of the object by typing the value directly in the box

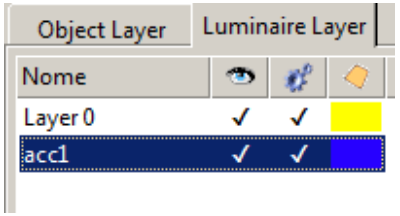


Object and Luminaires Layers

The ***Object and Luminares Layers*** window allows a number of objects or luminaires to be associated to a determined layer, a new layer to be created or an existing one to be renamed or deleted and luminaire lighting management.

- Pressing with the right mouse button on a layer inside the window opens a window which allows:
  - ***New Layer:*** to create a new layer, to which a new name will be given
  - ***Rename Layer:*** to rename an existing layer
  - ***Delete Layer:*** to delete an existing layer
  - ***Assign Selected Objects:*** to assign the layer to a selected object
- By clicking with the left mouse button on the symbols of the three columns you can:
  - display or hide the corresponding layer and the objects or luminaires associated to it
  - block the objects associated to that layer, so they can no longer be modified or moved (only objects)
  - exclude the objects or luminaires assigned to that layer by the calculation
  - change the color of the Tags assigned to the luminaires for lighting up.





Notes

To display or hide a layer is important when there are many objects in the project.

Hiding the objects is a help in the modeling, in that it frees the scene from unnecessary elements.

These objects can however still be selected and, therefore, modified from the *Scene* tree on the left.

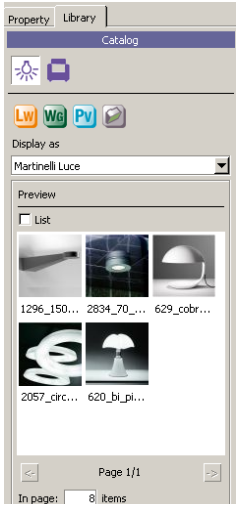
To block a layer instead allows you to avoid “involuntary” transformations to the objects present in the scene.

Excluding the objects from calculation instead allows the calculation times to be reduced especially during the preliminary verifications: excluding certain pieces of furniture, therefore, allows you to speed up calculation in this phase.

Libraries and properties TAB

Library

This allows viewing of the list of predefined objects and those of the most frequently used luminaires.



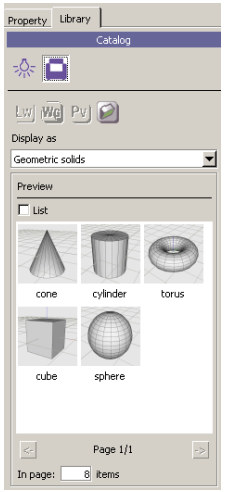
Clicking on the luminaires icon opens the library relative to the luminaires (image on the left).

By clicking on the arrow of the dropdown menu, below the icons of the other program modules it is possible to select the manufacturers present in the database.

To add new favorite luminaires to the list just access the *luminaires TAB*, on the left of the screen, select the product and drag it with Drag&Drop into the library.

To do this it is important:

- that the luminaire *library TAB* on the right of the screen is selected
- that the product is inserted in the current project



Clicking on the furniture icon opens the library relative to furniture (image on the right).

By clicking on the arrow of the dropdown menu, below the icons of the other program modules, it is possible to open the different furniture archives present in the database.

Notes

To insert the objects in the project just select them with the left mouse button and holding it pressed, drag them into the design area (Drag&Drop). This operation can be performed in all program modules.

The Folder icon allows you to carry out Drag&Drop operations from an external folder, where photometric files or 3D models have been saved.

Flagging the *List* string allows you to view the list of furniture and luminaires present in the library and not the preview.

Shortcuts

The program allows certain operations to be speeded up using the keyboard.

Rapid selection keys for modifications

These are the operations that allow object transformation. By pressing the associated key, the commands are activated, regardless of whether the object to be transformed has been selected:

W: translation

E**:** rotation

R**:** scale

Q**:** selection

T**:** aiming

F: fit of the selected object or the bounding box of the scene

Space Bar: opens the rapid selection menu

Rapid selection keys for managing the operative design area

These are the operations that allow better management of the design area (e.g. zoom, pan, etc.). To activate them, the key associated with the command and the left mouse button must be kept pressed in the design area:

Track: CTRL plus left mouse button, or mouse wheel pressed. Keeping the keys pressed and moving the mouse will enable you to move the image

Zoom in - Zoom out: SHIFT plus left mouse button or mouse wheel. Keeping the keys pressed and moving the mouse will enable you to enlarge the image

Tumble: ALT plus left mouse button. Keeping the keys pressed and moving the mouse will enable you to rotate the image

Rapid selection keys for area design

These are the operations that allow better management of the calculation area realization (they are active when an interior or exterior area is being designed) . To activate them press the key associated with the command:

Back: to go back, that is cancel the last point fixed with the mouse

Enter: completes the step, that is it closes the environment and moves on to the next step

Esc: cancels everything and exits the environment creation tool

G: keeping the key pressed, the mouse pointer will position itself on the grid points **(**snaps) whose step can be defined in the TOOLS/Settings window

O: keeping this key pressed, the mouse pointer moves orthogonally

X: if a background .DXF is being used, keeping this key pressed, the pointer will automatically position itself on the snap nearest the dxf

Notes

To select an object just click on the object itself with the left mouse button, inside the design area.

More than one objects can be selected at a time by keeping the **CTRL key** pressed and selecting with the left mouse button the names of the objects to be selected (in the *Scene TAB* on the left of the screen).

When the area is edited, keeping the L key pressed while inserting a new segment, the segment will be created maintaining the wall parallel to itself (for a more detailed explanation see the Modify area and extruded objects chapter).

Operative design zone

The operative design zone consists of the area where the environment is modeled and the objects necessary for the calculation are inserted.

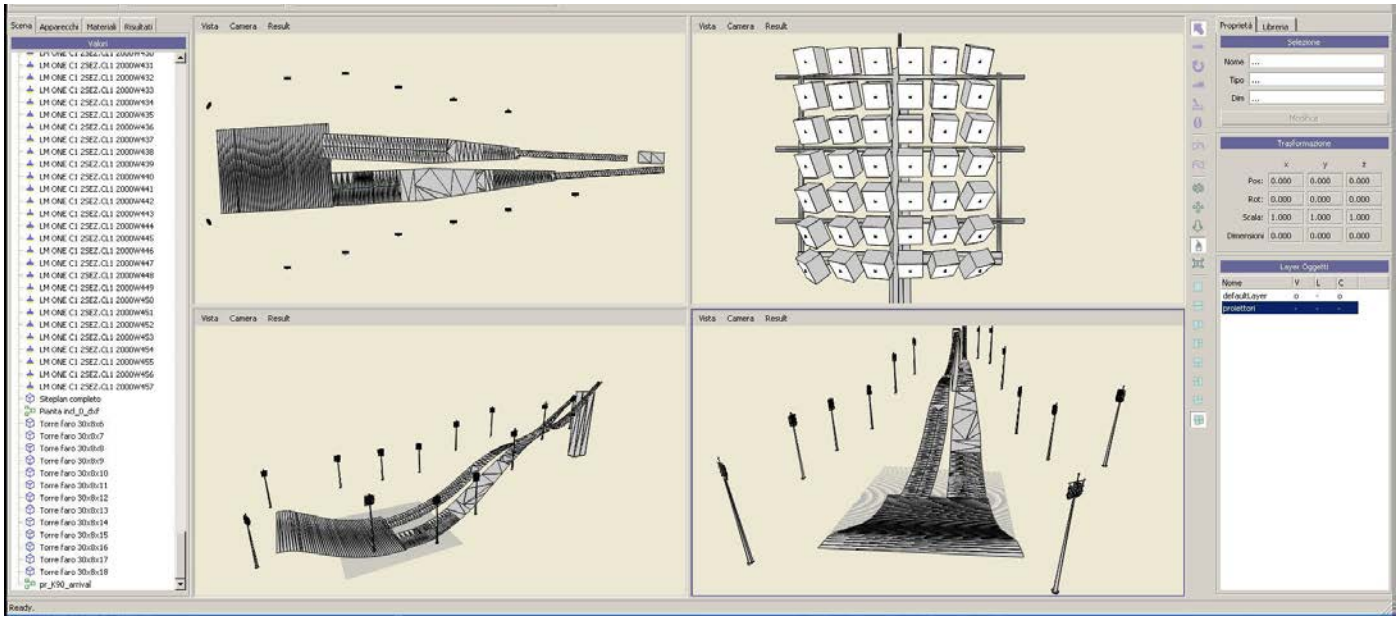
It also represents the area where the calculation results are visualized, whether graphs or rendering.

The work environment can be divided into four windows, each configurable separately.

To configure the number and arrangement of the design windows just select the desired format from the ***Views*** menu or from the vertical icon bar situated on the right of the operative area.

Each window has three dropdown menus which can be activated with a click of the left mouse button:

- ***View:*** this allows activation of the various types of visualization of the object, both as regards the model view and the results view
- ***Camera*****:** this allows configuration of a three-dimensional view (Perspective) or 2D, Front, side and top views
- ***Results*****:** this permits visualization of the calculated results



Notes

To create an independent window you must select ***Create*** in the menu and the command ***Camera***. Enter the camera menu from the selected window and select the name of the camera just created.

At this point you can work from window to window: for example it is possible to select a floodlight in one window and aim it (with *Pick Orient*) in another.

The **View** menu, inside the design area, allows you to set visualization of the reference grid for the design.

Select the *Tools/Settings* menu to access the grid setup window.

In this way the dimension, step and reference grid color of the design can be set.

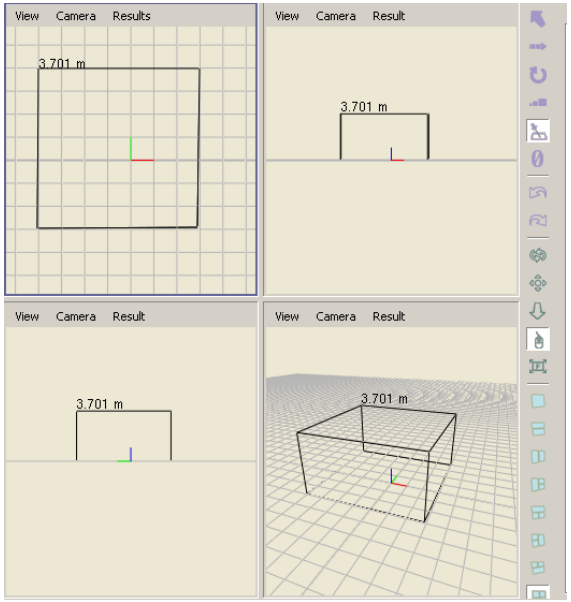
Creation of calculation area

Creation of an interior/exterior environment

By environment we mean an external area of work (where only the ground surface is represented) or an internal area (where the floor, walls and ceiling are represented), in which to carry out calculation.

Creating an environment for interiors or exteriors allows us to view the results graphs already subdivided in the summary into floor, walls or ceiling.

To create an environment, in the first place, it is necessary to establish the type of area to be modeled:



Selecting the icon with the left mouse button enables you to draw an interior environment

Selecting the icon with the left mouse button enables you to draw an exterior environment (without walls and ceiling)

After selecting the icon, and moving the mouse into the design area:

- The cursor will appear as a cross pointer, on which the X and Y coordinates of the point in which it is situated are highlighted
- By clicking point by point, the single lines of the environment are drawn (for curved walls see the following paragraph). To facilitate the creation of the perimeter, moving the cursor, the program will visualize the length of the line in meters
- Clicking on the point of origin of the area will close the environment. Alternatively the environment can be closed with the *Enter* key
- In this way the room height definition window will be shown, as explained in the following paragraph
- Selecting the room with the right mouse button in the *Scene TAB* on the left of the screen and choosing *Modify* will enable you to access the Object Editor, where surface characteristics and reflection coefficients can be modified

Notes

Once the calculation area has been created it is advisable to save the project using the *File/Save* menu or the corresponding icon on the *File* icon bar.

Remember that the central area of the drawing allows the different *Views* to be visualized, with a maximum of four windows

Commands that can be performed using the keyboard:

Back: to go back, that is cancel the last point fixed with the mouse

Enter: completes the step, that is it closes the environment and moves on to the next step

Esc: cancels everything and exits the environment creation tool

Space: opens the rapid choice menu

G: snap of 1/2 step on the grid

O: orthogonal movement

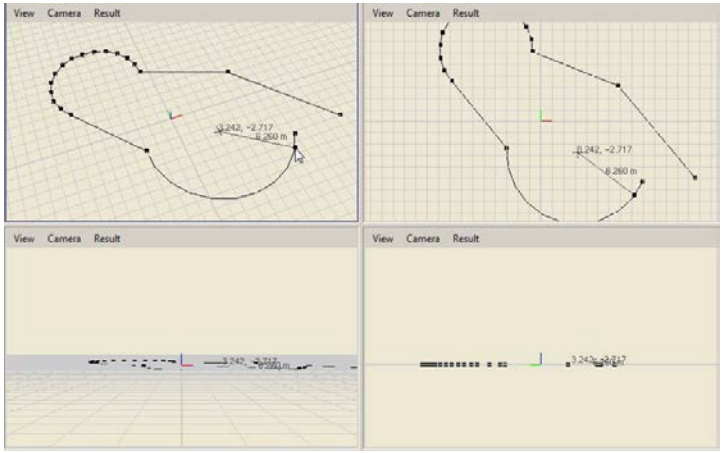
F: fit of the selected object or of the bounding box of the scene

Creation of calculation area

Inserting a curved wall

During area creation (whether interior or exterior) it is possible to insert curved walls:

- By positioning the pointer on the final point of the curve to be created
- By keeping the left mouse button pressed and moving the pointer in the direction of the curve opening. In this way the center coordinates and curve radius will be visualized
- By releasing the right mouse button once the correct dimensions of the curved element have been decided



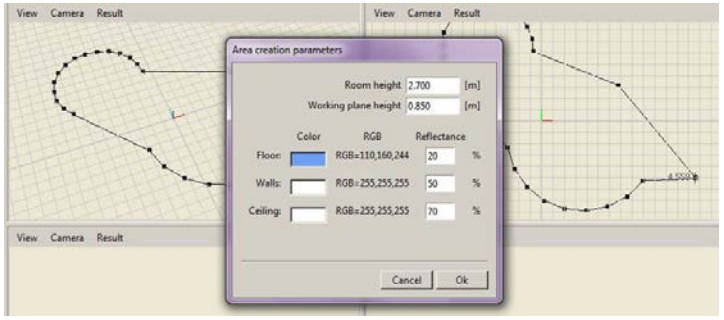
Definition of room parameters

Once room creation is complete, a window automatically opens in which to type:

- Room height in meters
- Working plane height
- Area reflections (walls, floor, ceiling)

Click on *Ok* with the left mouse button to close the window and the previously defined window will appear.

The height of the room can however always be modified in the *Properties TAB,* on the right of the design area, by typing the new dimension in the field relating to Z, after selecting the area.



Notes

Working plane height is set by default at 0.85m, the standard height of a table.

Often however, especially in exterior calculations, the correct height should be moved to 0.10m.

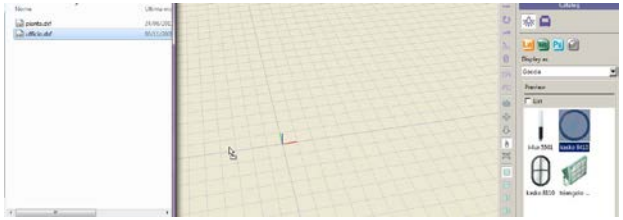
To define the colors of the environment, click twice with the left mouse button in the rectangle relating to the surface color you wish to modify. In this way the colors dialog window will open. The program automatically proceeds to set the reflection corresponding to the selected color. To modify the value, just type the desired value in the reflections box

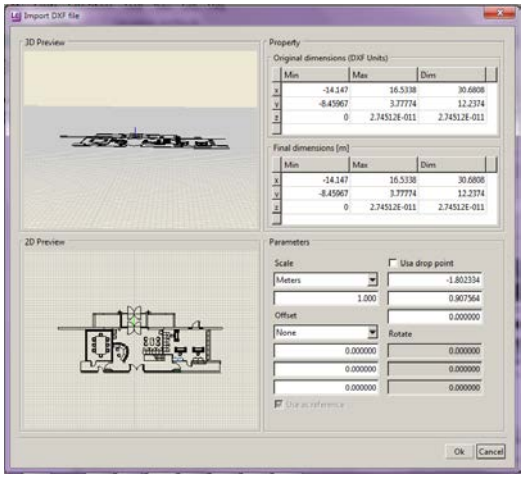
Creation of the calculation area

Insertion of a 2D .DXF file

The simplest way to create a new environment is that of importing a 2D .DXF file to trace.

- To import the .DXF file into the design area from an external folder, Drag&Drop is used. To do this, just select the file in the origin file and drag it into the program design area with the left mouse button
- Once it has been imported a window will open visualizing the *original dimensions* of the design and the *final dimensions* in m (used by the program)
- At this point it is possible to set:
  - the scale of the original design (remember that the designs must be created in meters to be correctly managed by the program), to rescale the design if not in meters
  - the point of origin for inserting the file (Offset):
    - None: to set the design as it is
    - Bottom left: to position the left corner of the design at the origin of the axes
    - Centered axes X-Y: to center the design where the axes intersect
    - Customized: set directly by the user.





Leave the values in the window unchanged and click on the *Ok* button to import the file without modifying it.

- Subsequently you must select the type of environment you want to realize (interior or exterior), in the way described in the previous chapter
- Finally just trace the perimeter of the background .DXF file to produce the environment on which to perform calculation, and set the height of the perspective view, in the case of an interior, once the perimeter has been drawn

Notes

It is advisable to simplify the file before importing it:

- by removing all the parts that can weigh down the file and that are unnecessary for the comprehension of the drawing (cross-hatching, shading, etc.)
- by positioning the drawing origin directly on 0.0
- by checking that the drawing scale is in meters

The wrong import scale can cause serious errors in the realization of the project, since the program calculates the values using the metric scale.

Rescaling the drawing in the window will modify the final dimensions of the drawing, shown in the table, so as to verify that the set scale is correct.

By flagging *Use drop point* the .DXF will be inserted in the point at which the mouse has been released in the design area

If a 3D .DXF is being imported, by flagging *Use as reference* it will be possible to import the file as a 2D object.

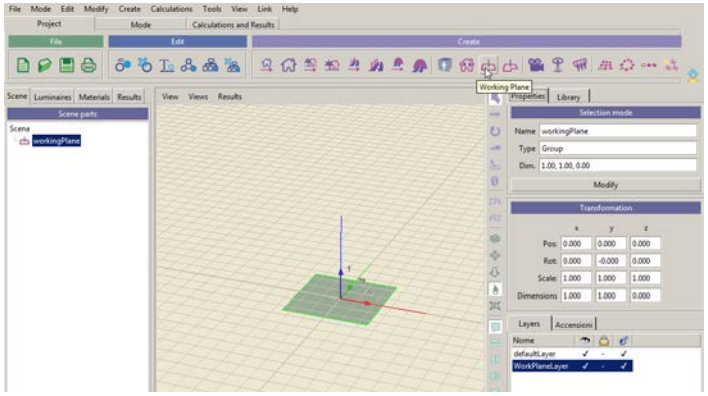
By keeping the X key pressed, the pointer will automatically position itself on the nearest snap in the .DXF.

Creating a working plane

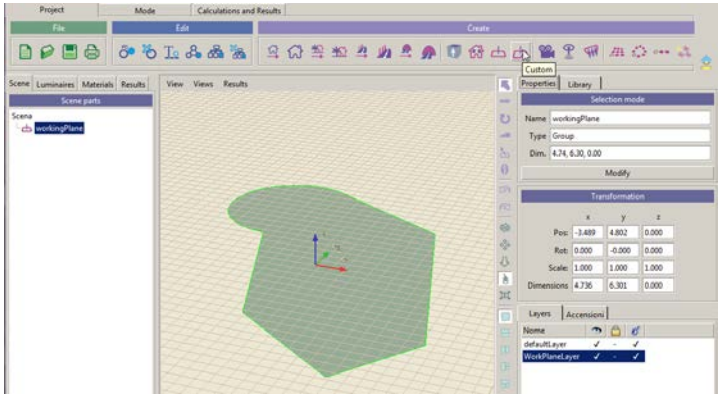
Creating a rectangular or irregular working plane

Selecting the *Working plane* icon with the left mouse button allows you to create a regular working plane with default size of 1x1m.

The dimensions can always be altered by editing the fields in the *Properties* TAB.



Selecting the *Custom* icon instead allows the creation of a working plane with customized shape and size, using the same procedures as for area creation.

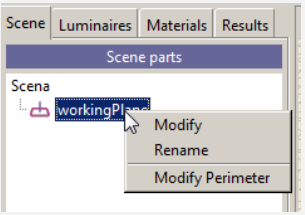


The working plane is assigned a default Layer on which all operations described in the paragraph relating to the layer can be performed.

All operations (e.g. movement, rotation or modify perimeter) as described for objects can be carried out on the working plane.

Notes

By clicking with the right mouse button on the name of the working plane in the *Scene* TAB it is possible to rename the element or edit the perimeter.

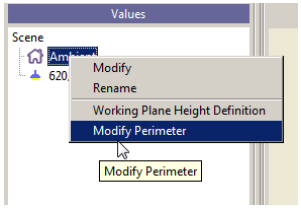


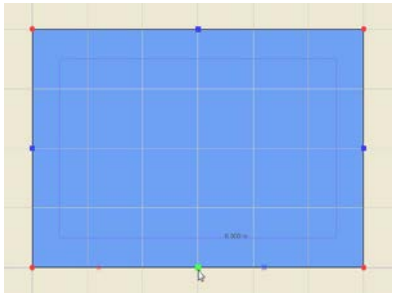
Modifying the area, extruded objects and working planes

This command allows you to modify the area perimeter or an extruded object, eliminating, adding or moving the vertices.

To access modification, select the area or object with the right mouse button, in the *Scene TAB* and select ***Modify Perimeter.***

When an extruded object is selected, the model will be temporarily moved to the origin of the axes to allow the modifications.



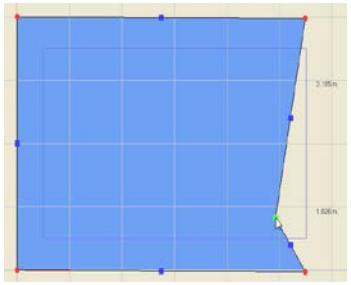


Once the command has been selected:

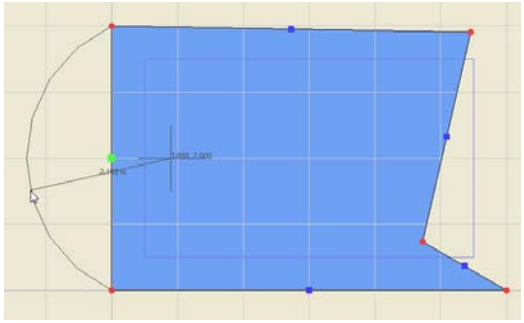
- The vertices will be highlighted with a red dot
- The middle points of each side with be highlighted with a blue square

By keeping the left mouse button pressed on a vertex it is possible to move the angle of the area; click on the blue square instead to move the whole side in any direction.

If you click on a vertex or middle point, both a red and a blue "ghost" will be visualized, as shown in the images beside:



- By selecting and moving (with the left mouse button pressed) the blue square, a new segment will be inserted
- By selecting and moving (with the left mouse button pressed) the red dot, a new vertex will be created
- By selecting and moving (with the right mouse button pressed) the red dot, a new circular segment will be created, as shown in the figure below



During modification the rapid selection keys for drawing the area can be used, as explained in the Shortcuts chapter.

By pressing the L key during insertion of a new segment, the segment will be created keeping the wall parallel

Finally press the *Enter* key to accept the modifications, whereas pressing *Canc* the area or object will not be modified.

Notes

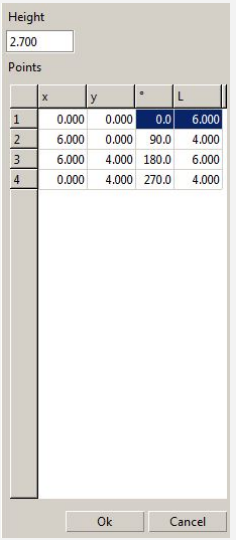
Editing the perimeter opens the table with the coordinates of the vertices and the height of the object on the right-hand side of the screen.

Click inside the boxes both to edit the vertices and to modify the height.

After modifying the vertex coordinates, press the *TAB* key to visualize the modifications in the drawing.

When a vertex is selected, click on the *Canc* key to delete it. On the contrary if you press the *Ins* key, a new vertex will be inserted.

Click on the *Ok* key to accept the modifications, or click on *Canc* to annul the modifications.



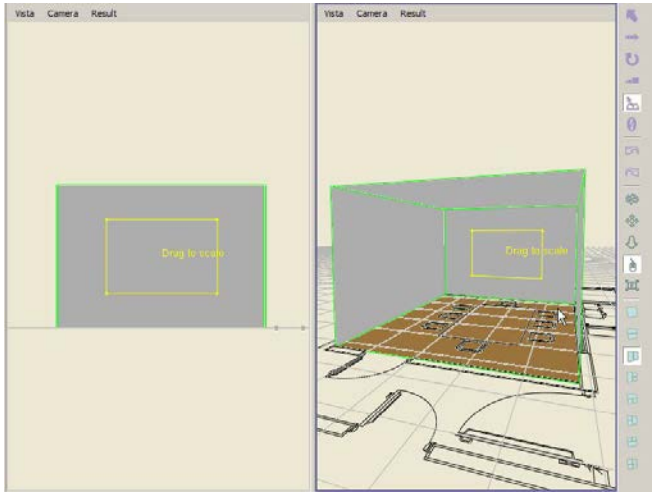
The editable data are:

- Coordinates X and Y
- Angle between two segments (during modification the previous segment will remain constant and the subsequent segment will be "moved")
- Segment length
- Room height

Insertion of a window

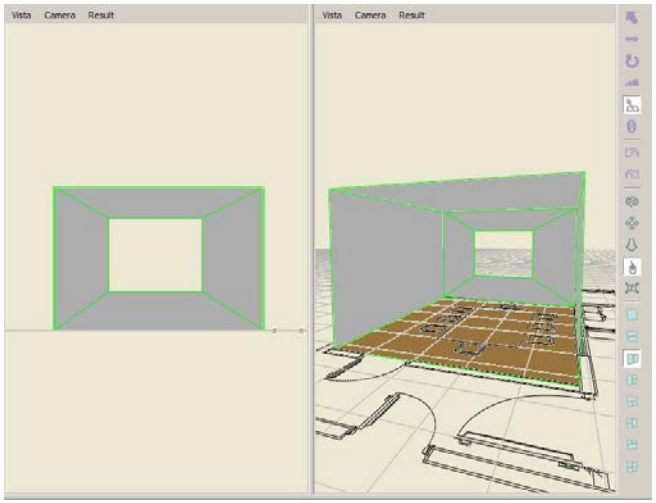
So as to be able to calculate the contribution of natural light in the interior environments, there is a tool that allows you to open a window in a perimeter wall.

To create the opening the procedure below must be followed:



Select the relative icon (nel TAB o nel menù *Crea*) with the left mouse button and move into the design area

- Select with a mouse click the wall in which to create the opening. In this way a yellow rectangle will appear on the wall
- Keep the left mouse button pressed inside the rectangle and move the cursor up/down or left/right to create the dimensions of the window
- Press *Enter* to confirm the dimension
- At this point, to position the window on the wall, keep the left mouse button pressed and move the rectangle
- Finally press *Enter* to confirm the position and open the window



Notes

The procedure requires the use of the *Enter* key to confirm and if necessary Esc to annul the command.

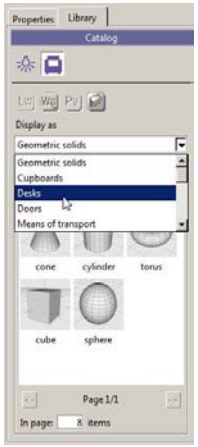
Insertion of an object

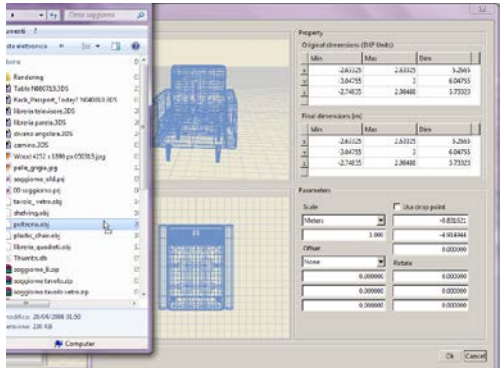
The insertion of an object is effected with the Drag&Drop function in two different ways:

Selecting the icon of the object libraries in the right-hand *Library* TAB and dragging the selected item of furniture into the drawing.

Click on the dropdown menu (image on the right) to open the library list, from which to choose the objects.

At this point just select the furniture with the left mouse button and, keeping the button pressed, drag it into the design area (Drag&Drop). When the mouse button is released the object will be inserted in the object list in the *Scene TAB* and then it can be repositioned, duplicated, rotated and scaled.





By dragging the furniture as a .3DS or .OBJ file from an external folder.

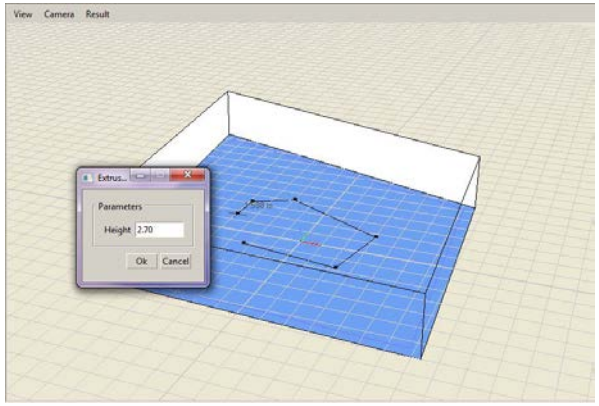
Once the file you want to import has been selected with the left mouse button, you can drag it into the drawing.

At this point the management window described in the following paragraph will open.

There is a third way of adding an object, selecting the *Extruded Furniture* icon

- in the *Create* icon bar
- in the *Create menu*

In this way the object can be drawn directly in the design area, clicking the vertices point by point, exactly as happens when creating the environment (Creation of an interior/exterior environment paragraph) and defining the height once the perimeter has been closed.



Notes

Selecting the object from the *Scene TAB* tree on the left, with a mouse click on the name, the object will be selected also in the design area (the surface lines will appear green).

Furthermore, at the same time the properties will be visualized in the right-hand *Properties* TAB, where the object can be modified and rescaled.

The object (.3DS or .OBJ) can also be inserted using the *File/Import* menu. This function opens a dialog window which allows you to choose the object from inside the folders present in the computer.

In this case the object will be inserted at the origin of the absolute X, Y and Z axes.

The extruded object can be edited in the same way as the area perimeter by clicking on the furniture name in the Scene TAB with the right button and selecting *Modify Perimeter.*

Inserting an object

3D files management window

Once the model has been imported, a window divided in two parts will open.

The first part called *3D Coordinates,* shows the original dimensions of the design and the final dimensions in m (used by the program).

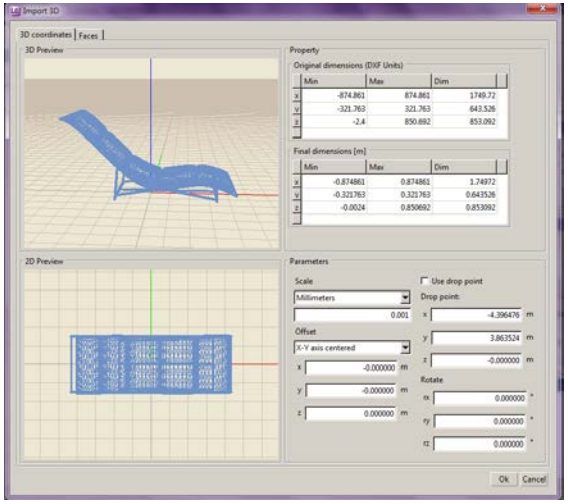
In this TAB you can set:

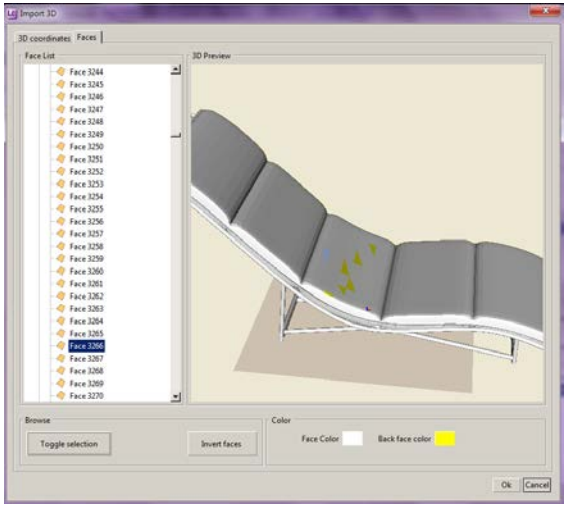
- the scale of the original design (remember that in order for the program to manage the designs correctly they must be in metres), to rescale the design if not realized in meters
- the starting point for file insertion (Offset):
  - None: to position the model as it is
  - Bottom left: to position the left corner of the model at the origin of the axes
  - Centred X-Y axes: to center the model at the intersection of the axes
  - Customized: directly set by the user.
- The rotation to be applied to the model on the X, Y, Z axes
- Insertion using the Drop point, i.e. the point where the mouse releases the model inside the design area when imported with Drag&Drop.

In the *Faces* Tab it is possible to check the correct positioning of the faces of the model.

When they are marked in white it means that the positioning is correct, while if they are marked in yellow it means that the versors are positioned in the opposite direction to that of observation. In this case you will need to select the incorrect faces (either from the list or by directly clicking on the model face) and click on the *Invert faces* key, to change the position direction.

If you do not alter the values in the window, click on the *Ok* key to import the file without variations.





Notes

Clearly, the more faces the model has, the longer editing will be and also the calculation of the model itself.

By clicking in the area where the model is shown, it is possible to perform all zoom, pan and rotation operations already described:

Track: CTRL plus left mouse button, or pressed mouse wheel. Keeping the keys pressed and moving the mouse you can move the image.

Zoom in - Zoom out: SHIFT plus left mouse button or mouse wheel. Keeping the keys pressed and moving the mouse you can enlarge the image.

Tumble: ALT plus left mouse button. Keeping the keys pressed and moving the mouse you can rotate the image

The selected faces will be highlighted with blue meshing on the model.

Objects and materials editor

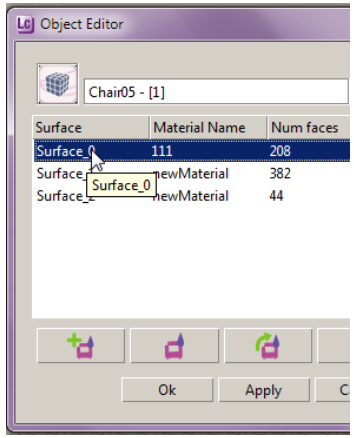
Object Editor

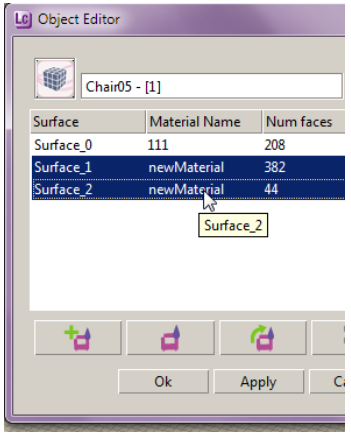
The *Object editor* window allows you to modify the properties of the individual surfaces relative to the furniture or environments. To access the Editor, the object you want to edit must be selected.

At this point the window can be opened in two ways:

- By clicking with the right mouse button on the name of the object in the *Scene TAB* (on the left of the screen) and selecting *Modify*
- By clicking on *Modify* in the *Properties TAB* (on the right of the screen)

Once the operation is complete, the window in the illustration alongside opens, showing the list in which the surfaces contained in the model and the material assigned to each of them can be seen.





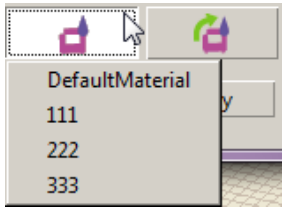
At this point, selecting the individual surface from the *Surfaces* column, the material assigned to every single face can be modified.

If you select the material in the materials column, all those surfaces which are associated with that material will be selected, so as to be modified all together

To assign a material you can:

Select ***Assign a new material***, to create a new material, typing the name of the new material in the window that opens.

Click on the *Ok* key to open the material management window (*Editor*) where the various parameters can be set.



Select ***Assign an existing material***, to assign a material that is already present in the list to the selected surface

The name of the selected material, at this point appears in the *Material Name* box and its characteristics can be modified both in the *Material Editor* window (*following chapter)*, and in the *Materials TAB* on the left of the screen.

Notes

The object to be edited can be selected either by clicking on the name in the *Scene TAB*, or directly in the design area by clicking with the left mouse button on the 3D element 3D.

In both cases the name will be highlighted in blue and the object in the drawing will have green contours.

Selecting a surface in Editor, the faces of the object of interest in the design area will be meshed.

By keeping the Shift or Ctrl key pressed it is possible to select multiple surfaces.

When an environment is created or an object is inserted, Default materials are assigned. In the case of 3D objects imported from outside often the colors and materials will already be assigned.

Example: if a tree is inserted, the surfaces relative to the leaves are normally assigned in green, while those of the trunk in brown.

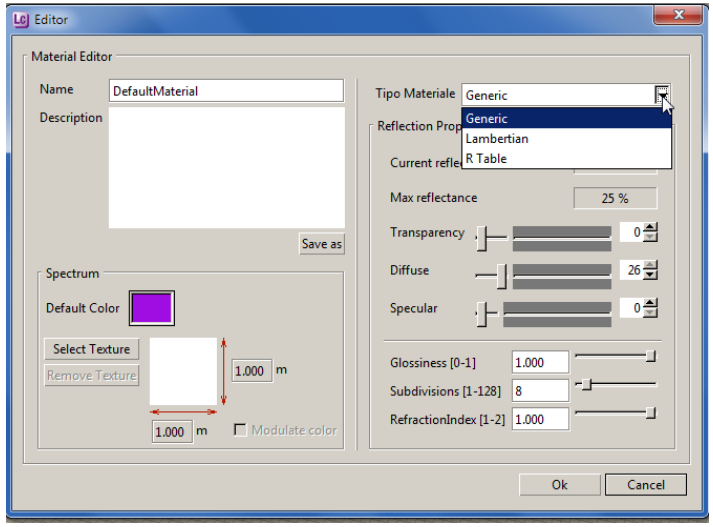
Objects and materials editor

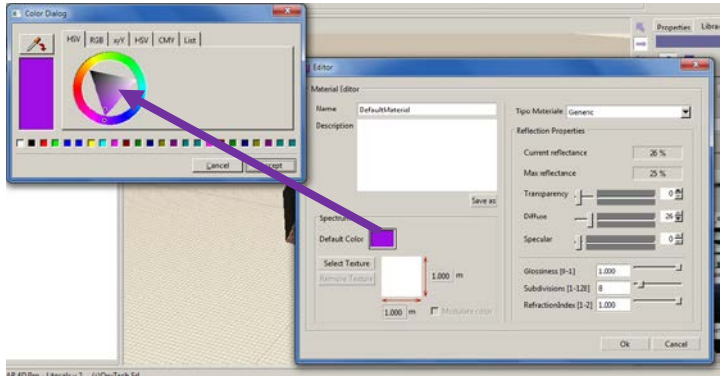
Material Editor

The *Edit Material* icon allows you to open the material modification window and set the properties.

The following operations can be performed in this window:

- ***Name:*** allows the material to be renamed by typing the new name in the place of the existing one
- ***Rename:*** allows the material name to be changed
- ***Default color*** box***:*** click twice to open the standard Windows window that allows selection of a new color to be assigned to the material
- ***Select Texture:*** this allows you to assign a texture image to the material, and to assign the main dimensions on X and Y
- ***Remove texture:*** eliminates this associa***tion***
- ***Modulate color:*** by flagging the box the “transparency” of the default color is set, so as to avoid mixing the set color with that of the associated texture (selectable only if a texture has previously been selected)
- ***Material type***: allows you to select the type of material to assign to the surfaces choosing between Generic, Lambertian and R Table.
- ***Reflections Properties Section***: here you can set the parameters that refer to the way in which the light interacts with a material. More precisely they describe in what quantity and form it is reflected, transmitted and absorbed





Notes

In color definition it is important to be careful to flag not the *Modulate color* field, in case a colored texture is assigned to the model.

Otherwise the color of the texture and the default color will be mixed.

Modulating the color is important when a black and which texture is assigned to a surface. In this way the surface will take the previously assigned color.

In defining the character***isti***cs, the most important data for calculation purposes is that of reflection, since it can greatly influence the final results, especially if a complete calculation is performed (with inter-reflections)

As regards the refraction index, reference can be made to table data that can be found in various sites, among which:

http://en.wikipedia.org/wiki/List_of_refractive_indices

As regards the other indices, currently no standard reference tables exist.

Objects and materials editor

Texture

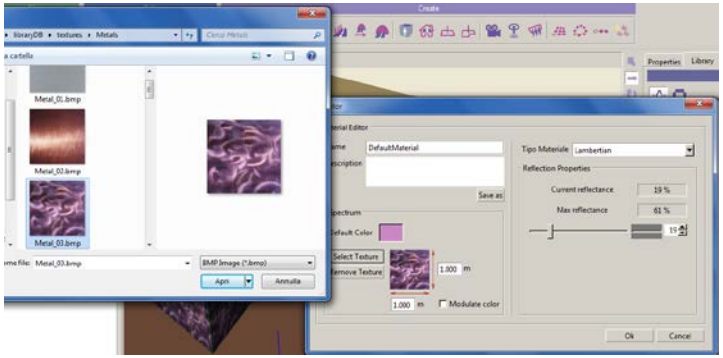
Click on ***Select Texture*** to open the dialog window in which to select the image to be associated with the material.

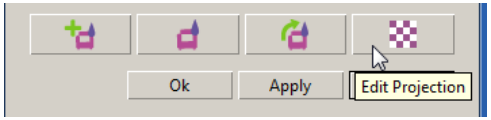
In order to be used by the program, the files must be in the following formats:

- .JPG
- .BMP
- .TIF

The users can realize their own files, inserting them in the texture management folder of the program *Data/LibraryDB/Texture,* where new sub-folders can be created.

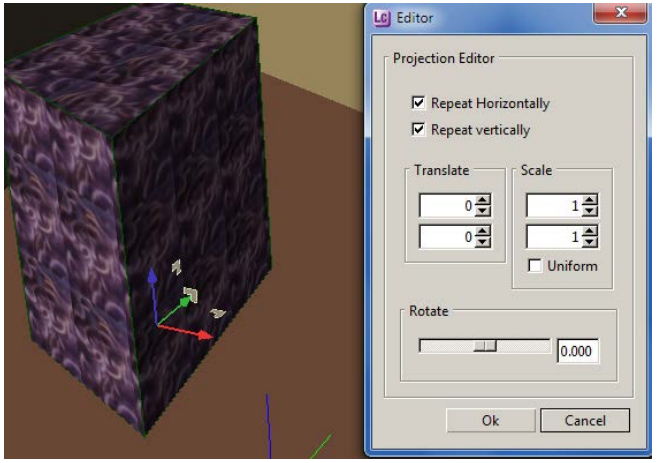
Once the material image file has been selected, return to the general editor of the object to access the texture mapping editor window, by clicking on Edit Projection.





The program tries to position the texture in the most suitable way. The user can however at any time modify the position and dimension of the surface texture of the object, by choosing from the following options:

- ***Repeat horizontally and vertically***: flag the box to repeat the image on the faces of the object, so as to cover all the surfaces
- ***Transpose***: to transpose the image along the surfaces of the object, vertically and horizontally. Click on the relative arrows to change the number inside the box which in turn will change the texture position
- ***Scale***: to scale the image, vertically and horizontally. Click on the relative arrows to change the number inside the box which in turn will change the texture position. Flag *Uniform* to rescale the image both horizontally and vertically
- ***Rotate***: to rotate the image along the axes' origin



Notes

It must be underlined that the texture is applied to the material and not to the object itself. This means that if there are a number of objects to which the same material is assigned, by modifying the parameters of an object, the parameters relative to the other objects will automatically be modified.

To visualize the textures associated with the object just click on the *View/With texture* menu situated inside the design area.

Insertion of a luminaire

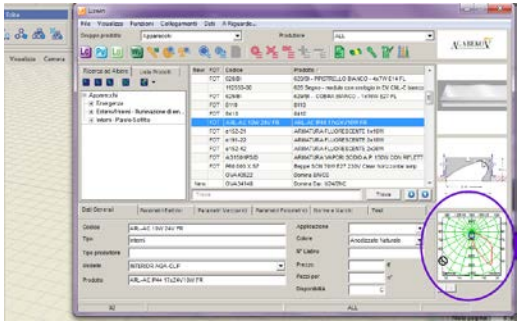
The insertion of a luminaire takes place using the Drag&Drop function directly from the individual program modules:

By selecting the favorite luminaires icon from the right-hand *Library* TAB and dragging the luminaire into the drawing.

Click on the dropdown menu (image on the right) to open the list of favorite manufacturers from which to choose the luminaires.

At this point just select the luminaire with the left mouse button and, keeping the button pressed, drag it into the design area.

When the mouse button is released, the object will be inserted in the object list in the *Scene TAB* on the left of the screen and then can be repositioned, duplicated, rotated and scaled.



By dragging the photometric file (.OXL) from the Liswin module. The luminaire must be selected by clicking on the photo of the photometry, relative to the chosen luminaire

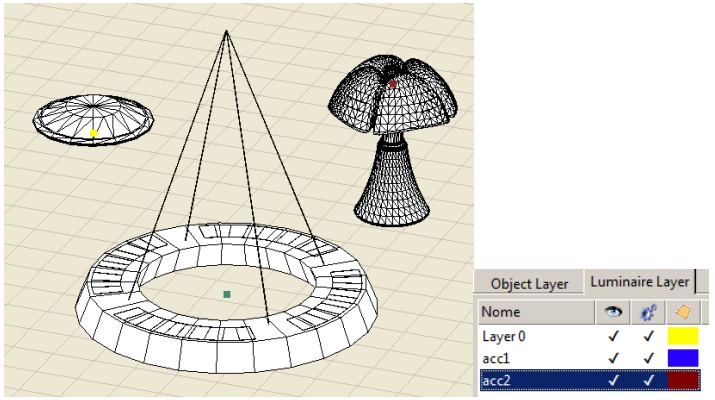
By dragging the photometric file (.OXL) and catalog data from the Webcatalog module

By dragging the photometric file (.OXL, .EUL or .IES) from the Photoview module

By dragging the photometric file (.EUL or .IES) from an external folder

Once the file you want to import has been selected with the left mouse button, it will be possible to drag it into the drawing.

Also in this case when the mouse key is released, the object will be inserted in the objects list of the *Scene TAB* and then can be repositioned, duplicated, rotated and scaled.



Once the luminaires have been inserted they will be tagged with a colored square which represents the lighting layer. To manage the layers, see the *Objects and Luminares Layers* paragraph.

Notes

If you select the object from the tree of the left-hand *Scene TAB* by clicking on the name with the mouse, the object will also be selected in the design area (the lines of the surfaces will appear green).

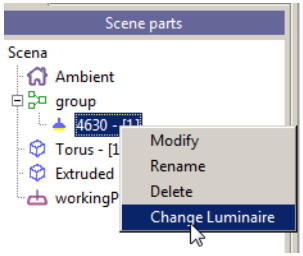
Furthermore, at the same time the properties will be visualized in the right-hand *Properties* TAB, where the object can be modified and rescaled.

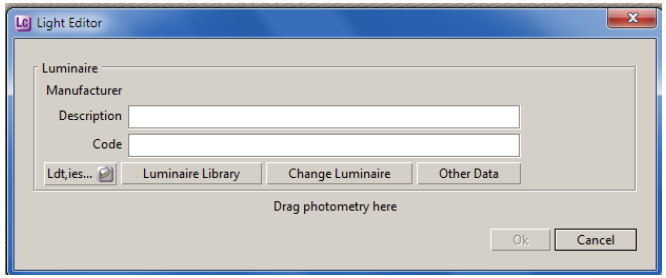
Substituting several luminaires simultaneously

To change one or more luminaires, selected using the CTRL key and left mouse button, just click with the right mouse button on the first luminaire selected and then select *Change luminaire.*

This opens a window in which to drag the new luminaire using Drag&Drop. Alternatively you can click on the following keys:

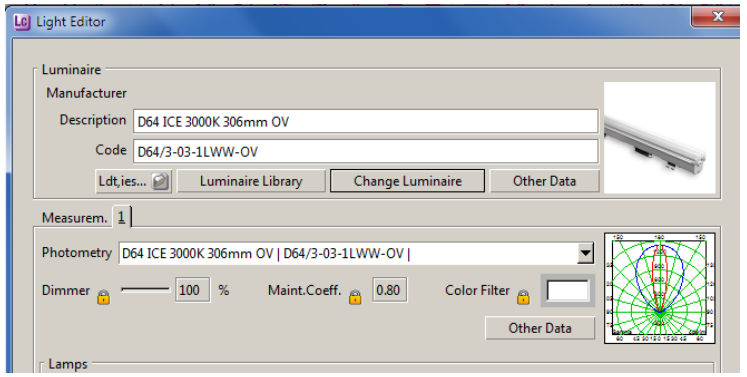
- ***Ldt, ies...*** to open an archive window, in which to look for the photometric file to drag into the program;
- ***Luminaire library*** to open the favorites archive and select the luminaire using Drag&Drop;
- ***Change luminaire*** to open the Liswin window and select the luminaire from an archive using the *Select* key.





Once the luminaire has been selected the *Light Editor* window opens, where a series of fields are marked with a closed padlock.

Open the padlock to modify the individual data. The modifications will be applied to all the selected luminaires.



Note

Luminaire and Light Filter Editor

Light Editor

The *Light Editor* window allows you to modify the luminaire properties. To access the Editor you must select the object you intend editing.

At this point the window can be opened in two ways:

- By clicking with the right mouse button on the luminaire name in the *Scene TAB* (on the left of the screen) and selecting *Modify*
- By clicking on modify in the *Properties TAB* (on the right of the screen)

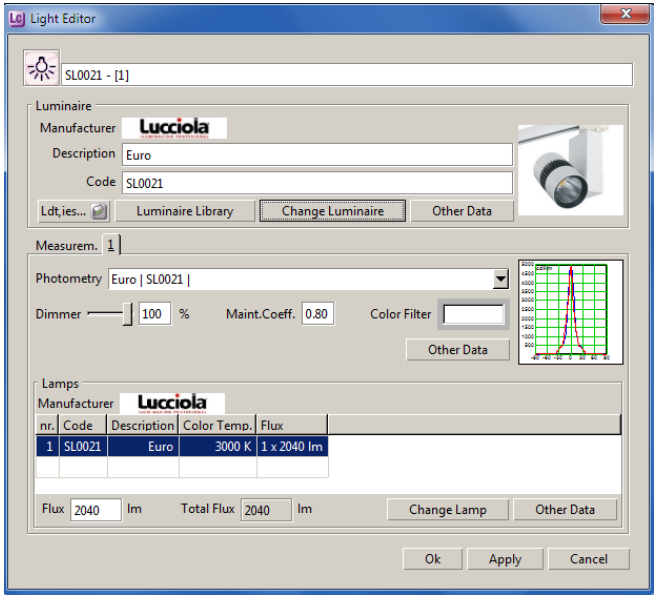
When the operation is complete, the window shown beside will open. The program gives the name by default to the luminaire inserted in the project, visualized in the *Scene TAB.* This name can however always be modified by clicking in the string on the top left and typing the new name, which will then also be shown in the *Scene TAB*.

The window contains all the information relative both to commercial data (if the product is also present in the Liswin module), and photometric data:

- The commercial data regards the manufacturer, description, code and image of the product and are not modifiable
  - The ***Change Luminaire*** key allows you to open the Liswin module to change the luminaire. Once the luminaire list has been visualized and the new luminaire has been selected with a mouse click, just

Click on the icon to insert the luminaire in the place of the previous one

  - The ***Luminaire library*** key opens the favorites file to select the luminaire using Drag&Drop;
  - The ***Ldt, ies...*** key opens an archive window, where you can look for the photometric file to drag into the program.



- The photometric data include the polar graph of the photometry and certain other editable data relative to:
  - ***Dimmer:*** this allows you to vary the intensity of light between 0 and 100
  - ***Maint.Coeff.:*** with a value between 0 and 1, it corresponds to the maintenance coefficient, the default value is 0.85
  - ***Color Filter:*** allows the color of emitted light to be modified. Select it to open the standard color window, which will depend on the version of Windows, in which to choose the color filter to apply to the lamp

Notes

The object to be edited can be selected either by clicking on the name in the *Scene TAB*, or directly in the design area by clicking with the left mouse button on the 3D element.

In both cases the name will be highlighted in blue and the object in the drawing will have green contours.

The ***Other data*** key in the part of the window relating to commercial data accesses the Liswin module while that in the part relative to photometric data accesses the Photoview module, where the graphs relative to the photometry can be viewed.

Also in this case it is possible to change a luminaire using the Drag & Drop function, dragging the photometric file into the window.

When the *color filter* is selected, calculation is performed taking into account the spectrometric nature of light and the relative rendering will take into account the interaction of the color of the light with the color of the objects.

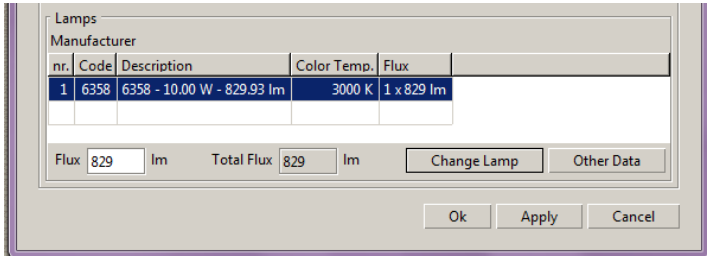
Luminaire and Color Filter Editor

Change lamp

In the case of luminaires selected from Liswin, in the list, situated at the bottom of the window, the lamps connected to the luminaire will appear with the relative flux, inserted in the ***Flux*** box.

The program allows you to change the lamp associated with the luminaire, or to associate a new one in the following way:

- Select the lamp, shown in the table, with a mouse click
- Click on ***Change lamp***, accessing the Liswin module in the lamps section
- Select the desired lamp from the list, with a mouse click



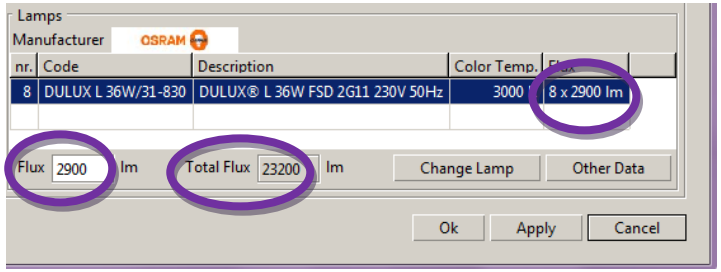
Select

Click on the icon to attach the new lamp, closing the Liswin window and returning to the Editor window.

When these operations are completed, the lamp will appear in the Editor in place of the previous one.

If, instead, you want to change not the lamp but only the luminous flux, the desired value can be inserted directly in the ***Flux*** field independently of lamp selection.

In this way the description of the attached lamp will not be modified but only the reference flux for calculation will.



Notes

The flux expressed in lumen represents fundamental data for performing lighting engineering calculation, without which verification is impossible.

The *Total flux* box shows the flux emitted by the luminaire. This means that, with traditional sources, if two lamps are associated with a luminaire, the *Total Flux* box will show the flux shown in the *Flux* box, multiplied by two.

In this case, when modifying the flux by hand, care must be taken to calculate the exact number of lamps connected.

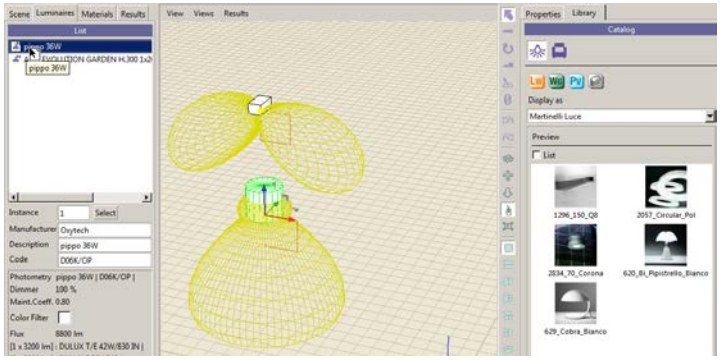
Creating a list of favorite luminaires

From the right-hand *Library* TAB, select the favorite luminaires icon to view the list of luminaires most used by the user.

To be able to add a luminaire to a personal list you first need to insert it in the project.

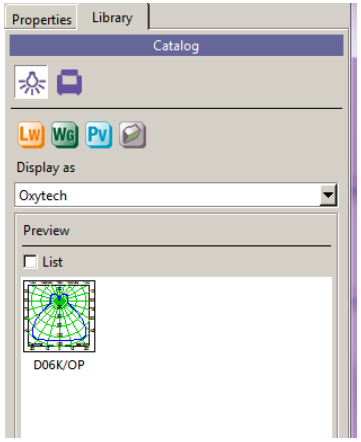
At this point, select it in the *Luminaires* TAB on the left of the screen to be able to drag it into the list.

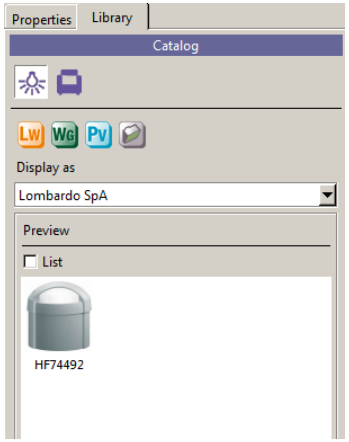
The luminaire will be visualized in a new archive, which will be named according to the *Manufacturer* text in the photometric file (which can be visualized and modified con Photoview).



To cancel a product from the lists you must select it and click on the *Canc* key.

If there was only one product in the list, at the next program start-up the name will be eliminated from the list itself.



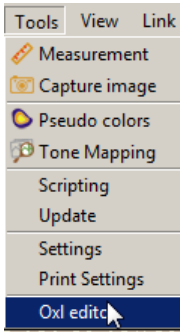


Notes

In the case of an eulumdat file the image shown as luminaire identification will have to be the photometric curve.

Instead in the case of an ,oxl file created with Liswin to which a photo has also been attached, the first image linked will be shown.

Linking an .OXL file to the 3D model of the luminaire



The .OXL file as described in the chapter *Data structure and updating* represents the file in which all the data related to a luminaire are inserted. In this file it is possible to directly connect the .OBJ or .3DS model of the luminaire itself.

To do this first select the *OXL Editor* from the *Instruments* menu.

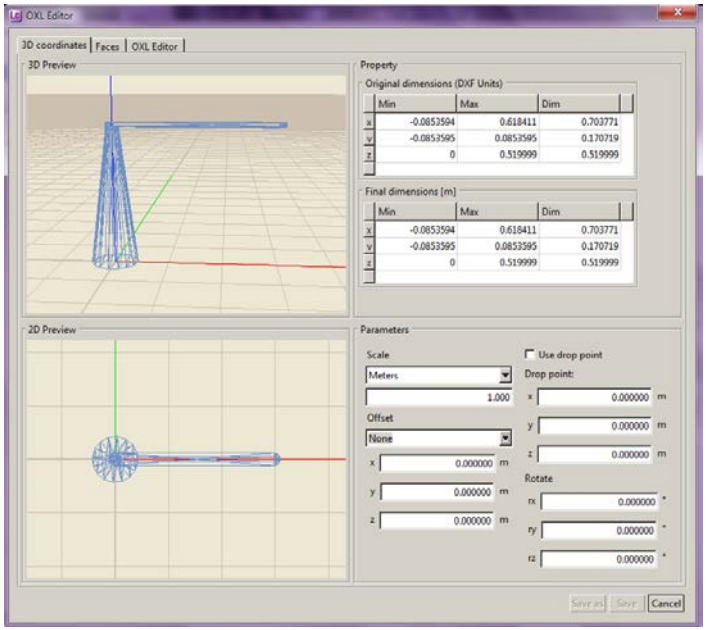
At this point a window with three TABs opens:

- ***3D Coordinates***: with which to define the coordinates and dimensions of the model
- ***Faces***: with which to correctly position the faces of the 3D model
- ***OXL Editor***: with which to link the l'OXL to the 3D model.

3D Coordinates

In this TAB it is possible to set:

- The scale of the original design (remember that the designs must be created in meters for the program to manage them correctly),to rescale the design if not in meters
- The axes starting point for inserting the file (Offset):
  - None: to position the model as it is
  - Bottom left: to position the left corner of the model at the axes starting point
  - Centred X-Y axes: to center the model at the axes intersection
  - Customized: set directly by the user.
- The rotation to be applied to the model on the X, Y, Z axes.



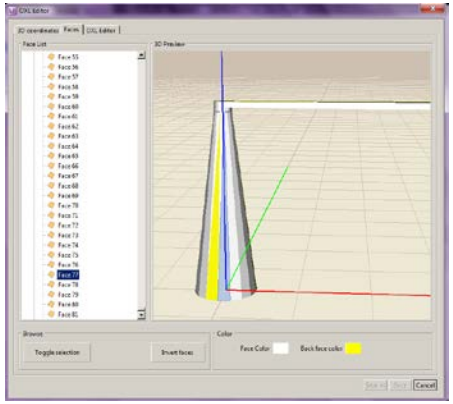
Note

Linking an .OXL file to the 3D model of the luminaire

Faces

In the *Faces* Tab it is possible to check the correct positioning of the model faces.

When they are marked in white it means that the positioning is correct, while if they are marked in yellow it means that the versors are positioned in the opposite direction to that of observation. In this case you will need to select the incorrect faces (either from the list or by directly clicking on the model face) and click on the *Invert faces* key, to change the position direction.



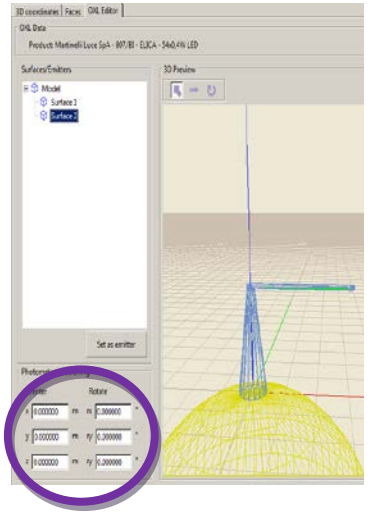
OXL Editor

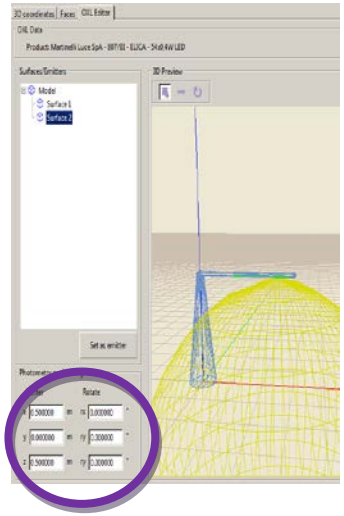
This allows the model edited in the previous TABs to be linked to the actual luminaire photometry.

Once the .OXL file has been imported using Drag&Drop, in this section you can move and rotate the photometry, using the Cartesian coordinates on the bottom left. In some cases movement is necessary to correctly position the luminous center of the photometry, in the central point of the luminaire luminous area.

A correct model should separate the surfaces of the luminous area from the others. In this way by selecting these surfaces from the list on the top left and clicking on *Set as emitter*, it will be possible to "color" these surfaces white to simulate the illuminated parts.

Once these operations have been performed click on *Save* or *Save with Name* and the .OXL file will be overwritten on the previous one or saved with a new name.





Notes

The selected faces will be highlighted with blue meshing in the model.

Wizard for interiors/exteriors

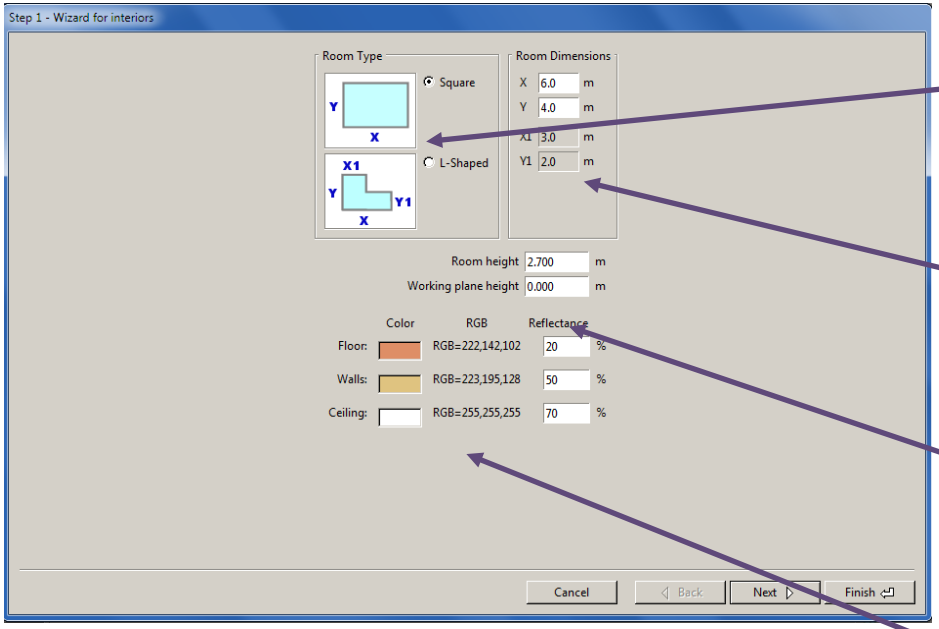
By means of this function you can insert a project step by step, setting the area parameters (which may be rectangular or L-shaped), selecting a luminaire, entering the installation type data (rows and columns), or the average illuminance value to be attained (total flux calculation).

This procedure can be applied both to interior and to exterior projects.

To access the window, you must select ***Wizard for interiors and exteriors*** from the *Create* menu.

Or click on the interiors icon in the *Create* icon bar

Or on the exteriors icon



Selection of room type (rectangular or L-shaped)

Room dimensions

Room and working plane height

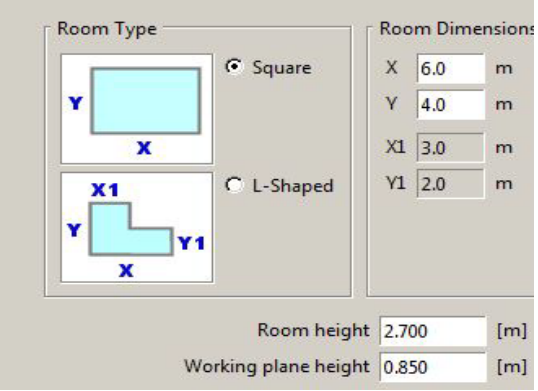
Room reflectance parameters

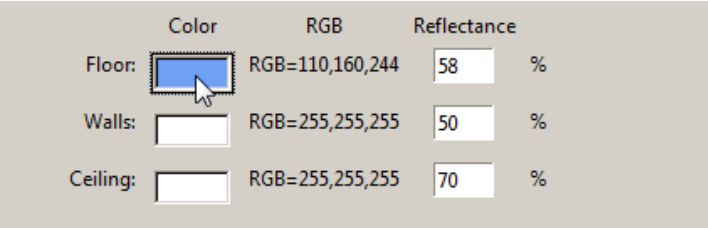
Notes

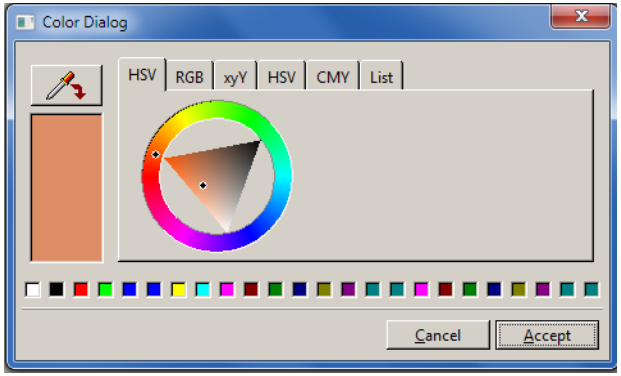
If the wizard for exteriors is selected it will not be possible to set the area height and wall and ceiling characteristics.

Wizard for interiors/exteriors

Setting the room parameters







After opening the window, you must:

- select the room/area type, by clicking on the relative box, choosing between:
  - Rectangular (dimensionsX,Y)
  - L-shaped (dimensions X, X1, Y, Y1)
- set the dimensions of the selected room by typing in the values inside the relative boxes on the right of the window (if an L-shaped room is chosen, the fields relating to X1 and Y1 will also be activated);
- set the value of the room height (only for interiors) and that of the working plane.

Subsequently the parameters relating to the characteristics of the area surfaces will need to be set:

- by clicking with the left mouse button inside the colored box relating to the floor (walls and ceiling). In this way the windows dialog window for surface color selection will open. After selecting the color, press the *Accept* key and the program will also automatically update the reflectance factor which will still be modifiable at any time;
- by typing in the desired coefficient in the *Reflectance* box, relative to the surface to be modified, if you do not wish to change the color, but only the reflectance coefficient.

Once data entry is complete, click on the key:

- ***Terminate*** to display the room inside the design area;
- ***Cancel*** to interrupt the operation
- ***Next*** to move to the luminaire entry window (for a more detailed explanation regarding luminaire entry see the *Insert luminaires in groups* chapter).

Notes

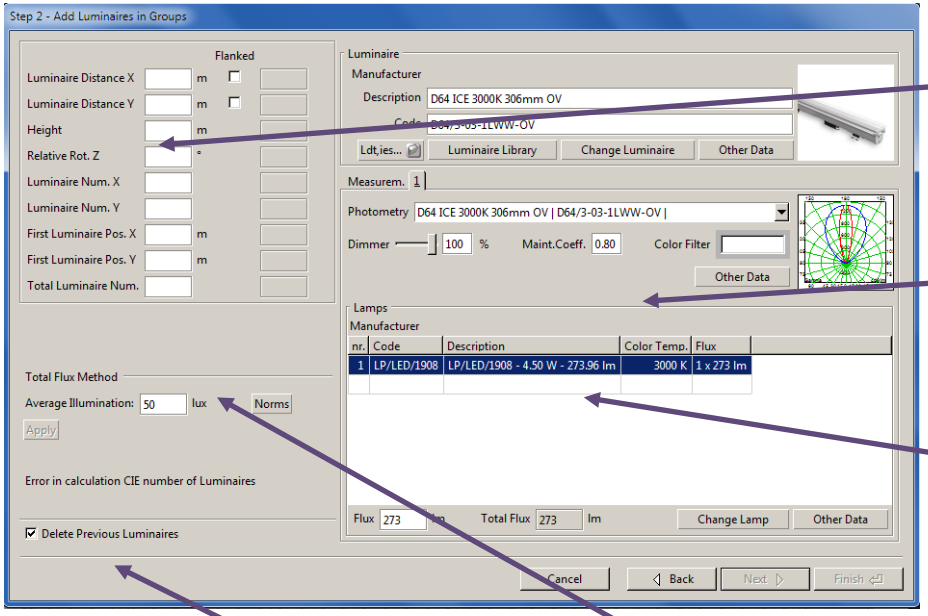
Inserting luminaire groups

A fast way of inserting luminaires is the *Add luminaires in groups* window. Using this window luminaires can be added automatically whether by setting an illuminance value, or by typing the installation data, interdistance, height, etc. as long as these are regular. In the first case the luminaires will be automatically added to the environment and the software will set the installation data (interdistance) in relation to the number of luminaires calculated.

In the second instead the luminaires will be set out by row and column in the environment, according to the parameters set in the table.

The window can be accessed directly from the Wizard for interiors or exteriors window. Alternatively, to access the window select ***Add luminaires in groups*** from the *Create* menu

Or click on the icon in the *Create* icon bar



Inserting luminaires by row and column

Luminaire summary data

Lamp summary data

Flag to delete luminaires present in the project

Luminaire insertion with the total flux method

Notes

In order to use the window it is first necessary to have created a reference environment for calculation, unless you access the entry window using the wizard procedure (for a more detailed explanation see the *Wizard for interiors/exteriors* chapter).

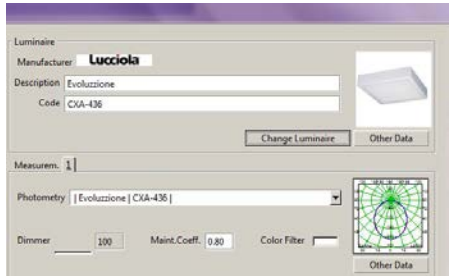
The Delete previous luminaires flag allows you to delete the luminaires previously inserted in the project. If you remove the flag the luminaires will not be deleted and will contribute towards the calculation.

Inserting luminaires in groups

To carry out the calculation a reference luminaire must be selected by pressing:

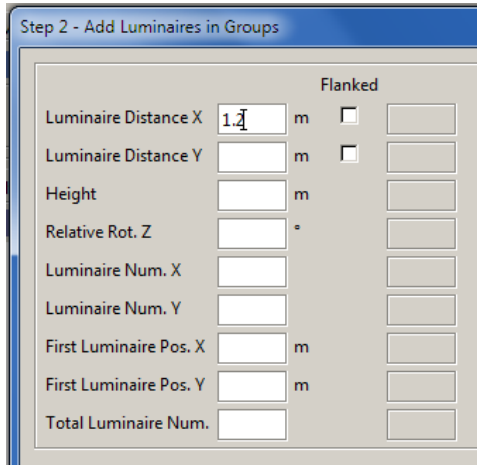
- The ***Luminaire library*** key to open the favorites archive in which to select the luminaire using Drag&Drop;
- The ***Ldt, ies...*** key to open a file window, in which to look for the photometric file to be dragged into the program.
- The ***Change Luminaire*** key to access the Liswin module in which to select the luminaire, as explained in the Light Editor and Change lamp paragraph

When luminaire selection is complete the type of insertion can be selected (by row and column or with the total flux method).



Add luminaires by rows and columns

This function allows you to add the luminaires to the environment regularly by row and column, by completing the table:



- ***Luminaire Distance X-Y*** [m]: this is the interdistance between two consecutive luminaires in the same row, both along the X and the Y axis
- ***Height*** [m]: this is the height at which the luminaires are positioned, measured from the floor to the luminous center of the luminaires
- ***Relative Rotation Z*** [°]: this is the rotation of all the luminaires around their own vertical axis passing through the luminous center
- ***Number of Luminaires X-Y***: this is the number of luminaires along the X and Y axis
- ***Position of First Luminaire X-Y*** [m]: this is the postion of the first luminaire with respect to the order of the axes
- ***Total Number of Luminaires***: this is the total number of luminaires to be inserted

The data must be inserted in the left-hand column (with the white background fields) while in the right-hand column the program reproduces them calculating and completing the remainder should those inserted be insufficient.

Should they be insufficient an error message is shown on the right (*Insufficient Data*). If instead the data inserted is incompatible the program shows on the right the message *Incompatible Data*. This occurs when, for example, the number of luminaires defined along X and Y are 2x2 whereas in the box the number of luminaires has been set at 6.

In the central part, between the two columns is the *Flanked* column with two boxes in correspondence with the two possible distances between the luminaires (X and Y): if one of the two boxes is flagged the luminaires will be flanked in a continuous row in the environment.

Press the *Ok* key to position the luminaires in the environment so as to be able to carry out calculation (Calculations Chapter).

Notes

it is however always possible to import a luminaire using the Drag&Drop function from the other program modules or from an external folder, dragging the reference file into the window.

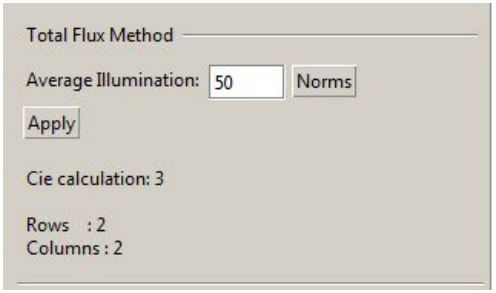
The *Other data* key allows access to the Photoview module to view photometric data or Liswin to view catalog data (if the luminaire is entered in an archive).

Should the area under examination have irregular geometry and one or more luminaires appear to be outside the area, the program will automatically delete them.

Inserting luminaires in groups

Total flux method

This function allows you to determine the number of luminaires to be inserted in the environment, given the average illuminance value to be obtained on the working plane and to position them automatically and regularly by rows and by columns.



- ***Average illuminance***: this is the illuminance you want to achieve on the working plane inside the area

The *Norms* key allows access to WebOxy where comments on the reference norms can be found, from which to establish the illuminance values for the individual areas.

Pressing the *Apply* key, the program shows, at the bottom, the theoretical number of luminaires required for calculation and the relative positioning by rows and columns.

If the calculated number of luminaires should not be divisible in a regular way by rows and columns, the program will automatically add or delete luminaires to make the configuration regular.

By flagging *Delete Previous Luminaires*, the luminaires present in the area will be automatically deleted.

Once data insertion is complete, press the *Ok* key to position the luminaires in the area, so as to be able to perform calculation (Calculations Chapter).

Simplified calculation is carried out according to the algorithm described in CIE 52 Recommendations (Total Flux) and therefore takes no shadows or furniture into consideration and is only valid in the following conditions:

- in parallelepiped rooms
- in the case of not highly concentrating luminaires
- when the area surfaces, particularly the floor, do not have a reflectance value greater than 75%

Applying this method outside the foreseen limits, although possible, may result in serious errors in the calculation of results.

It is therefore advisable to use this calculation in the initial project phases, given its high speed, but it cannot be considered the only verification.

Notes

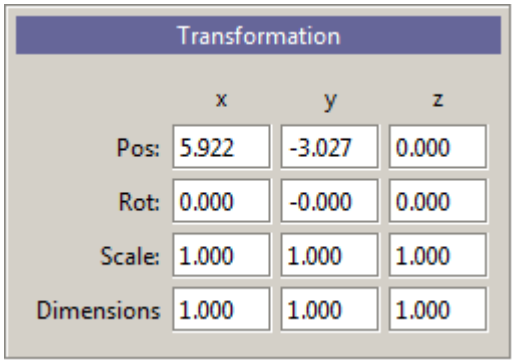
The luminaire number calculation is performed in the parallelepiped (bounding box) that contains it; it can therefore happen that, in irregular areas, some luminaires may appear outside the area: in this case the program will proceed to delete them automatically.

Transformations

Move

There are two ways of moving an object (furniture or luminaire):

- By manually editing the new position (Pos) on the X, Y and Z absolutes in the properties TAB

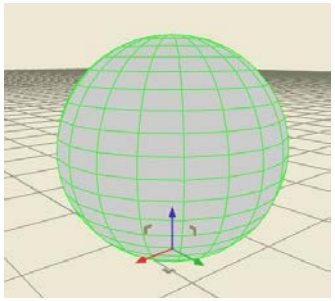


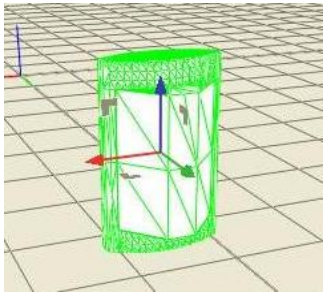
- By means of the *Move* icon:
  - Positioned on the vertical bar on the right of the design area
  - In the *Modify* menu

Once the command has been selected, a triplet of Cartesian axes will appear on the object with an arrow on the ends and three “pointers” on the planes of pertinence of two axes.

In this way two operations will be possible:

- By clicking on one of the Cartesian axes (blue, green, red) and dragging it, the object will be moved in the direction indicated by the axis itself
- By clicking on the pointer positioned between two axes and dragging it, the object will be moved in the two directions indicated while keeping the third fixed





Notes

Each object is associated to its triplet of intrinsic Cartesian axes x’ (red), y’ (green) e z’ (blue), on which to effect the transformations

The command can also be selected using the keyboard by pressing the W (move) key

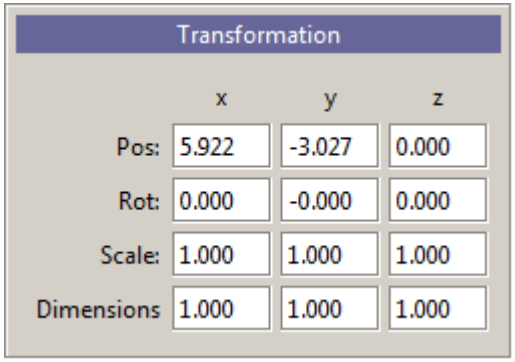
In order to activate the command, the object must first be selected.

Transformations

Rotate

There are two ways of rotating an object (furniture or luminaire):

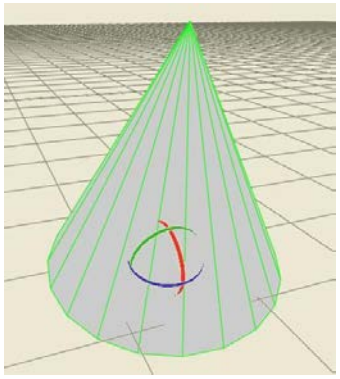
- By manually editing the final rotation (Rot) in the properties TAB

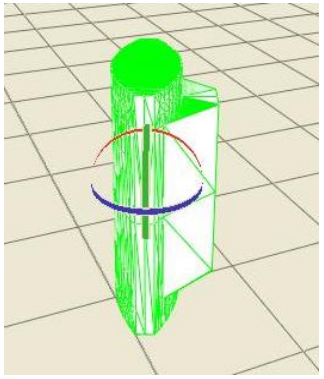


- Using the *Rotate* icon:
  - positioned on the vertical bar on the right of the design area
  - In the *Modify* menu

Once the command has been selected, a triplet of Cartesian axes will appear on the object in the form of an arch in the direction of rotation:

- By clicking on one of the axes (blue, green, red) and dragging it, the object will be rotated in the direction indicated by the axis itself





Notes

Each object is associated to its triplet of intrinsic Cartesian axes x' (red), y' (green) e z' (blue), on which to effect the transformations

The command can also be selected using the keyboard by pressing the W (move) key

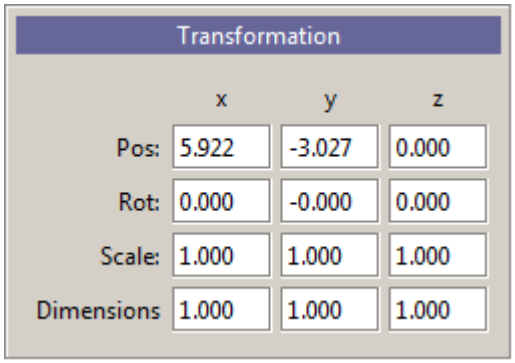
In order to activate the command, the object must first be selected.

Transformations

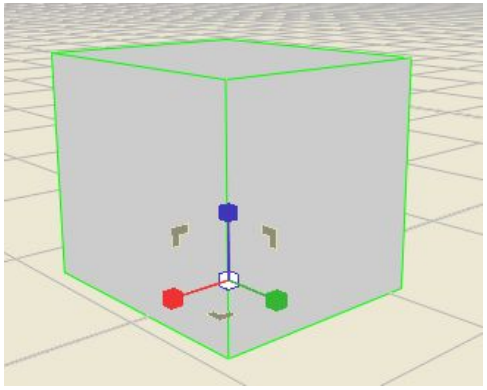
Scale

There are two ways of scaling an object (furniture or luminaire):

- By manually editing the scale factors (Scale) in the properties TAB



- Using the *Scale* icon:
  - positioned on the vertical bar on the right of the design area
  - In the *Modify* menu



Once the command has been selected, a triplet of Cartesian axes will appear on the object with a cube on the ends and three pointers on the planes of pertinence of two axes.

In this way two operations will be possible:

- By clicking on one of the Cartesian axes (blue, green, red) and dragging it, the object will be scaled in the direction indicated by the axis itself
- By clicking on the pointer positioned between two axes and dragging it, the object will be scaled in the two directions indicated keeping the third fixed

Notes

Each object is associated to its triplet of intrinsic Cartesian axes x' (red), y' (green) e z' (blue), on which to effect the transformations.

The command can also be selected using the keyboard by pressing the W (move) key

In order to activate the command, the object must first be selected.

Transformations

Aim

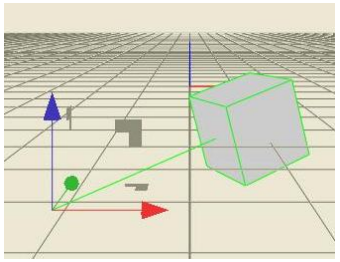
To orient an object (furniture or luminaire) it is necessary to

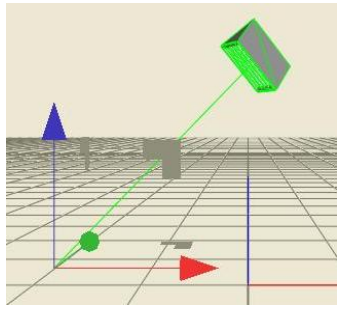
- Select the *Aim* icon positioned:
  - on the vertical bar on the left of the design area
  - in the *Modify* menu

Once the command has been selected, a triplet of Cartesian axes will appear with an arrow on the ends and three “pointers” on the planes of pertinence of two axes. The origin of the axes is positioned on the point “of arrival” of the aiming.

Two operations are thus possible:

- By clicking on one of the Cartesian axes (blue, green, red) and dragging it, the object will be oriented in the direction indicated by the axis itself
- By clicking on the pointer positioned between two axes and dragging it, the object will be oriented in the two directions indicated keeping the third fixed



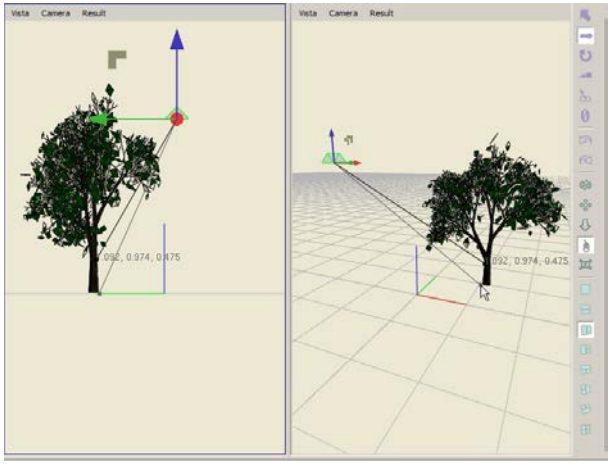


Another way of orienting is to select the ***Capture Aiming*** command from the *Modify* menu.

This command allows you to capture an object and orient it aiming its axis towards a destination. It allows for example a luminaire to be aimed towards an object.

To carry out the operation you must:

- Click with the mouse on the object to be aimed so as to “capture it”
- Click on the destination surface to orient it. When you click on the destination surface, a triplet of values appears near the mouse, indicating the position of the final point
- Press Enter to confirm the position



Notes

Each object is associated to its triplet of intrinsic Cartesian axes x’ (red), y’ (green) e z’ (blue), on which to effect the transformations.

The command can be selected also using the keyboard by pressing the T (aim) key.

In order to activate the command the object must first be selected.

Object Duplication

There are several ways of duplicating an object (luminaire, furniture or working plane) in the drawing:

Duplicate

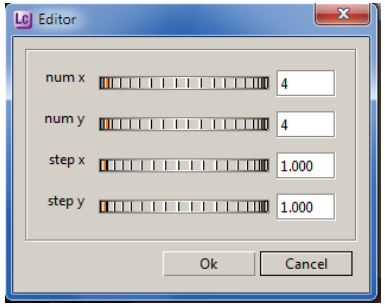
By clicking on the icon (or selecting the command from the *Edit* menu) the selected object will be copied on top of itself and it will be possible to move it using the *Move* command.

Grid position

By clicking on the icon (or selecting the command from the *Create* menu) the selected object will be duplicated according to a grid, where the total number of objects on the X and Y axes and their inter-distance will have to be set.

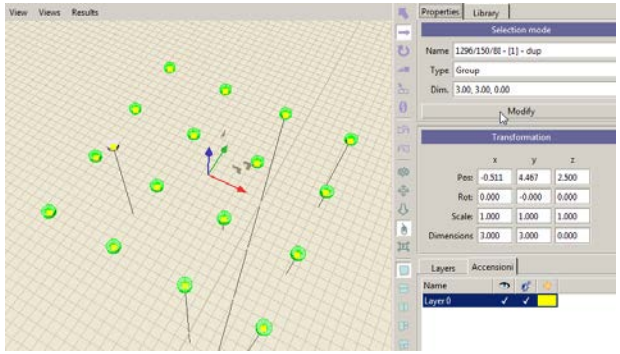
The parameters in the table represent:

- *Num x*: the number of objects on the x axis
- *Num y*: the number of objects on the y axis
- *Step x*: the distance between one object and the next on the x axis
- *Step y*: the distance between one object and the next on the y axis



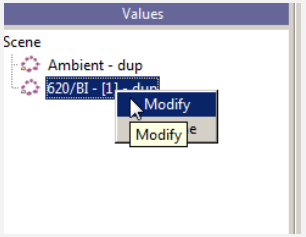
The parameters can also be modified by clicking on the wheel and rolling the cursor.

Once duplication is complete, on the *Scene TAB* the new group will appear in the list, which it will then be possible to modify, as a group, selecting the name in the list, or as single objects, selecting the object to be modified directly in the drawing and clicking on *Modify* in the *Properties* TAB.



Notes

By selecting with the right mouse button the duplication request and clicking on *Modify*, the duplication mask will be re-opened allowing you to modify the duplication data of the inserted objects.



Object Duplication

Position in circle

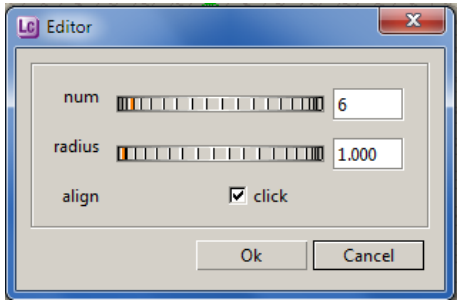
By clicking on the icon (or selecting the command from the *Create* menu) the selected object will be duplicated according to a grid, where the total number of objects and the duplication radius must be set.

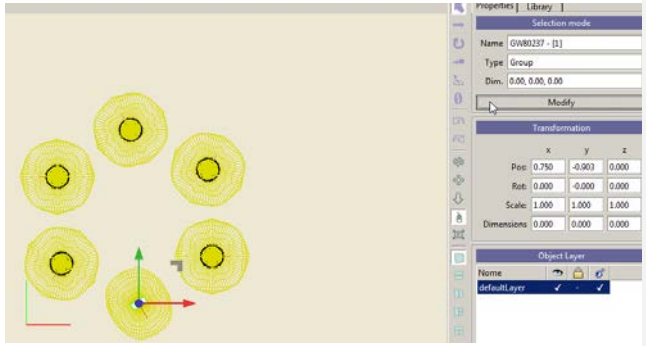
The parameters in the table represent:

- *Num*: total number of objects
- *Align*: align to center
- *Radius*: duplication radius

The parameters can also be modified by clicking on the wheel and rolling the cursor.

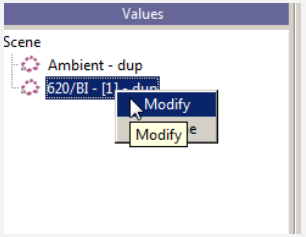
Once duplication is complete, on the *Scene TAB* the new group will appear in the list, which it will then be possible to modify, as a group, selecting the name in the list, or as single objects, selecting the object to be modified directly in the and clicking on *Modify* in the *Properties* TAB.





Notes

By selecting with the right mouse button the duplication request and clicking on *Modify*, the duplication mask will be re-opened allowing you to modify the duplication data of the inserted objects.



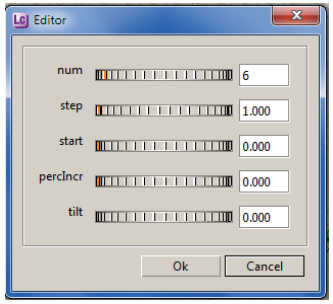
Object Duplication

Position in line

By clicking on the icon (or selecting the command from the *Create* menu) the selected object will be duplicated according to a grid, where the total number of objects on the X and Y axes and their inter-distance will have to be set.

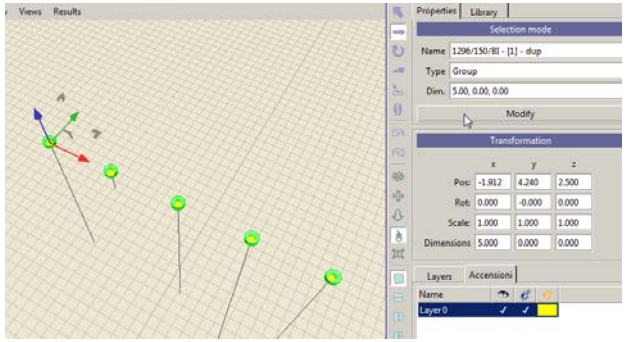
The parameters of the table represent:

- *Num*: total number of objects
- *Step*: distance between one object and the other
- *Start:* distance of the line starting point from the Cartesian axes
- *Tilt*: tilt of the luminaires on the X axis



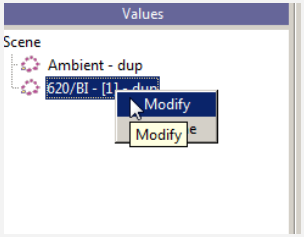
The parameters can also be modified by clicking on the wheel and rolling the cursor.

Once duplication is complete, on the *Scene TAB* the new group will appear in the list, which it will then be possible to modify, as a group, selecting the name in the list, or as single objects, selecting the object to be modified directly in the drawing and clicking on *Modify* in the *Properties* TAB.



Notes

By selecting with the right mouse button the duplication request and clicking on *Modify*, the duplication mask will be re-opened allowing you to modify the duplication data of the inserted objects.



Calculation of natural light

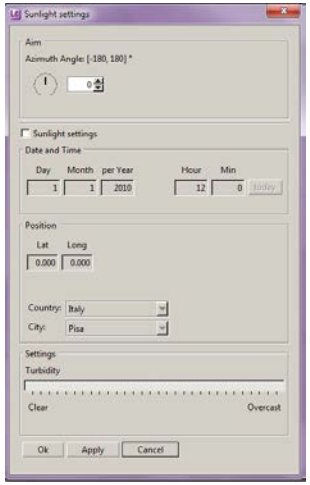
Orient North

The calculation of natural light supplies the parameters necessary for evaluating the contribution of the sun, in terms of illuminance, inside the areas under examination.

To have an accurate analysis, it is necessary first to define the orientation of North with respect to the environment and especially to set the position of the sun throughout the day.

To access the ***Sun & sky settings*** window, select:

- The *Orient North* icon positioned:
  - In the icon bar in *Calculations*
  - In the *Calculations* menu
- Alternatively it is possible to access the calculations window by selecting ***Sun & sky settings***



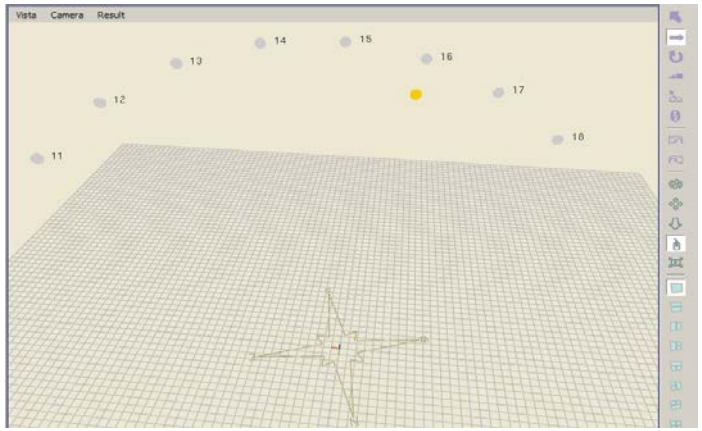
The parameters to be set in the table are:

- ***Orientation*****:** this is the parameter that identifies North, by means of angle settings
- ***Sunlight Settings:*** this activates the setting of the day and time at which calculation is desired, and allows terrestrial coordinates to be defined. Here the Latitude and Longitude positions can be inserted directly, or the preset values can be selected from Nation and City
- ***Turbidity*****:** this allows the setting of the clearness of the sky, from clear to cloudy

When the values have been set in the table, click on OK and the compass rose will appear with orientation North inside the design area.

The sun will also be shown (yellow sphere) positioned in the set hour.

At this point it will be possible to calculate with only the contribution of natural light, without inserting lighting devices, or to complete the project and verify the levels of illuminance with the contribution of both.



Notes

Leaving 0° as the value in the orientation box, North will be oriented upwards (Y axis), looking at the plan view drawing.

For positive angle values, North will rotate in an anticlockwise direction, for negative values it will rotate clockwise.

Insertion of a sensor

The “sensor” simulates a genuine illuminance sensor placed inside an environment and can be associated to a number of lighting devices, so as to check the variations in the quantity of light emitted in specific areas.

To access the ***Sensor Editor*** window it is first necessary to insert an sensor in the environment using:

The *Sensor* icon positioned:

- in the *Create* icon bar
- in the *Create* menu

At this point to edit the sensor you must:

- Select the sensor in the *Scene TAB* on the left of the design area and select *Edit*
- Click on *Modify* in the *Properties TAB* on the right of the design area

The first window ***Controlled lights*** allows a number of lighting devices to be associated to the sensor, so as to realize a dynamic control system.

Association is performed by keeping the sensor properties window open and, after selecting the luminaires (from the list on the left in the *Scene TAB* or directly in the drawing), by pressing the ***Add*** key:

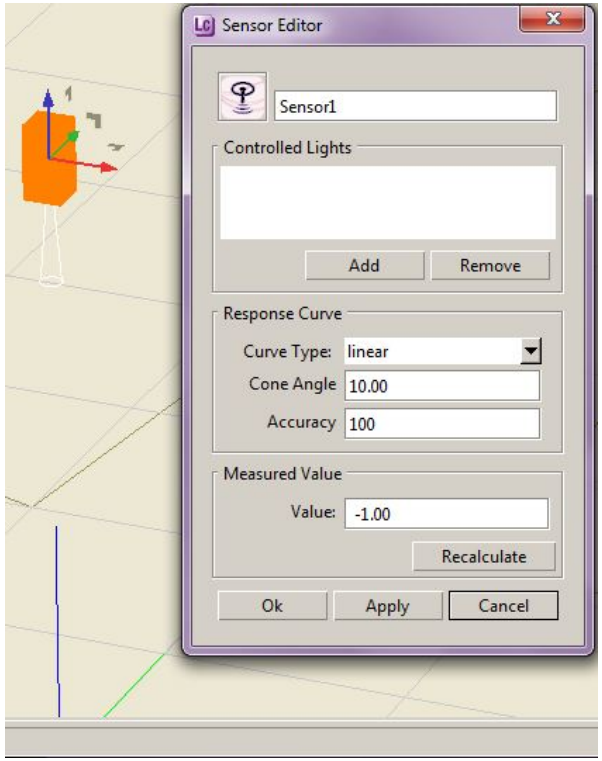
The ***Remove*** key deletes the selected luminaires from the list.

The ***Curve of response*** box allows the setting of data relating to the sensitivity of the sensor, such as:

- *Curve Type* peculiar to the sensor
- *Cone Angle* that therefore identifies the area of reception of the sensor
- *Accuracy* that is the precision with which the sensor reads the illuminance

The ***Measured value*** box shows the average value read by the sensor in the *Value* box.

The position of the Sensor can be moved in the drawing and therefore the value of illuminance in that point can be read by pressing the ***Recalculate*** key.



Notes

Since to all effects the sensor is an object, its dimensions and position in the environment are controlled with the keys of object *Transformation* or in the *Properties* TAB window.

If the *Value* box shows the value -1 it indicates a value outside the sensitivity range of the instrument.

Calculations

Calculation Setup

After completing insertion of the elements that go towards realizing the lighting engineering verification, calculation can be started by means of:

The icon *Start Calculations* positioned:

- in the Calculations icon bar
- in the Calculations menu

When the ***Calculation Setup*** window is opened, calculation of the illuminances is set by default.

In *Mode definition* two different types of calculations can be set:

- ***Direct component*:** calculation of only direct illumination
- ***Direct + Indirect component*:** complete calculation of reflectances

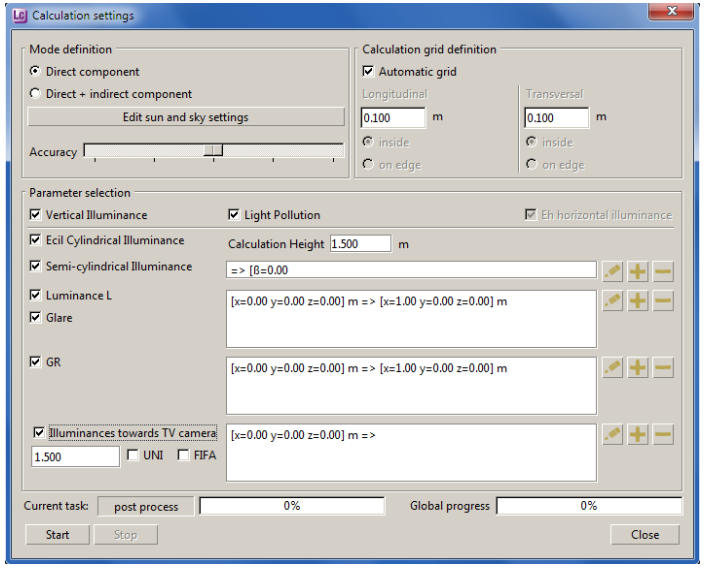
The program automatically configures a results visualization grid. Removing the flag from ***Automatic grid***, it is however possible to configure a customized grid in longitudinal and transversal directions.

In this way it is also possible to decide how to position the grid in the space:

- ***inside*:** in which the first point of the grid is positioned in the center of the surface
- ***on edge*:** in which the first point of the grid is positioned on the edge of the surface

By pressing the ***Start*** key, calculations start up, showing the progress in a percentage in the *Calculation Progress* bar.

On conclusion press the ***Done*** key to close the window.



Notes

To select the calculations you wish to carry out you must flag the box according to the type of calculation desired.

The keys on the right allow management of the observers in those calculations that require them and represent:

Edit the observers inserted to modify the data

Add an observer

Edit the observers inserted to modify the data

When a new observer has been inserted, the coordinates will appear in the central part of the window.

According to the type of calculation, the modifiable fields will be activated in the observer definition window.

Calculations

Inserting an observer

Setting observers allows you to carry out those calculations in which the position and direction of vision occupy a fundamental role, such as for example luminance calculation of non Lambertian surfaces or UGR calculation of interior areas.

Press the icon to add an observer.

The icon is situated on the right of each type of calculation in which an observer may be added

The setup window is made up of three distinct sections:

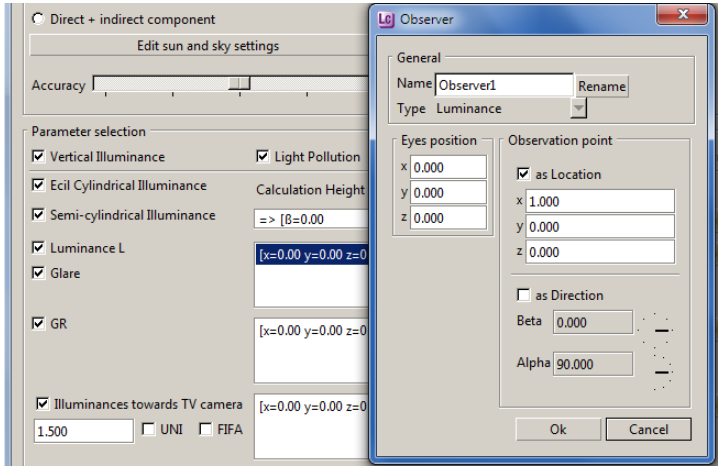
- ***General***, which indicates:
  - the observer name, modifiable using the *Rename* key
  - the type of calculation (Luminance, Glare, etc.)
- ***Eyes position***: which indicates the position of the observer in Cartesian coordinates
- ***Observation point***: which indicates the direction of observation, that is the point towards which the observer is looking

To define the direction, one of the two following parameters must be set by flagging the box to the side of the string:

- ***By Place***: where to insert the x,y,z Cartesian coordinates of vision. More simply we could say they represent the coordinates of the point towards which the observer is looking
- ***By Direction***: where to insert a horizontal (Beta) and a vertical (Alpha) angle of vision. In this case the point of observation is calculated by setting two angles, where x and y are represented by the horizontal angle (Beta) and z by the vertical angle (Alpha)

To add a new observer, firstly the calculation to be effected must be selected by flagging the appropriate box.

Secondly, click on the relative icon, thus opening the setting window:



Notes

For a more detailed explanation of observer settings for each individual calculation see the chapter List of available calculations.

On the operative level, firstly the observer's **eyes position** must be set, obtaining it graphically from the drawing, in relation to the X, Y and Z absolute reference coordinates of the design.

Secondly the **observation point** must be sent using the Cartesian coordinates (for Place) and angles (for Direction). In both cases to define the correct coordinates reference must be made to the absolute Cartesian axes.

In the first case, the calculation planes are all in the direction of the observer, in the second the planes in the various points are all oriented in the same way according to the β (on the horizontal plane) and α angles (tilt angle): this means that the directions of observation are all parallel to each other (infinity observer).

Calculations

List of available calculations

The program allows different types of calculation to be performed such as:

- ***Sun and sky settings***: this allows you to calculate the contribution of natural light (for a more detailed explanation see the chapter: Calculating natural light)
- ***Illuminance [lux]*:** on all surfaces
- ***Vertical illuminance [lux]***: these illuminances are calculated in the 4 directions +X, -X, +Y and -Y parallel to the Cartesian axes on vertical planes situated in the points of the calculation grid at the height of the working plane
- ***Light pollution***: this allows you to verify the percentage of quantity of light, in exterior installations, that is lost in the sky
- ***Cylindrical illuminance [lux]*:** these illuminances are calculated on the cylinder situated in each of the calculation grid points at the defined height. These illuminances do not correspond, as may be thought, to the average of the 4 vertical illuminances in the 4 directions but are proportional to them for less than a factor of 2/π
- ***Semi-cylindrical illuminance [lux]:*** these illuminances are calculated on the semi-cylinder situated in each of the calculation grid points at the defined height: by selecting the calculation, the height will be automatically visualized in the cylindrical illuminance box (1.5m), where it can be modified. The semi-cylindrical illuminance is dependent on the position of the observer and consequently, when it is selected, clicking on the **+** key opens the observer settings window. Here you can define, alternatively, either the position of the observer (in this case the illuminances are calculated in the direction of the latter) or the direction defined by means of the β [°] angle, deviation angle (in this case the illuminances in the various points are all parallel to each other according to the direction defined). The rotations origin axis for evaluating the angle is the X positive axis
- ***Luminance [cd/m$_2$]***: Calculation of the luminance is dependent on the type of reflection defined for the surface whether diffuse reflection or Lambertian luminance (for the surface only one reflection factor has been defined) or real (a table of reduced reflection factors is defined for the surface depending on the angle of observation and the incidence of the luminous ray: these tables are used in the design of road lighting installations). Definition of the position and direction of observation makes sense in the calculation of the luminances of road surfaces or non Lambertian surfaces. In the other cases calculation of the luminance is independent of the observer's position

Notes

Luminance Calculation

Calculation of the luminances in road installations in accordance with the norms is always effected with the observer situated at the fixed height of 1.5 m.

Calculation Times

It is difficult to define a precise calculation time since it depends on a series of factors, among which:

- the number of surfaces making up the environment
- the number of luminaires inserted
- the number of pieces of furniture and their surfaces
- whether or not evaluation is made of the shadows created both by possible recesses in the walls and by the inserted furniture

Calculations

- ***Glare:*** activating luminance calculation, it is also possible to activate that of glare types which, depending on the kinds of installation, are:
  - Interiors: the program carries out calculation of glare evaluation parameters such as UGR (Unified Glare Rating), VCP (Visual Comfort Probability) and CGI (in accordance with CIE Recommendations 55). The program allows the insertion of more than one observer using the position insertion window (Cartesian coordinates x, y, z) and observation direction window (Cartesian coordinates x', y', z' or β angles, for deviation, and α for tilt). Access to the insertion window is gained by clicking on the **+** key
  - Roads: the program in this case carries out calculation of the parameters G (discomfort glare), Lv (veil luminance) and Ti (threshold increase) according to the Recommendation selected, automatically positioning the reference observers
  - General Exterior Areas: the program in this case carries out calculation of the G parameter according to the CIE Recommendations for sports areas where 19 observers are automatically defined with predefined positions and directions of observation and calculation of the GR parameter relative to the glare of floodlights in general exterior areas with the observer in any position and direction of observation
- ***TV illuminances in the direction of the camera [lux]:*** these illuminances are those in the direction of the camera or cameras, since it is possible to define more than one. When the function is selected (a √ appears beside the description) the program presents the window with which to define either the camera position coordinates (coordinates x, y, z) or the direction of observation (β [°] angles of deviation on the horizontal plane and α [°] of tilt) with the reference axis for evaluation of the β angle corresponding to the positive X axis, of the α angle corresponding to the negative Z axiso: in the first case, the calculation planes are perpendicular to the camera direction of observation – calculation point, in the second the planes in the various points are considered all directed in the same way according to the β angles (on the horizontal plane) and α (tilt angle): that is to say that the directions of observation are all parallel to each other (observer to infinity).

  Defining the calculation height in the left-hand window (default is 1.5m), illuminance calculation can be effected with:
  - The UNI norm
  - The FIFA norm

  by clicking inside the box to the side of the reference norm.

Notes

Results visualization

When the Calculation window is closed, the results summary table appears automatically.

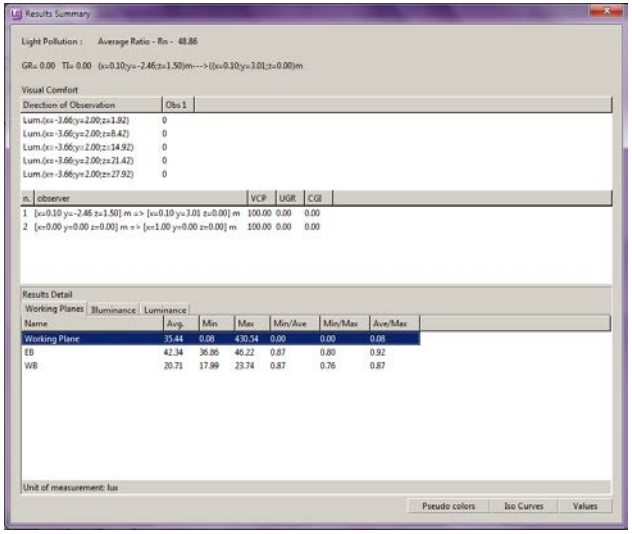
The table illustrates the list of graphs available for visualization and the parameters of visual comfort calculated.

Selecting the individual lines with the left mouse button and clicking on the key of the graph you require (pseudo colors, iso curves, values), the corresponding graph will be visualized.

The selected items will be inserted in the *Results TAB,* where they can be deleted using the CANC key.

In this way the graphs can be opened at any time with a double click of the mouse and visualized in the design area.

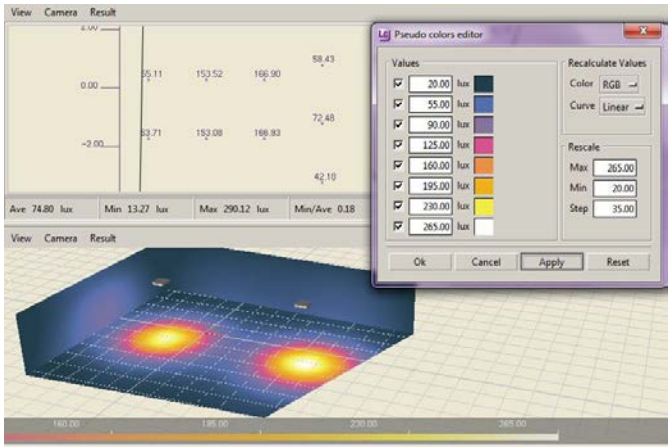
Once the summary has been closed, it will always be possible to access it using:



the *Summary* icon positioned:

- In the Results icon bar
- In the Calculations menu

Another way of visualizing the calculation results is represented by the pseudo color diagram. With this type of graph the environment can be represented three-dimensionally and a color can be associated to each level of illuminance, creating a scale of colors.



It can be accessed using the *View Pseudo Colors* icon positioned:

- in the Results icon bar
- in the Tools menu

By means of the *Capture image* icon (in the Calculations icon bar) it is possible to save the created image. This image will automatically be saved in the */ImpExp* folder.

Notes

To select a number of lines at the same time, press CTRL and the left mouse button.

When the graphs relative to the individual surfaces are opened in the design area, the uniformity ratios and reference values (minimum, medium, maximum) are also shown.

When a surface graph is visualized in the window, by entering the *Views* menu in the window, the pseudo color graph of the plan can be visualized.

The ***Pseudo Color Editor*** window allows setting of the reference parameters for image representation:

- By typing the illuminance values in the boxes, a customized scale can be configured
- Click on the color to choose the reference color

Alternatively in *Recalculate Values* a default scale can be configured, selected from the dropdown menu:

Colors: to set an image in color or black and white

Curve: to view the data in a linear or logarithmic scale

The ***Rescale*** window allows you to visualize and modify the maximum and minimum illuminance value the scale refers to, as well as the step.

Rendering

Dynamic Rendering

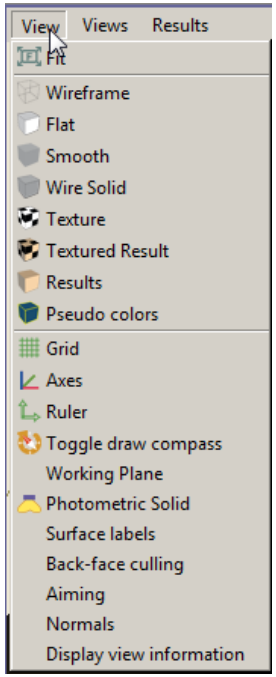
Dynamic rendering, also called Real Time Rendering, allows you to walk in the environment, but does not permit visualization of the Ray Tracing effects.

When the results window in the design area is closed, the visualized area appears rendered, according to the results obtained with the calculation. In this situation it is possible to move around inside the area, so as to realize “shots” that can be saved and then printed.

To save the images thus created in the design, select:

the *Capture image* icon positioned:

- in the *Calculations* icon bar
- in the Tools menu



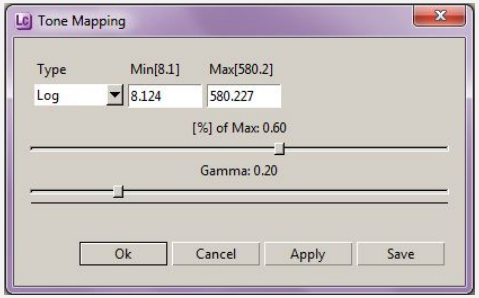
In this way the images are automatically saved in the ...\ImpExp folder of the program.

Another way to access dynamic rendering visualization is to select *Results* in the *View* dropdown menu. The rendering may be represented in each *Camera* (Perspective, Front, Top, Side), but not when inside the results table view.

Clearly, to be able to visualize the rendering, the results must first be calculated.

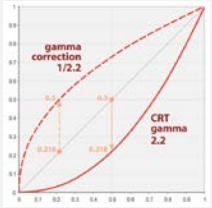
Notes

Click on the *Visualization management* icon, in the *Results* icon bar (or in the *Tools/Visualization management* menu), to access the management window of image luminosity and contrast.



The Tone Mapping window includes the following functions:

- ***Type***: this allows you to choose between linear or logarithmic representation
- ***Min, Max***: the minimum and maximum values of the environment
- ***% of the Max***: is the percentage of the maximum value of image saturation
- ***Range (Gamma)***: this is the correction of image exposure (0 light image, 1 dark image).



Rendering

Ray Tracing

This type of rendering generates an image of synthesis, where the view set with dynamic rendering is associated with a higher quality image with fixed observer in which all effects of specularity, transparency and refraction are included.

Given the calculation times needed to generate an image with Ray Tracing, it is not possible to realize dynamic renderings; to create each image, a new observer position will have to be defined, moving within the room, then launching a new visualization with Ray Tracing.

To start Ray-Trace select the *Start Rendering* icon positioned:

- in the Calculations icon bar
- in the Calculations menu

Once the rendering window has been started up, the image will be composed, visualizing the progress in the percentage seen in the line in the lower part of the window.

The images will be saved automatically in the …\ImpExp folder of the program.

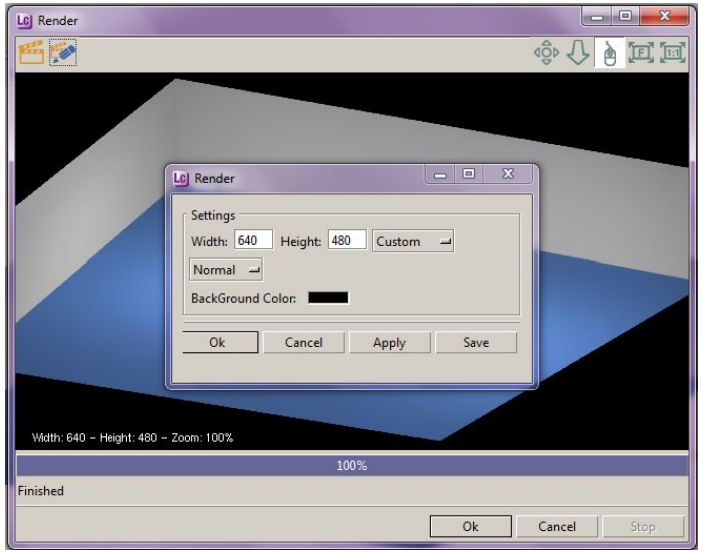
The various icons present in the window allow:

Setup of rendering settings according to different parameters

Rescaling of the image according to the size of the window

Rescaling the image in 1:1 scale

Movement inside the image, using the Pan and Zoom in - Zoom out commands



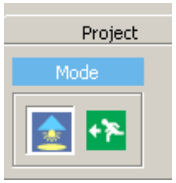
Notes

Click on this icon to open the settings window where you can set:

- the dimensions of the image (width x height)
- image quality (Normal, Medium, High)
- background color. Clicking the color box will open the Windows colors window where you can set the new color

Emergency lighting calculation

This function, only available with Litestar Pro, allows you to carry out calculation of emergency lighting according to norms.

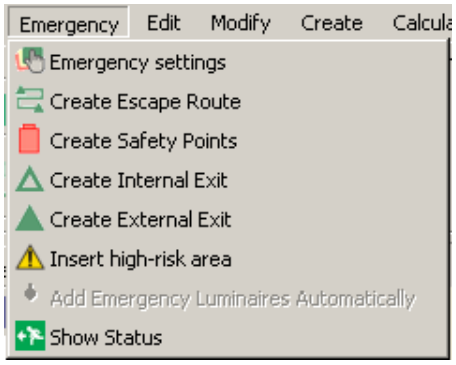


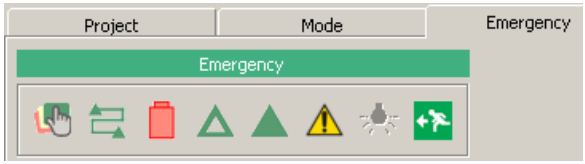
To access the module select the *Emergency* icon situated:

- in the *Modes* icon bar
- in the *Modes* menu

Once the *Emergency* mode is activated, a new menu will appear in the menu and icon bars, in which all the functions that are useful for designing an emergency lighting project can be found:

- ***Emergency Settings:*** to set the calculation parameters
- ***Create Escape Routes:*** to draw the escape routes in the environment
- ***Create Safety Points:*** to add elements, such as extinguishers, that require greater illuminances
- ***Create Internal Exit:*** to define the safety exits inside the area
- ***Create External Exit:*** to define the safety exits outside the area
- ***Insert High Risk Area:*** to define smaller areas within the environment where greater illuminance is required
- ***Add Emergency Luminaires Automatically***: to access the automatic luminaire insertion mode (available only with the emergency plus license)
- ***Show Status:*** to visualize the results status window





Notes

Emergency lighting calculation

Emergency parameters settings

To access the emergency parameters settings window select the *Emergency Settings* icon situated:

- in the *Emergency* icon bar
- in the *Emergency* menu

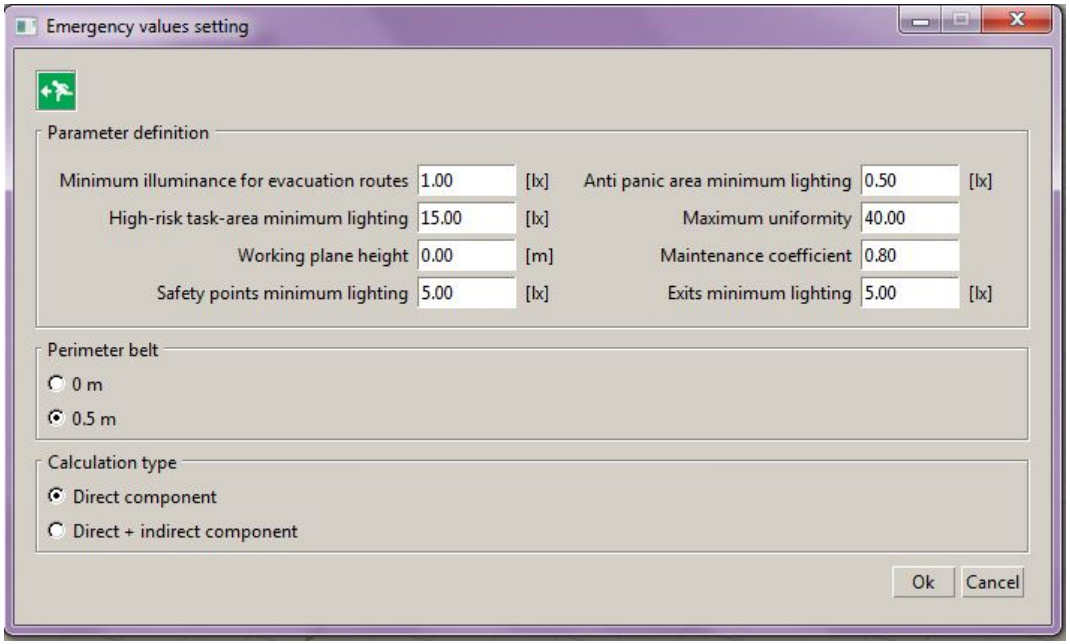
The window allows you to set the main parameters necessary for verifying the values calculated in the project.

The setting, performed according to norm UNI1838, is by default but the user is free to modify the individual data at any time.

The table is subdivided into three parts:

- Parameter definition, to set the parameters that will be used as reference values, to be compared with those effectively calculated in the project to verify their congruency
- Perimeter belt, to set whether or not to exclude a perimeter belt of 0.5 m from the calculation
- Calculation type, to set the type of calculation to be performed choosing between direct and direct+indirect

Clicking on the *Ok* key will set the values by default; clicking on the *Cancel* key will return to the previously set values.



Notes

Emergency lighting calculation

Inserting project elements

In order to perform calculation correctly and to verify that the illuminance values obtained correspond to the parameters set, it is necessary to define the main characteristics of the environment, such as:

- Escape routes
- Safety exits both internal and external
- Safety points (if present)
- High risk areas (if present)

in the following way:

Select this icon to activate the command to highlight the escape routes in the area.

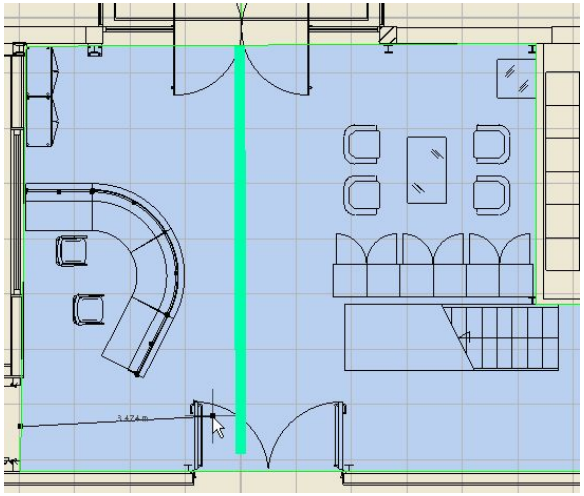
To mark the escape routes you must click near the safety exit and “draw a line” clicking again at the end of the escape route

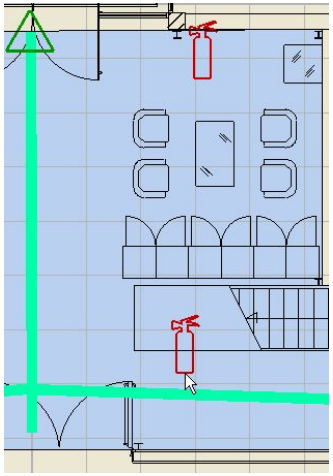
Select this icon and click inside the area with the left mouse button to position the internal emergency exits

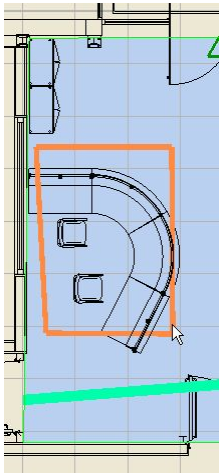
Select this icon and click inside the area with the left mouse button to position the external emergency exits

Select this icon and click inside the area with the left mouse button to position the safety points, for example the extinguishers (as represented with the red symbols in the figure on the right)

Select this icon and click inside the area with the left mouse button to draw an area in which to verify the values set in the high risk area setting (as shown by the orange rectangle in the figure on the far right)







Notes

To confirm the inserted elements and exit the command just press the *Enter* key.

Press the *Esc* key instead during execution of the commands related to the escape routes and high risk areas to exit the command without confirming.

The codes of the inserted objects will be visualized in the list found in the *Scene TAB*.

To cancel the objects just select them with the left mouse button (in the *Scene TAB* or in the area) and press the *Canc* key.

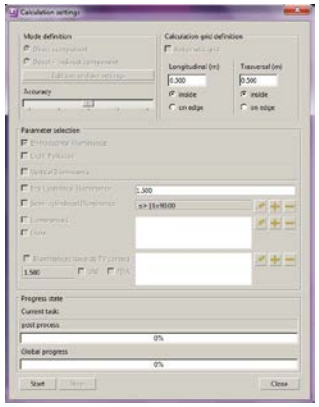
Emergency lighting calculation

Results calculation and visualization

Once the elements required to complete the lighting engineering verification have been inserted, calculation can be started using:

The *Start Calculation* icon situated:

- in the *Calculations* icon bar
- in the *Calculations* menu



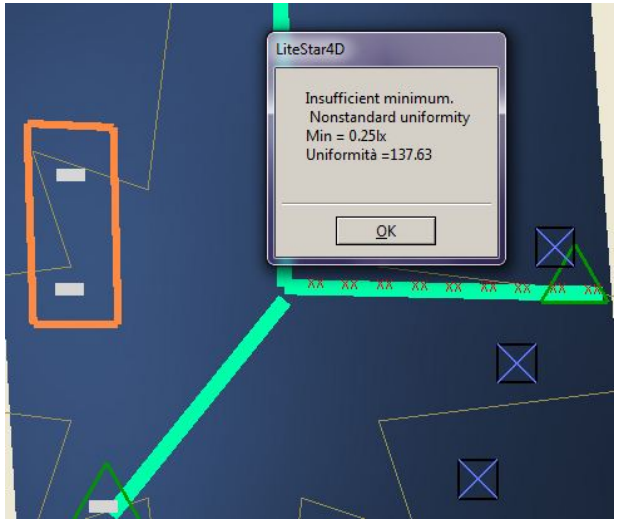
The setup window (shown in the figure on the right) cannot be modified, except the part related to the calculation grid, since the parameters to be calculated have already been set in the *Emergency Parameters* table.

To start calculation just click on the *Start* key.

Once calculation is complete a number of windows will open in the drawing in which the non-congruent parameters will be summarized (should the calculation not correspond to the reference parameters).

Instead, the points in the area in which the values do not satisfy the parameters will be highlighted graphically with an X.

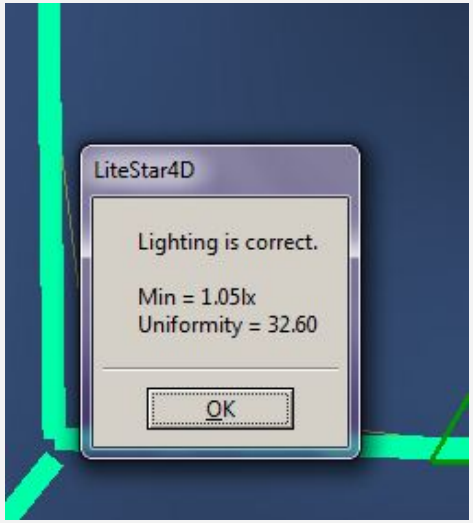
Should the calculated parameters be correct however, a window will appear saying *Illuminance is correct*, showing a summary of the main values calculated.



By clicking on the *Show Status* icon situated:

- in the *Emergency* icon bar
- in the *Emergency* menu

it will be possible at any time to open the summary window of the calculated parameters.



Notes

Click on the *Results* icon situated in the *Results* icon bar to visualize the results summary table, from which to select the graphs, as explained in the Visualization of results chapter.

Emergency lighting calculation

Automatic luminaire insertion (only with Emergency Plus license)

The automatic luminaire insertion module allows you to add luminaires automatically, after selecting the type to be used, in the various areas.

To access click on the *Add emergency luminaires Automatically* icon, situated:

- in the *Emergency* icon bar
- in the *Emergency* menu

The window shows different TABS such as:

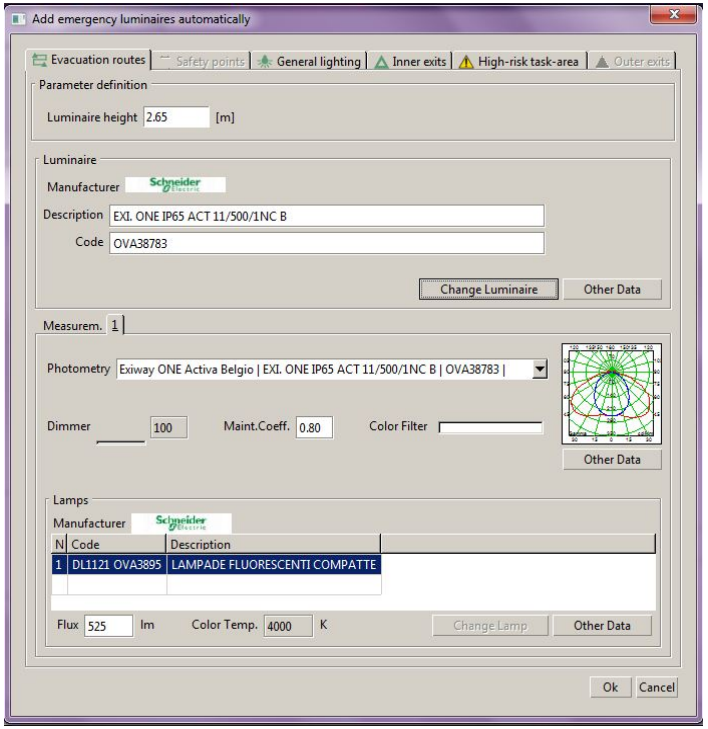
- Escape Routes
- Safety Points
- General Illumination
- Internal Exits
- High Risk Areas
- External Exits

Inside each TAB the height of installation of the luminaires can be selected by typing the corresponding value in the *Luminaire Height* field.

To add or modify the luminaires you can:

- Click on the ***Change luminaire*** key and select a luminaire from the list in Liswin (as explained in the Light Editor paragraph)
- Import a file using the Drag&Drop function (as explained in the Drag&Drop chapter)

In both cases the luminous flux of the lamps and maintenance factor can be modified by typing a new value in the respective fields.



Once luminaire selection is complete, clicking on the *Ok* key will automatically open up the calculation setup window in which calculation can be started (as explained in the previous paragraph).

Notes

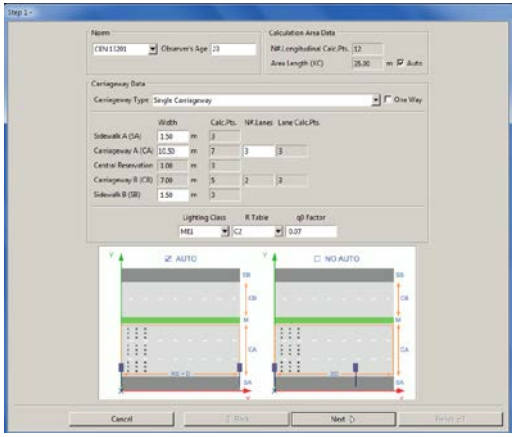
Should the automatic positioning not satisfy project requirements, it is always possible to modify the positioning manually directly inside the work area and repeat calculations.

Roads calculation

Guided roads

This function allows to automatically define simplified roads, according to the configurations set by the selected norm, with one or two carriageways with sidewalks, central reservations and a single type of luminaire.

Clicking on the icon opens a window like the one shown on the right hand-side in which it is possible to set the following parameters:



- ***Norm:*** this option allows to choose the norm according to which the calculation will be performed. It is subdivided in:
  - *Norm:* this allows you to choose one among the available norms: CIE 30, UNI 10439, CIE 140, CEN 13201
  - *Observer's Age:* this field, expressed in years, is active for insertion when the norm so requires (norms CIE 140 and CEN 13201). The estimated standard age is 23
- ***Carriageway Type:*** it is possible to choose among the following options:
  - Single Carriageway: in this case the program creates one carriageway and 2 sidewalks at its sides with the dimensions defined in the Carriageway Data section
  - 2 Symmetrical Carriageways: the program creates two carriageways of equal width, a central reservation and two sidewalks at the sides with the dimensions defined in the Carriageway Data section
  - 2 Asymmetrical Carriageways: the program creates two carriageways of different widths, a central reservation and 2 sidewalks at the sides with the dimensions defined in the Carriageway Data section
- ***One Way:*** this is a flag that allows you to define whether the grouping of lanes (carriageway) is traveled in only one direction (activated) or in 2 opposing directions (deactivated)
- ***Carriageway Data:*** these data are defined here for each road element/component (sidewalk A, sidewalk B, carriageway A, central reservation, carriageway B):
  - The width [m]
  - The number of transversal calculation points for the calculation of illuminances (only modifiable when the "Free" norm has been selected)
  - The number of lanes in each carriageway
  - The number of transversal calculation points corresponding to the single lanes, for the calculation of luminances and illuminances (for the calculation of longitudinal uniformity, they must be an odd number)
- ***La classificazione stradale illuminotecnica*** secondo normativa
- ***The reduced reflection factors*** (Tables R: C1, C2, R1, ….) with the corresponding q0 factor, valid for carriageways

Notes

When a particular norm is chosen, certain parameters, such as the number and position of the calculation points, will be automatically inserted according to the reference norm, thus preventing them from being changed or modified by the user in any way.

A road with double carriageways is considered by default a two-way traffic system: should the double carriageway road be one-way, you must select the option 'One Way'.

In this case the program considers circulation from left to right.

In the case of sidewalks and central reservations the program automatically assigns a regular reflection to the surface defining it a pre-set reflection factor.

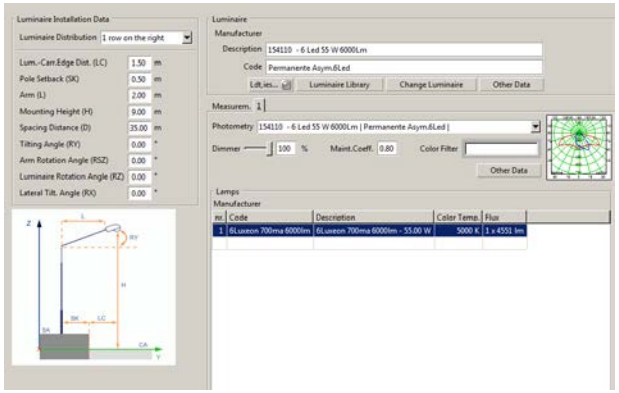
Roads calculation

- ***Calculation Data:*** here you can define certain calculation elements such as:
  - *Number of longitudinal calculation points*: calculation points in a longitudinal sense (parallel to the road axis)
  - *Examined Area (XC) [m]*: this refers to the length of the section that will be analyzed if the Auto option is deactivated. If the Auto option has been activated, the program will consider the section of the road that lies between two successive luminaires.

The program automatically adds to the column the number of luminaires/poles that fit in 5 times the height of the installation before the area and 12 times after the area in the case of one way traffic, in 12 times both before and after the area in the case of two way traffic

Once the data relative to the road characteristics have been completed, click on *Forward* to access the installation data insertion window:

- ***Luminaire Distribution:*** it is possible to choose among the following options which vary according to the type of carriageway chosen:
  - Single Carriageway
    - 1 row on the right
    - 1 row on the left
    - 2 facing rows
    - 2 staggered rows
  - 2 Symmetrical Carriageways
    - 2 facing rows
    - 2 staggered rows
    - 1 central row in each carriageway
    - 2 facing rows in each carriageway



    - 2 staggered rows in each carriageway
  - 2 Asymmetrical Carriageways
    - 2 facing rows
    - 2 staggered rows
    - 1 central row in each carriageway
    - 1 row in each carriageway
    - 2 facing rows in carr. A – 1 row in carr. B kerbside
    - 2 staggered rows in carr. A – 1 row in carr.B kerbside
    - 1 row in carr. A kerbside– 2 rows in central reservation
    - 1 staggered row in carr. A. Kerb – 2 rows in central reservation

Notes

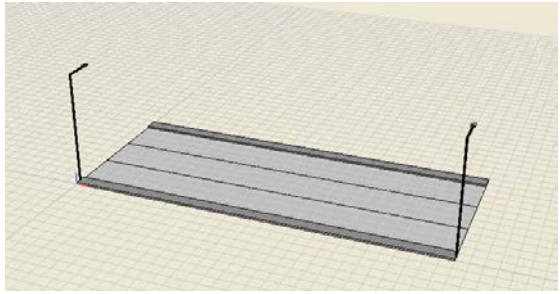
Roads calculation

- ***Installation Data:*** here you define the data relative to luminaire installation such as:
  - *Luminaire-Carr.Edge Distance (LC) [m]:* the distance between the luminaire upright and the verge on which the pole stands
  - *Pole Setback (SK)*: the distance of the pole from the carriageway
  - *Arm (L) [m]:* the projection length of the pole bracket on the horizontal plane
  - *Mounting Height (H) [m]:* the height at which the luminaires are positioned, taken as the height of the luminous center from the road surface at height 0 m
  - *Spacing Distance (D) [m]:* the interdistance between two consecutive poles/luminaires positioned on the same side
  - *Tilting Angle (RY) [°]:* this is the inclination according to which the luminaire is rotated around the intrinsic y axis of the luminaire itself and parallelly to the road axis. Inclination is at 0° with the luminaire horizontal and the luminous axis vertical, and rotation is positive when the luminaire rotates anticlockwise with respect to the observer who has the pole supporting the luminaire on his left
  - *Arm Rotation Angle (ARZ) [°]* This allows rotation of the arm while maintaining unchanged that of the luminaire. Rotation is carried out with respect to the 0 reference taken on the positive x axis. By default the arm is rotated by + o -90°, that is to say in transversal direction to the road. ARZ additional rotation depends also on the traffic direction: if an additional rotation (for example 20°) is applied to a configuration of 2 opposite rows in a single traffic direction there will be a rotation of 90+20° for the right-hand row and of 270+20° for the left-hand row; in the case of two way traffic it will be 90+20° and 270+20°
  - *Luminaire Rotation Angle (RZ) [°]:* This allows rotation of the luminaire maintaining unchanged that of the arm. The same description applies as for arm rotation

    Lateral Tilt Angle (RX) [°]: this inclination allows you to rotate the luminaire around its own intrinsic x axis, that is around the axis parallel to the lamp and passing through it
- The ***Luminaire library*** key opens the favorites archive in which to select the luminaire using Drag&Drop;
- The ***Ldt, ies...*** key opens a file window, in which to look for the photometric file to be dragged into the program.
- The ***Change Luminaire*** key accesses the Liswin module in which to select the luminaire, as explained in the Light Editor and Change lamp paragraph
- It is however always possible to select a photometry using the Drag&Drop function, dragging the luminaire in the window (as explained in the Drag&Drop chapter).

Click on the *End* key to visualize the stretch of road under examination inside the design area.

Instead click on the *Access Advanced Project* key to enable access to the advanced roads editor.

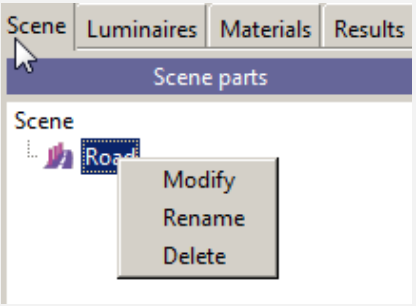


Notes

Clicking on the Change Luminaire key gives access to the Liswin module. Once the desired luminaire has been selected, to import it into the Litecalc window just press on the *Select* key on the top right.

For all other operations that can be carried out on the luminaires please see the *Luminaires Editor* chapter.

To modify the installation data just select the tunnel in the *Scenes* TAB with the right mouse button and select *Modify*



Roads calculation

Advanced Roads - Roads

This function allows automatic definition of complex roads, with one or two carriageways and pavements, central reservations, cycling paths, etc., with different heights and luminaire types.

Click on the icon to open an empty window in which to set the installation reference parameters.

The window can also be accessed by means of the *Access Advanced Project* key, once insertion in *Roads Wizard* has been completed.

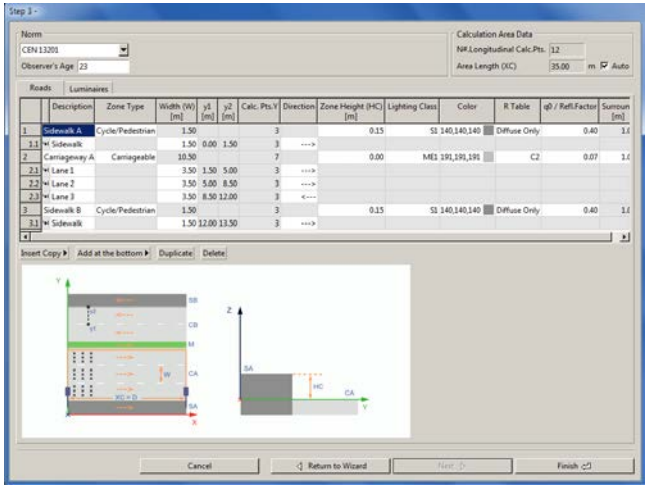
Using the dropdown menu at the top, it is possible at any time to select the reference norm, which will automatically set the calculation grid in accordance with the selected norm.

Next to the drop-down menu there is a cell that allows you to set the observer's age (norms CIE 140 and CEN 13201). The estimated standard age is 23 years old.

Lastly, it is also possible to set the length of the stretch under examination which may be equal to the interdistance between the two poles or even longer, by flagging the *Auto* key.

The buttons below allow you to perform these main operations:

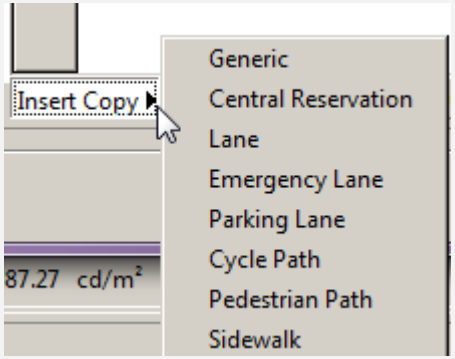
- ***Insert Copy:*** to insert a new element (zone or sub-zone) above the selected one. If a zone is selected, a new zone will be inserted. If instead a sub-zone is selected, the new element will be added above the reference zone.
- ***Add at the Bottom:*** to insert a new element (zone or sub-zone) at the bottom of the list. If a zone is selected, a new zone will be inserted. If instead a sub-zone is selected, the new element will be added at the bottom of the reference zone.
- ***Duplicate***: to duplicate the selected zone or sub-zone
- ***Delete***: it allows you to eliminate the selected element from the table



Notes

Clicking on the *Add to zone* or *Add new zone* key opens a dropdown menu from which to choose the type of zone to be inserted from the following:

- Generic
- Central Reservation
- Lane
- Emergency Lane
- Parking Lane
- Cycle Path
- Pedestrian Path
- Sidewalk



Roads calculation

The main element of the project list is called “zone”. The zone is identified by the name that appears in the left hand column of the grid. Each zone may be made up of a number of features

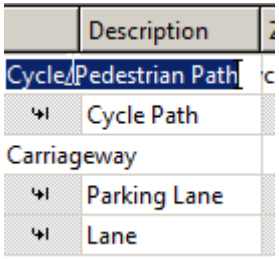
To define the different features of a zone or sub-zone the following fields can be edited, characterized by the white box:

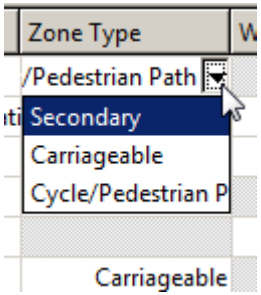
- ***Description***: the name we intend to give to each road element
- ***Zone Type*** : it represents the main feature of the zone under examination. The available zone types are as follows: Secondary, Carriageable and Cycling/Pedestrian. Depending on the zone type chosen, the calculation to be made will automatically be set. If, for instance, we choose Carriageable, the luminance calculation will be made following the corresponding norm
- ***Width (HC) [m]:*** it refers to the width of the lane/sidewalk/central reservation
- ***y1 [m]:*** this represents the starting point of the zone/sub-zone, with regard to the Y axis
- ***y2 [m]:*** this represents the ending point of the zone/subzone, with regard to the Y axis
- ***Direction***: this identifies the direction of the traffic
- ***Zone Height (HC) [m]***: it is the zone height with respect to the reference plane of 0m height; the program in actual fact allows calculation of road sections situated at different heights from 0m as happens with overpasses and sidewalks
- ***Lighting Class***: it represents the different classes of project references, to be verified and respected when carrying out the calculation, according to norm EN13201
- ***Color***: this option offers the possibility of changing the colors of the different surfaces. A cycling lane, for instance, could have red asphalt. This option is particularly useful when we wish to create a rendering after the calculation
- ***R Table - q0/Refl.Factor***: defines the type of reflection of the surface under examination. In the case of Diffusive reflection (Lambert’s Law of regular reflection is applicable), it is only necessary to define the reflection factor (percentage value between 0% and 100%). In the case of non Diffusive reflection, it will be necessary to define the Reduced Reflection Factors Table among tables C1, C2, R1 … R4 and the reflection factor q0
- ***Surround***: sets the dimension for the calculation of the sr lateral visibility parameter

The ***Pt.Calc.Y*** and ***Num.Punti. Calc.Long***. fields are only editable if no reference norm is selected (option *Free*). In this case the user will have to decide the number of longitudinal and transversal calculation points

The modifiable fields (which are white as opposed to those that cannot be edited, which are grey) may be of two types:

- ***Editable***: by clicking twice inside the box it is possible to modify the value shown directly
- ***Dropdown***: clicking twice in the box opens a dropdown menu, from which to choose among the various options





Notes

In the case of non Diffusive surfaces it becomes necessary to set the observer’s position (x with respect to the origin and y with respect to the right-hand verge of the carriageway) to allow the calculation of luminance on the road section under examination. Please be aware that the program automatically sets the observer’s position according to the norm that has been chosen.

In case of diffusive reflection it is not necessary to define the observer since the luminance values are independent from their position (all observers see the same luminance values).

The field “width” - regarding the zone - indicates the total width of the zone, as the sum of the different elements that make it up. This field cannot be edited.

Roads calculation

Advanced Roads - Luminaires

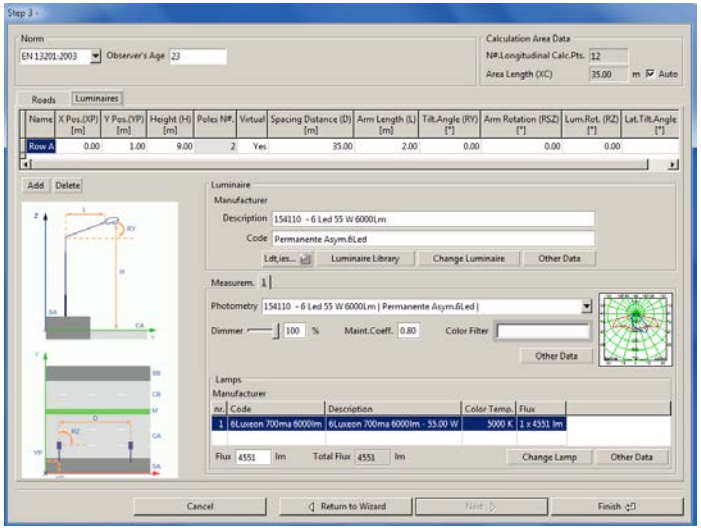
Selection of the *Luminaires* key opens the window in which to define the position and type of luminaires to be used in the project. In fact with the *Advanced roads* module it is possible to insert different types of lighting devices in the individual calculations, and globally verify the lighting engineering parameters, on the basis of the norm chosen.

The below perform the main operations such as:

- ***Add***: this allows you to insert a new row of luminaires. The program then proceeds to insert a new luminaire selecting it from the Liswin module. It is however always possible to select a photometry using the Drag&Drop function, dragging the luminaire in the window (as explained in the Drag&Drop chapter).
- ***Delete***: this eliminates the selected element from the table

To define the various installation characteristics of a row of luminaires, the following fields are editable:

- ***Name:*** this is the name given to the row of luminaires to be defined (example Row A or Row 1 …)
- ***Position X – Y (XP-YP) [m]***: these are the absolute X and Y coordinates of the first pole in the row
- ***Luminaire Height (H) [m]***: this is the height of the luminaire installation and corresponds to the distance between the reference plane at 0 m height and the luminous center of the luminaire
- ***N.Poles:*** this represents the number of poles forecast inside the area under examination



Notes

To modify a luminaire that has already been inserted just select the line of reference and click on:

- The *Luminaire Library* key: opens the favorites archive in which to select the luminaire using Drag&Drop;
- The ***Ldt, ies...*** key opens a file window, in which to look for the photometric file to be dragged into the program.
- The ***Change Luminaire*** key accesses the Liswin module in which to select the luminaire, as explained in the Light Editor and Change lamp paragraph

It is however always possible to modify the luminaire also using the Drag&Drop function by dragging the file inside the luminaire area.

For all other possible operations on the luminaires see the *Luminaire Editor* chapter.

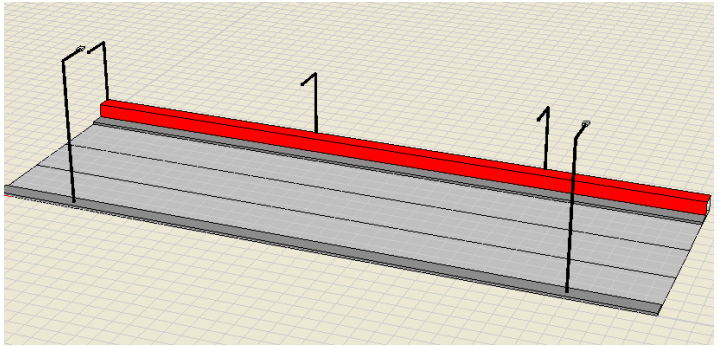
Roads calculation

- ***Virtual Row:***
  - if this option is active the program will extend the row of luminaires outside the area under examination to take into account the contribution of all the luminaires; the number of luminaires added is equal to the number of luminaires/poles that can fit into 5 times the height of the installation before the area and 12 after (according to the driver's direction) if the traffic is one way, 12 times both before and after in the case of two way traffic. If there are two or more rows of luminaires with different numbers of poles and inter-distances, the program takes into consideration the row with the maximum total length
  - If the Virtual Row option is deactivated the program takes into consideration a stretch of road corresponding to the number of poles defined in the *N. of Poles* box without adding other elements either before or after the area under examination
- ***Spacing Distance (D) [m]:*** this is the inter-distance between 2 consecutive luminaires in the same row
- ***Arm length (L) [m]:*** this this how long the arm of the pole projects over the horizontal plane
- ***Tilt Angle (RY) [°]:*** this is the inclination (rotation) of the luminaire around its own y axis
- ***Arm Rotation (RSZ) [°]:*** this is the rotation of the arm around the vertical axis (z) while keeping luminaire rotation unchanged, taking as 0 reference the positive X axis (as explained in the roads guidelines)
- ***Luminaire Rotation (RZ) [°]****:* this is the rotation of the luminaire around the vertical axis (z) while keeping arm rotation unchanged, taking as 0 reference the positive X axis (as explained in the roads guidelines)
- ***Lateral Tilt Angle (RX) [°]:*** this is the inclination (rotation) of the luminaire around its own x axis

Also in this case to modify the data you must click twice inside the editable boxes (white).

Clicking finally on the *End* key causes the stretch of road under examination to be visualized in the design area.

Click instead on the Return to Wizard key to move to the guided module.



Once insertion is complete to reedit the area you must select the element with the right mouse button in the *Scene TAB* and press *Modify.*

Notes

Roads calculation

Results

When the insertion operations are completed and you have returned to the main program screen, calculations can be launched by clicking on the relative icon in the *Calculations* TAB or select *Start Calculations* in the *Calculations* menu.

The program will automatically set the correct calculation parameters according to the previously selected norm.

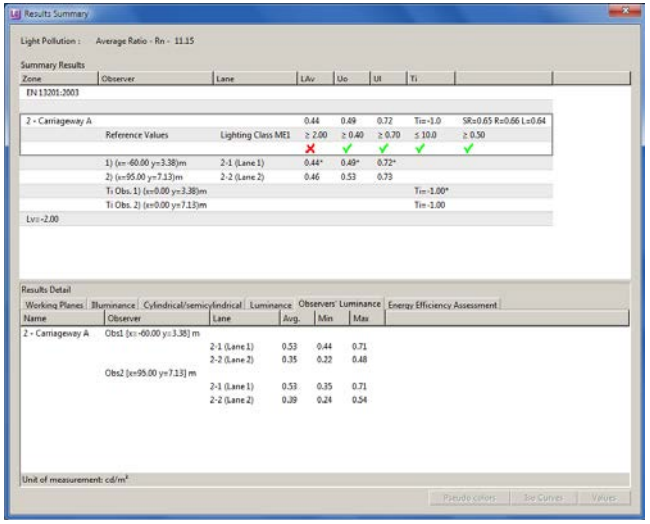
To launch calculations just click on the *Start* key .

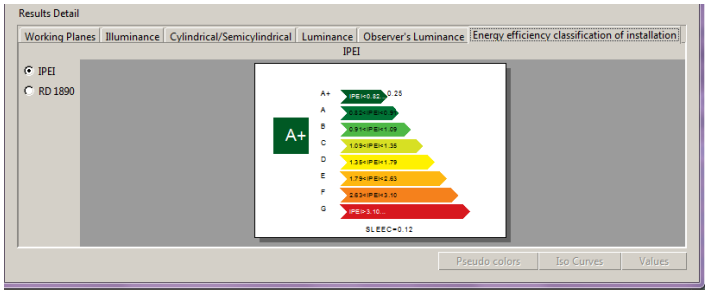
When calculations are complete, click on the *Close* key to automatically access the results table.

The upper part of the table will summarize the information related to the luminance calculation on the carriageways. The correspondence or non-correspondence with the road classification selected during the planning phase, in accordance with norm EN13201, will be shown by these two symbols ☑ ☒.

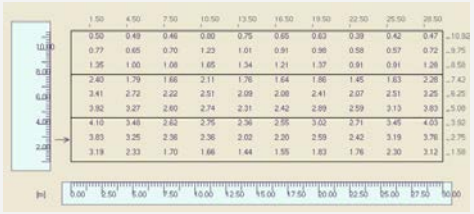
By clicking on the TABs in the lower part on the other hand it will be possible to access the illuminance and luminance values in the various areas. Select the area of interest in the list and click on one of the keys on the bottom right to visualize the relative graphs.

Click on the *Installation Energy Classification* TAB to visualize the energy classification of the installation, in accordance with IPEI parameters (only for norm EN13201-2003) or Spanish norms.





Notes



Select the observer line in the *Observer Luminance* TAB and then click on one of the keys on the bottom right to visualize the graph of the entire carriageway, where an arrow shows the observer position.

If instead one lane is selected, the graph relating to a single lane will open.

Roads calculation

Indicator of energy performance in accordance with EN13210-2015

If calculation has been carried out in accordance with EN13201-2015, once the *Results* screen has been visualized, it is possible to access the *Indicator of energy performance* TAB, where the indicator of annual energy consumption can be calculated.

Here you can set a series of useful parameters for consumption calculation, such as:

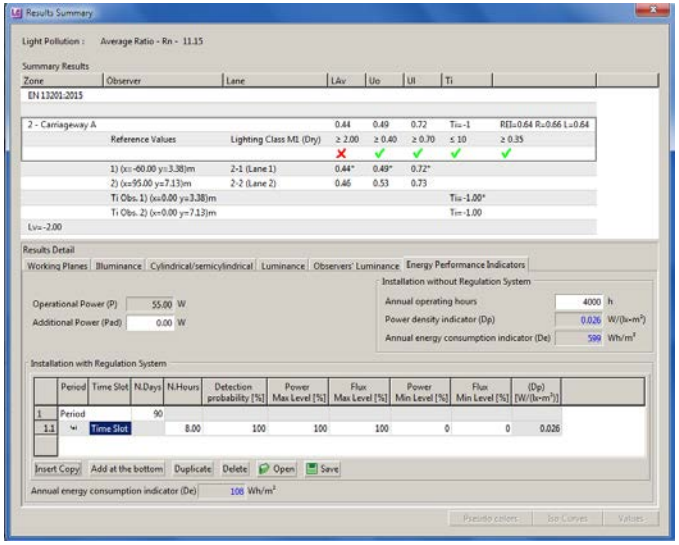
- ***Additional power*** (in addition to the operative power automatically set on the basis of the power declared in the luminaire photometry), for example of the regulation system
- ***Annual Operating Hours of installation*** for a less in-depth calculation, i.e. that does not take into consideration for example the managements systems;

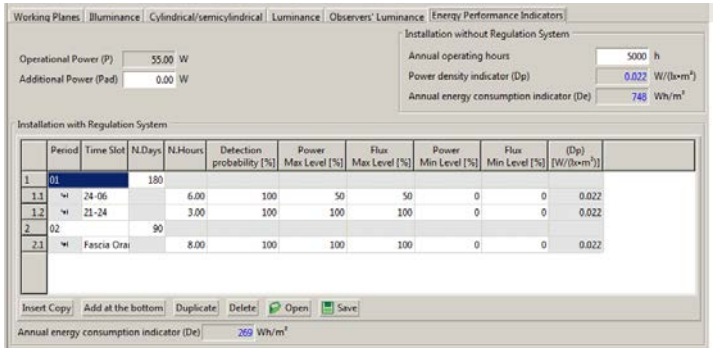
Once these two parameters have been set the software automatically calculates the Dp and De.

Should you wish to calculate the consumption of an installation with regulation system, the table at the bottom can be completed. Here various profiles will have to be entered, such as:

- The ***periods of the year***, complete with the days relative to the period, the different time slots and number of hours (e.g. the time slots for winter months may be different from those of the summer months);
- ***Detection Probability***, that is the probability, in percentages of hours, that the detection sensor measures the passing of vehicles
- ***Power and Flux Reduction*** in percentages for that period of time
- ***Percentage of Minimum Power and Flux*** should a detection probability datum have been set (it is the percentage below which the installation is not regulated).

Once these parameters are set the De result will be shown on the bottom left.





Notes

The keys:

- ***Insert:*** to insert a new element (zone or subzone) over the one selected. If a period has been selected a new period will be inserted. If instead a time slot has been selected the new element will be added over the reference element
- ***Add at bottom:*** to insert a new element (period or time slot) at the bottom of the list. If a period is selected a new period will be inserted. If instead a sub-zone has been selected the new element will be added at the bottom of the reference zone.
- ***Duplicate***: to duplicate the zone or sub-zone selected
- ***Delete***: this allows you to delete the selected element from the table
- ***Open***: to open a previously saved profile;
- ***Save***: to save a set profile.

To modify the fields just click twice in the relative box and type in the new values.

Tunnels calculation

The project step by step

Click on the icon to access the guided tunnels module

In this way an interface window will be seen in which the first step is to set:

- The section type of tunnel to be calculated (rectangular, vaulted, etc.);
- The physical characteristics of the tunnel (height and reflection coefficients).

At this point the entry luminance and luminance curve must be calculated using the Adrian diagram as well as the physical characteristics of the area (only for Tunnel Plus, by accessing advanced project).

To do this first click on the *Adrian* key (in the advanced project module), to access the data settings window, where the following must be defined:

- The length of the tunnel;
- The type of installation and relative qc;
- Atmospheric conditions;
- Road classification in accordance with EN 13201 (11248);
- The geographical position of the tunnel;
- Traffic speed;
- Road type and conditions.

To define the veil luminance the Adrian diagram is used, by clicking on the ***Image TAB*** and inserting a photo, (via the ***Operations/Change insert photo*** menu) or by directly setting the value. For a more detailed explanation of how to complete the Adrian graph, please see the *Adrian Diagram* chapter.

Once the veil luminance has been established, the program will automatically calculate the luminance curve to be applied in the project, which can be viewed in the ***Situation TAB***, and can also be printed using the ***File/print*** menu.

Still using the ***File*** menu, the calculations made can be saved (***Save***) and finally you can exit the window (***Exit***) to return to the main module and start inserting the luminaires.

At this point you can:

- Set the installation type and road characteristics (carriageways, lanes, etc.);
- Select the luminaire to be used in calculations and set the installation characteristics by clicking on the ***Forward*** key;

Press on the ***Terminate*** key in the design area to visualize the tunnel design and inserted luminaires.

Once calculation is complete (already reset) the results obtained will be visible in the ***Results*** table***.***

.

By clicking twice on the result you wish to view, the values relative to the selected area will be shown (for a more detailed explanation of the available graphs please see the *Results* chapter)

To access the tunnels management window again from the ***Results*** window, you will need to click on the relative icon.

Note

To save the general project, select ***Save Project*** in the *File* menu.

Tunnels calculation

Guided project

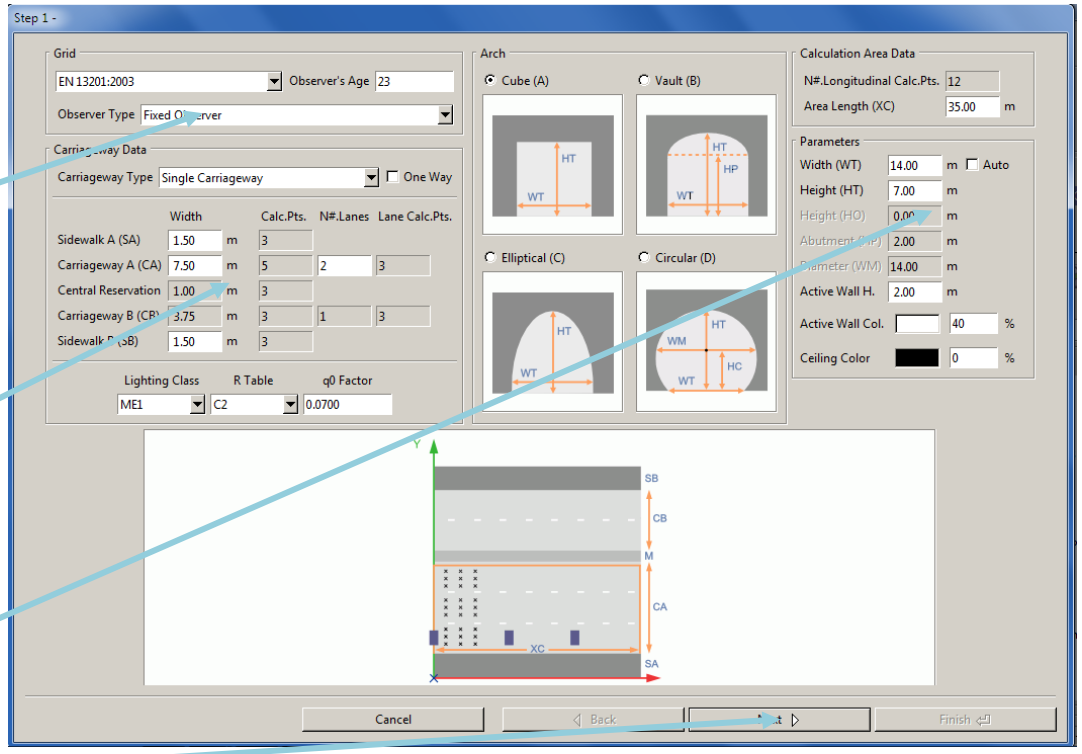
Click on the icon to access the guided tunnels module

Launching the module opens the main operative area, from which all the information necessary for realizing a simple project can be inserted, such as type and height of the tunnel and wall reflection coefficients

Selection of norm and observer type

Carriageway physical characteristics definition fields

Tunnel physical characteristics definition fields



Access key to luminaire insertion

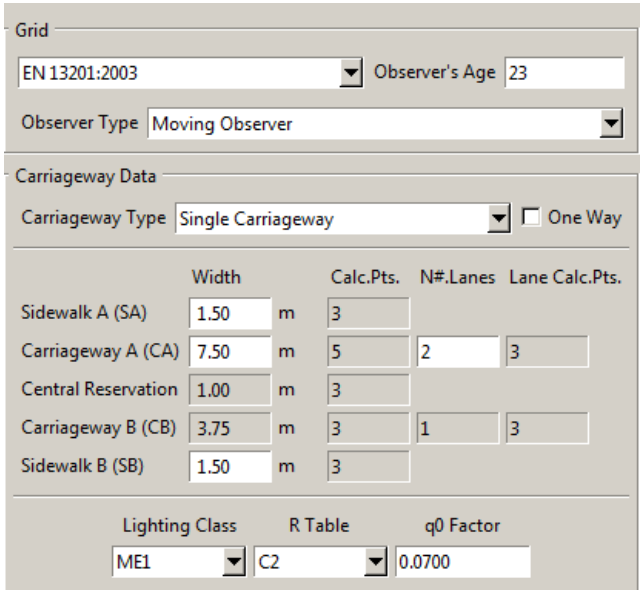
Note

Tunnels calculation

In this section the physical and geometrical data of the tunnel can be entered such as:

- ***Grid:*** this option allows to choose the norm according to which the calculation will be performed. It is subdivided in:
  - *Norm:* this allows you to choose one among the available norms: CIE 30, UNI 10439, CIE 140, CEN 13201
  - *Observer's Age:* this field, expressed in years, is active for insertion when the norm so requires (norms CIE 140 and CEN 13201). The estimated standard age is 22
  - *Observer type*: this allows selection between fixed and moving observer.
- ***Carriageway Type:*** it is possible to choose among the following options:
  - Single Carriageway: in this case the program creates one carriageway and 2 sidewalks at its sides with the dimensions defined in the Carriageway Data section
  - 2 Symmetrical Carriageways: the program creates two carriageways of equal width, a central reservation and two sidewalks at the sides with the dimensions defined in the Carriageway Data section
  - 2 Asymmetrical Carriageways: the program creates two carriageways of different widths, a central reservation and 2 sidewalks at the sides with the dimensions defined in the Carriageway Data section
  - *One Way:* this is a flag that allows you to define whether the grouping of lanes (carriageway) is traveled in only one direction (activated) or in 2 opposing directions (deactivated)

these data are defined here for each road element/component (sidewalk A, sidewalk B, carriageway A, central reservation, carriageway B):



- The width [m]
- The number of transversal calculation points for the calculation of illuminances (only modifiable when the "Free" norm has been selected)
- The number of lanes in each carriageway
- The number of transversal calculation points corresponding to the single lanes, for the calculation of luminances and illuminances (for the calculation of longitudinal uniformity, they must be an odd number)

- ***The lighting engineering road classification*** according to norms
- ***The reduced reflection factors*** (Tables R: C1, C2, R1, ….) with the corresponding q0 factor, valid for carriageways

Note

When a particular norm is chosen, certain parameters, such as the number and position of the calculation points, will be automatically inserted according to the reference norm, thus preventing them from being changed or modified by the user in any way.

A road with double carriageways is considered by default a two-way traffic system: should the double carriageway road be one-way, you must select the option 'One Way'.

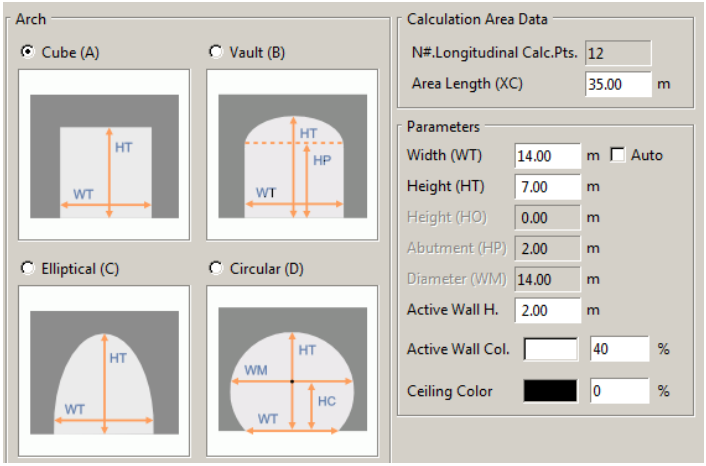
In this case the program considers circulation from left to right.

In the case of sidewalks and central reservations the program automatically assigns a regular reflection to the surface defining it a pre-set reflection factor.

Tunnels calculation

- ***Parameters***, where to set:
  - *Arch shape:* this is the geometrical section of the tunnel;
  - *Width:* this shows the tunnel width. By setting Auto the summation of the carriageway parameters will be assigned;
  - *Height:* this is the height of the central part of the tunnel to be calculated or the median part;
  - *Abutment*: this represents the height of the upright part of the tunnel before the vault begins;
  - *Diameter*: this is the diameter in circular tunnels*;*
  - *Active wall height:* this is the height of the part of the wall with its own reflection coefficient (usually 2m);
  - *Active wall color:* this is the reflection coefficient of the tunnel walls, measured in percentage;

  The value is set by default at 40%, for both walls, since it is considered a light surface;
  - *Ceiling color:* this is the reflection coefficient of the ceiling, measured in percentage.



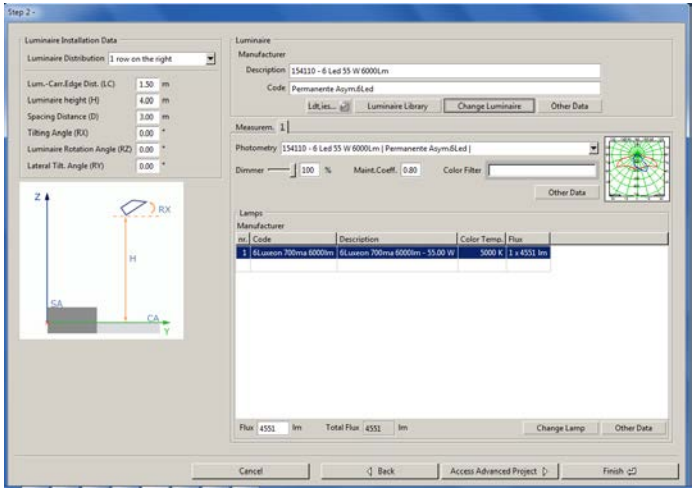
- ***Calculation Data:*** here you can define certain calculation elements such as:
  - *Number of longitudinal calculation points*: calculation points in a longitudinal sense (parallel to the road axis)
  - *Examined Area (XC) [m]*: this refers to the length of the section that will be analyzed if the Auto option is deactivated. If the Auto option has been activated, the program will consider the section of the road that lies between two successive luminaires.

Note

Tunnel calculation

Once the data relative to the road characteristics have been completed, click on *Forward* to access the installation data insertion window:

- ***Luminaire Distribution:*** it is possible to choose among the following options which vary according to the type of carriageway chosen:
  - Single Carriageway
    - 1 row on the right
    - 1 row on the left
    - 2 facing rows
    - 2 staggered rows
  - 2 Symmetrical Carriageways
    - 2 facing rows
    - 2 staggered rows
    - 1 central row in each carriageway
    - 2 facing rows in each carriageway
    - 2 staggered rows in each carriageway



  - 2 Asymmetrical Carriageways
    - 2 facing rows
    - 2 staggered rows
    - 1 central row in each carriageway
    - 1 row in each carriageway
    - 2 facing rows in carr. A – 1 row in carr. B kerbside
    - 2 staggered rows in carr. A – 1 row in carr.B kerbside
    - 1 row in carr. A kerbside– 2 rows in central reservation
    - 1 staggered row in carr. A. Kerb – 2 rows in central reservation

Note

Tunnels calculation

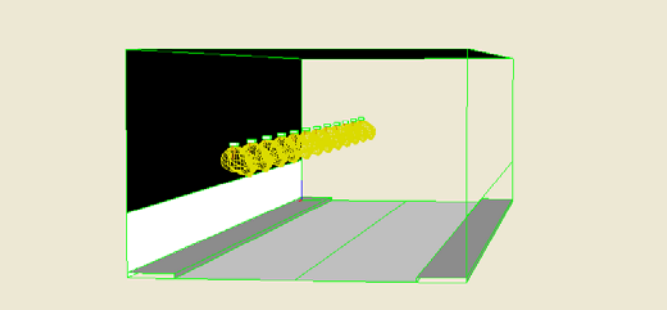
- ***Installation Data:*** here you define the data relative to luminaire installation such as:
  - *Luminaire-Carr.Edge Distance (LC) [m]:* the distance between the luminaire upright and the verge on which the pole stands
  - *Mounting Height (H) [m]:* the height at which the luminaires are positioned, taken as the height of the luminous center from the road surface at height 0 m
  - *Spacing Distance (D) [m]:* the interdistance between two consecutive poles/luminaires positioned on the same side
  - *Tilting Angle (RX) [°]:* this inclination allows the luminaire to be rotated around its own intrinsic x axis, i.e. around the axis parallel to the lamp and passing through it
  - *Tilting Lateral Angle (RY) [°]:* this is the inclination according to which the luminaire is rotated around the intrinsic y axis of the luminaire itself and parallelly to the road axis. Inclination is at 0° with the luminaire horizontal and the luminous axis vertical, and rotation is positive when the luminaire rotates anticlockwise with respect to the observer who has the pole supporting the luminaire on his left
  - *Luminaire Rotation Angle (RZ) [°]:* This allows rotation of the luminaire around the z axis intrinsic to the luminaire

- The ***Luminaire library*** key opens the favorites archive in which to select the luminaire using Drag&Drop;
- The ***Ldt, ies...*** key opens a file window, in which to look for the photometric file to be dragged into the program.
- The ***Change Luminaire*** key to access the Liswin module in which to select the luminaire, as explained in the Light Editor and Change lamp paragraph

It is however always possible to select a photometry also using Drag&Drop, dragging the luminaire into the window (as explained in the *Drag&Drop* chapter).

By clicking on the *Terminate* key the stretch of tunnel under examination will be visualized inside the design area.

By clicking instead on the *Access Advanced Project* key you will be able to access the advanced tunnels editor.

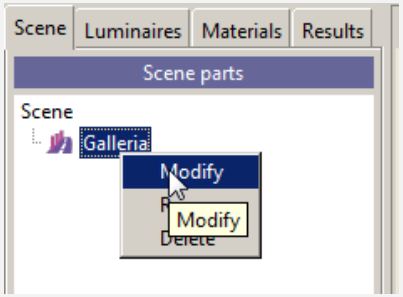


Note

Click on the Change Luminaire key to access the Liswin module. Once the desired luminaire has been selected, to import it into the Litecalc window you must press the *Select* key on the top right.

For all other operations performable on the luminaires please see the *Light Editor* chapter.

To modify the installation data just select the tunnel in the *Scenes* TAB with the right mouse button and select M*odify*



Tunnels calculation

Advanced Tunnels - Roads

This function allows automatic definition of complex tunnels, with one or two carriageways and sidewalks, central reservations, cycling paths, etc., with different heights and luminaire types.

Click on the icon to open an empty window in which to set the installation reference parameters.

The window can also be accessed by means of the *Access Advanced Project* key, once insertion in *Tunnels Wizard* has been completed.

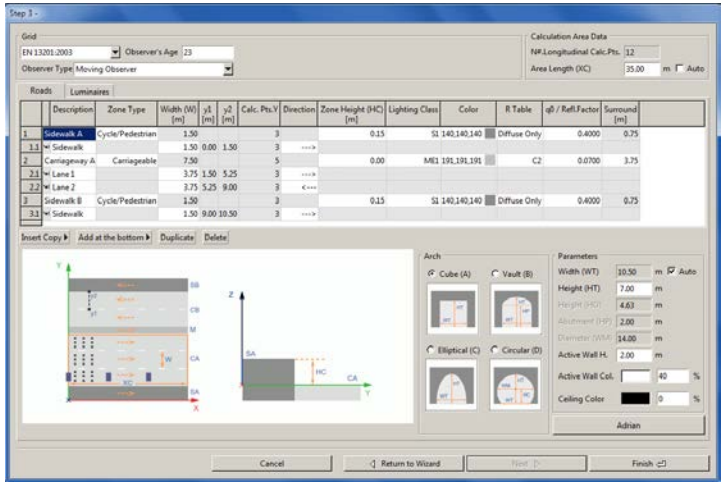
Using the dropdown menu at the top, it is possible at any time to select the reference norm, which will automatically set the calculation grid in accordance with the selected norm, and the type of observer.

Next to the drop-down menu there is a cell that allows you to set the observer's age (norms CIE 140 and CEN 13201). The estimated standard age is 23 years old.

Finally the length of stretch under examination can be set which may be equal in length to the last row of luminaires, or of a different length, by flagging the *Auto* key.

The buttons below allow you to perform these main operations:

- ***Insert Copy:*** to insert a new element (zone or sub-zone) above the selected one. If a zone is selected, a new zone will be inserted. If instead a sub-zone is selected, the new element will be added above the reference zone.
- ***Add at the Bottom:*** to insert a new element (zone or sub-zone) at the bottom of the list. If a zone is selected, a new zone will be inserted. If instead a sub-zone is selected, the new element will be added at the bottom of the reference zone.
- ***Duplicate***: to duplicate the selected zone or sub-zone
- ***Delete***: it allows you to eliminate the selected element from the table

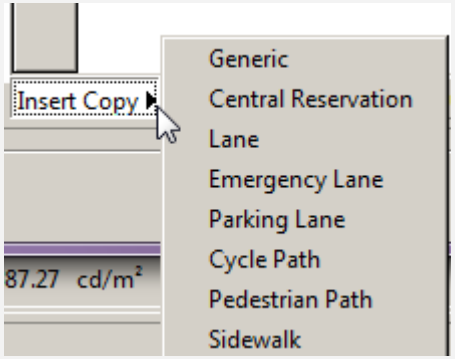


On the right hand side of the TAB you can also set the dimensions of the tunnel as described in the paragraph dedicated to the *Guided project*, or access the window relative to the Adrian diagram by clicking on the relative key.

Note

Clicking on the *Add to zone* or *Add new zone* key opens a dropdown menu from which to choose the type of zone to be inserted from the following:

- Generic
- Central Reservation
- Lane
- Emergency Lane
- Parking Lane
- Cycle Path
- Pedestrian Path
- Sidewalk



Tunnels calculation

The main element of the project list is called “zone”. The zone is identified by the name that appears in the left hand column of the grid. Each zone may be made up of a number of features

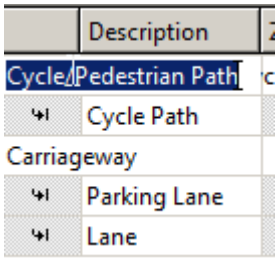
To define the different features of a zone or sub-zone the following fields can be edited, characterized by the white box:

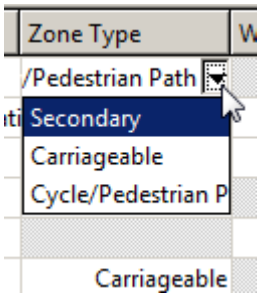
- ***Description***: the name we intend to give to each road element
- ***Zone Type*** : it represents the main feature of the zone under examination. The available zone types are as follows: Secondary, Carriageable and Cycling/Pedestrian. Depending on the zone type chosen, the calculation to be made will automatically be set. If, for instance, we choose Carriageable, the luminance calculation will be made following the corresponding norm
- ***Width (HC) [m]:*** it refers to the width of the lane/sidewalk/central reservation
- ***y1 [m]:*** this represents the starting point of the zone/sub-zone, with regard to the Y axis
- ***y2 [m]:*** this represents the ending point of the zone/subzone, with regard to the Y axis
- ***Direction***: this identifies the direction of the traffic
- ***Zone Height (HC) [m]***: it is the zone height with respect to the reference plane of 0m height; the program in actual fact allows calculation of road sections situated at different heights from 0m as happens with overpasses and sidewalks
- ***Lighting Class***: it represents the different classes of project references, to be verified and respected when carrying out the calculation, according to norm EN13201
- ***Color***: this option offers the possibility of changing the colors of the different surfaces. A cycling lane, for instance, could have red asphalt. This option is particularly useful when we wish to create a rendering after the calculation
- ***R Table - q0/Refl.Factor***: defines the type of reflection of the surface under examination. In the case of Diffusive reflection (Lambert’s Law of regular reflection is applicable), it is only necessary to define the reflection factor (percentage value between 0% and 100%). In the case of non Diffusive reflection, it will be necessary to define the Reduced Reflection Factors Table among tables C1, C2, R1 … R4 and the reflection factor q0
- ***Surround***: sets the dimension for the calculation of the sr lateral visibility parameter

The ***Pt.Calc.Y*** and ***Num.Punti. Calc.Long***. fields are only editable if no reference norm is selected (option *Free*). In this case the user will have to decide the number of longitudinal and transversal calculation points

The modifiable fields (which are white as opposed to those that cannot be edited, which are grey) may be of two types:

- ***Editable***: by clicking twice inside the box it is possible to modify the value shown directly
- ***Dropdown***: clicking twice in the box opens a dropdown menu, from which to choose among the various options





Note

In the case of non Diffusive surfaces it becomes necessary to set the observer’s position (x with respect to the origin and y with respect to the right-hand verge of the carriageway) to allow the calculation of luminance on the road section under examination. Please be aware that the program automatically sets the observer’s position according to the norm that has been chosen.

In case of diffusive reflection it is not necessary to define the observer since the luminance values are independent from their position (all observers see the same luminance values).

The field “width” - regarding the zone - indicates the total width of the zone, as the sum of the different elements that make it up. This field cannot be edited.

Tunnels calculation

Advanced Tunnels - Luminaires

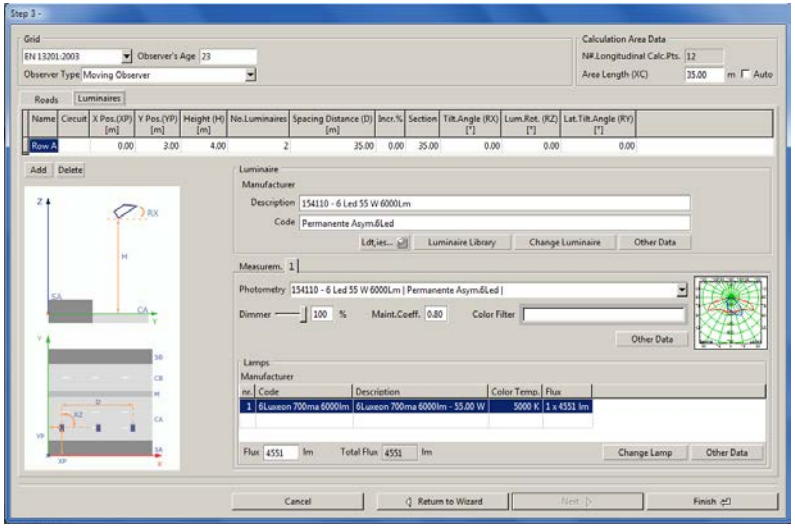
Selection of the *Luminaires* key opens the window in which to define the position and type of luminaires to be used in the project. In fact with the *Advanced Tunnels* module it is possible to insert different types of lighting devices in the individual calculations, and globally verify the lighting engineering parameters, on the basis of the norm chosen.

The below perform the main operations such as:

- ***Add***: this allows you to insert a new row of luminaires. The program then proceeds to insert a new luminaire selecting it from the Liswin module. It is however always possible to select a photometry using the Drag&Drop function, dragging the luminaire in the window (as explained in the Drag&Drop chapter).
- ***Delete***: this eliminates the selected element from the table

To define the various installation characteristics of a row of luminaires, the following fields are editable:

- ***Name:*** this is the name given to the row of luminaires to be defined (example Row A or Row 1 …)
- ***Circuit***: to subdivide the lighting circuits
- ***Position X – Y (XP-YP) [m]***: these are the absolute X and Y coordinates of the first pole in the row
- ***Luminaire Height (H) [m]***: this is the height of the luminaire installation and corresponds to the distance between the reference plane at 0 m height and the luminous center of the luminaire
- ***N.Luminaires:*** this represents the number of poles forecast inside the area under examination



Note

To modify a luminaire that has already been inserted just select the line of reference and click on:

- The ***Luminaire library*** key: this opens the favorites archive in which to select the luminaire using Drag&Drop;
- The ***Ldt, ies...*** key: opens a file window, in which to look for the photometric file to be dragged into the program.
- The ***Change Luminaire*** key to access the Liswin module in which to select the luminaire, as explained in the Light Editor and Change lamp paragraph

It is however always possible to modify the luminaire using Drag&Drop by dragging the file inside the area relative to the luminaire.

For all the other operations performable on the luminaires please see the *Luminaires Editor* chapter.

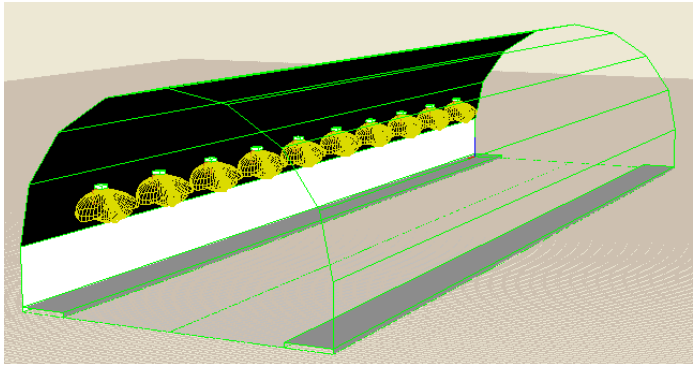
Tunnels calculation

- ***Interdistance (D) [m]:*** this is the interdistance between 2 consecutive luminaires in the same row
- ***Increase %:*** this is the percentage of increase desired in the interdistance of the row under examination;
- ***Stretch***: this is the length of the stretch under examination. If indicated, the program automatically updates the number of luminaires for that same stretch with that interdistance. If instead the number of luminaires and the interdistance are indicated, the length will automatically be updated
- ***Lateral Luminaire Tilting (RX) [°]:*** this is the inclination (rotation) of the luminaire around its own x axis
- ***Luminaire Rotation (RZ) [°]****:* this is the rotation around the vertical axis (z) of the luminaire keeping the rotation of the arm unvaried, taking as reference 0 the positive X axis (as explained in guided roads)
- ***Lateral Tilting Angle (RY) [°]:*** this is the inclination (rotation) of the luminaire around its own y axis

Also in this case to modify the data you must click twice inside the editable boxes (white).

Clicking finally on the *End* key causes the stretch of road under examination to be visualized in the design area.

Click instead on the Return to Wizard key to move to the guided module.



Once insertion is complete to reedit the area you must select the element with the right mouse button in the *Scene TAB* and press *Modify.*

Note

Tunnels calculation

Results

When the insertion operations are completed and you have returned to the main program screen, calculations can be launched by clicking on the relative icon in the *Calculations* TAB or select *Start Calculations* in the *Calculations* menu.

The program will automatically set the correct calculation parameters according to the previously selected norm.

To launch calculations just click on the *Start* key .

When calculations are complete, click on the *Close* key to automatically access the results table.

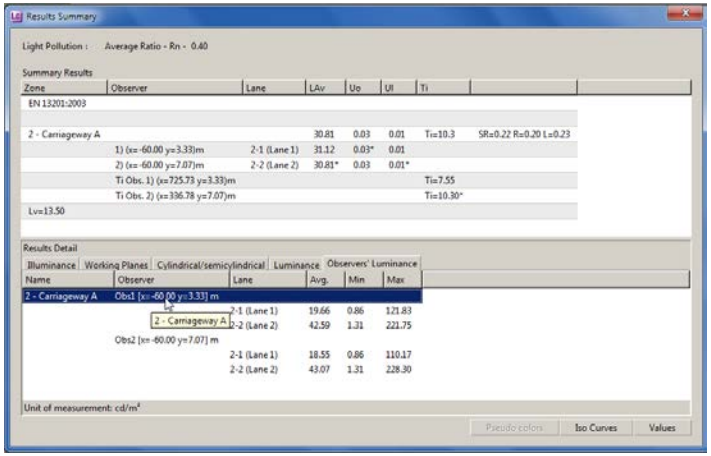
The upper part of the table will summarize the information related to the luminance calculation on the carriageways.

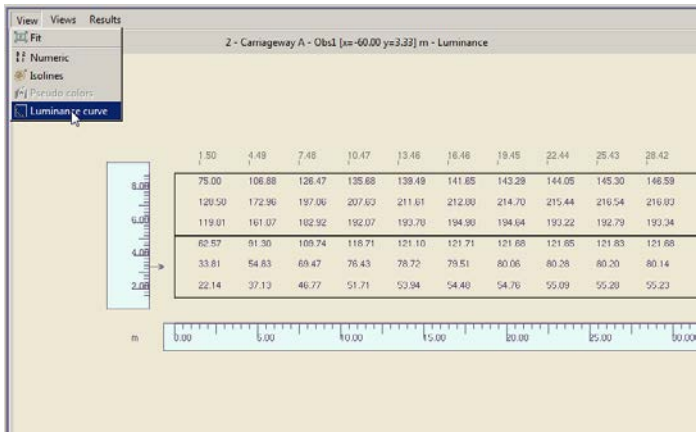
By clicking on the TABs in the lower part on the other hand it will be possible to access the illuminance and luminance values in the various areas. Select the area of interest in the list and click on one of the keys on the bottom right to visualize the relative graphs.

Alternatively click twice on the result you wish to view to open the values graph.

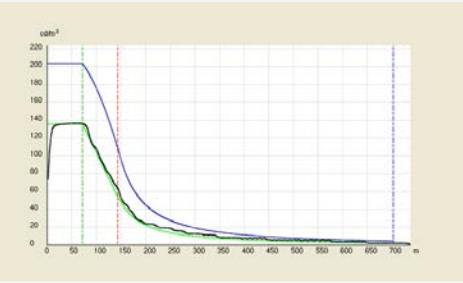
Select the observer line in the Observer Luminance TAB and then click on one of the keys on the bottom right to visualize the graph of the entire carriageway, where an arrow shows the observer position.

If instead one lane is selected, the graph relating to a single lane will open.





Notes



Once the values have been visualized, select Luminance Curve from the View menu to access the comparison of the real luminance curve with the theoretical one calculated using the Adrian diagram (for a more detailed explanation of the Adrian diagram please see the next chapter).

Also in this case if the whole carriageway has been viewed the curve will regard the carriageway, whereas if a single lane has been opened, it will be relative only to the lane.

Luminance curve

Adrian diagram

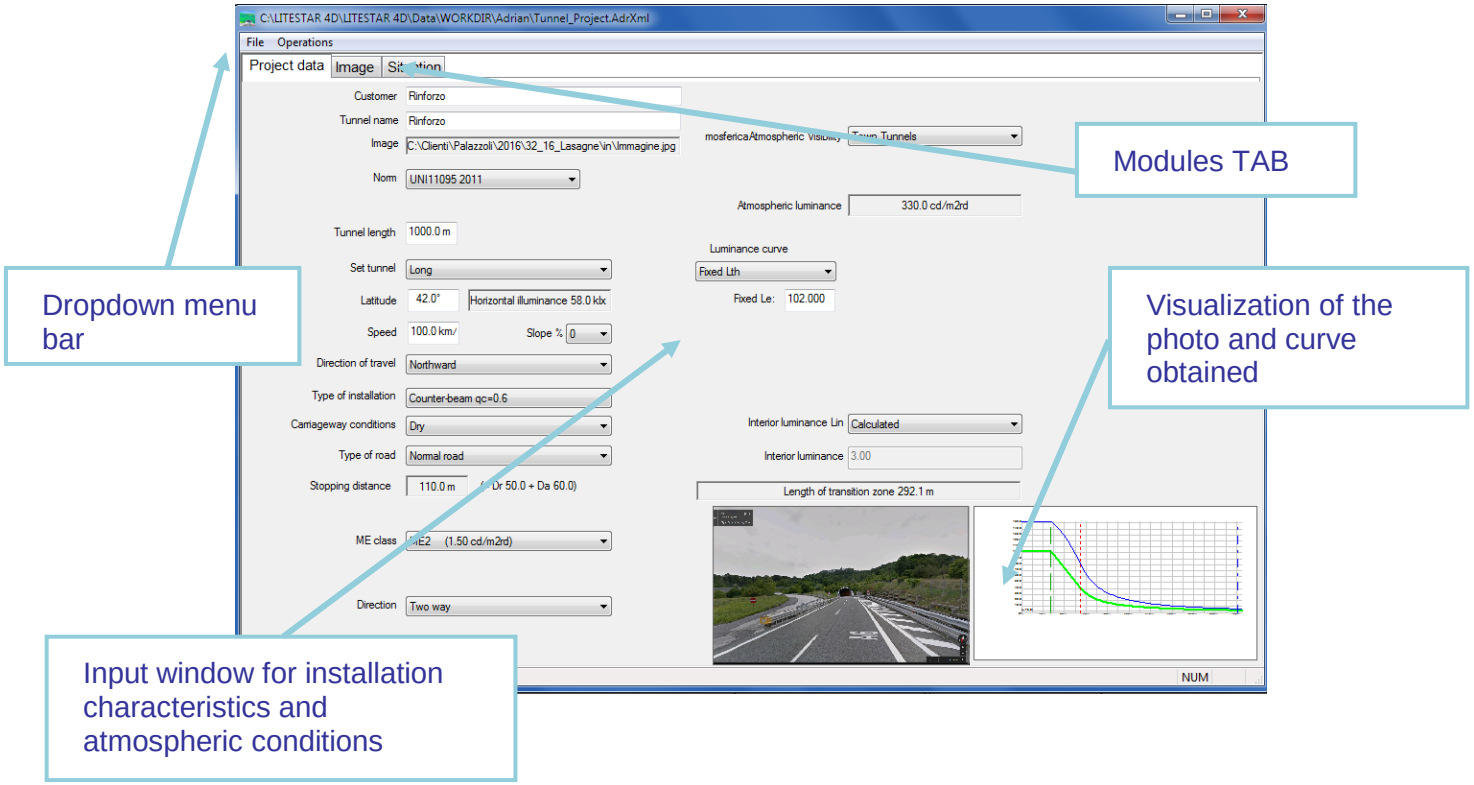
Clicking on the *Adrian* key of the *Advanced project* module opens a window in which to set the data necessary for calculating the entry luminance and thus the luminance curve.

The window is made up of two menus (described in the following paragraph) and three TABs, which are:

Project data: in which to set the data relative to the road characteristics and atmospheric conditions.

Image: where the veil luminance is calculated using the Adrian diagram

Situation: where the luminance curve is visualized



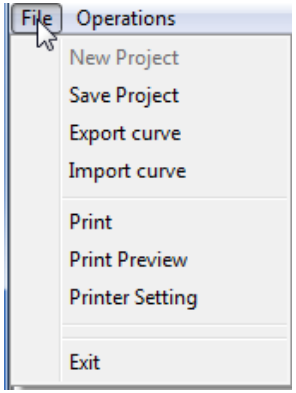
Note

Luminance curve

File Menu

For all operations connected with opening, exporting and saving a project:

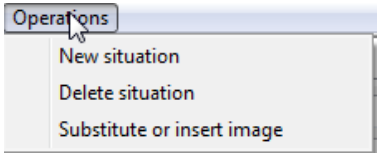
- ***New Project:*** to start a new project
- ***Save Project:*** to save the current project
- ***Export curve:*** to export the values of the luminance curve into a .CSV file
- ***Import curve:*** to import a previously created AdrXml file
- ***Print:*** to print the calculated luminance curve
- ***Print preview:*** to view the preview
- ***Printer setting:*** to set up the printer
- ***Exit:*** to leave the program



Operations Menu

For all the operations that can assist in the project:

- ***New Situation:*** to create a new scene to be analyzed
- ***Delete Situation:*** to delete a scene
- ***Substitute/Insert Image:*** to substitute or insert a photo to be analyzed with the Adrian diagram



Notes

The project is automatically saved in …Data/Workdir with the name of the project saved in Litestar.

Saving the project means you can then compare the hypothetical luminance curve with that effectively obtained in the project phase

Luminance curve

Project Data TAB

In this section you can insert the data relative to the reference norm, the physical characteristics of the road and atmospheric conditions.

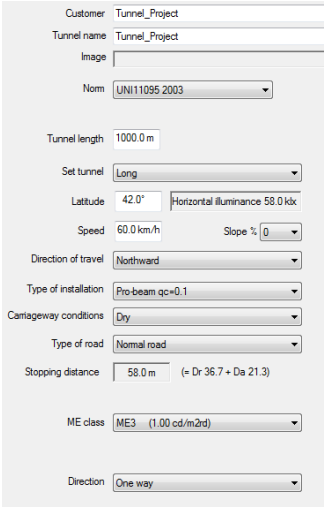
When the fields are completed the program will automatically update the relative data:

There are two types of field to complete:

- Dropdown: in this case just click with the mouse on the arrow on the right and select the item you require
- Insertion: in this case just click with the mouse inside the blank line and type in the descriptions

Depending on the norm selected in the left part of the window, the following fields are found:

- ***Customer***: where the data relating to the project customer are typed;
- ***Tunnel name***: where the tunnel name is typed;
- ***Image:*** where the image path is shown;
- ***Tunnel Length*** where:
  - To type the tunnel length;
  - To set whether the tunnel can be considered long or short;
- ***Latitude***: where to type the data relative to the latitude of the geographical position of the tunnel;
- ***Speed***: where to set the traffic speed;
- *Slope*: where to define the road slope;
- ***Direction of travel***: to indicate the direction of the tunnel;
- Interior luminance (Li);
- Horizontal luminance (relative to the latitude);
- Visibility stopping distance (dv);
- Atmospheric luminance (Latm).



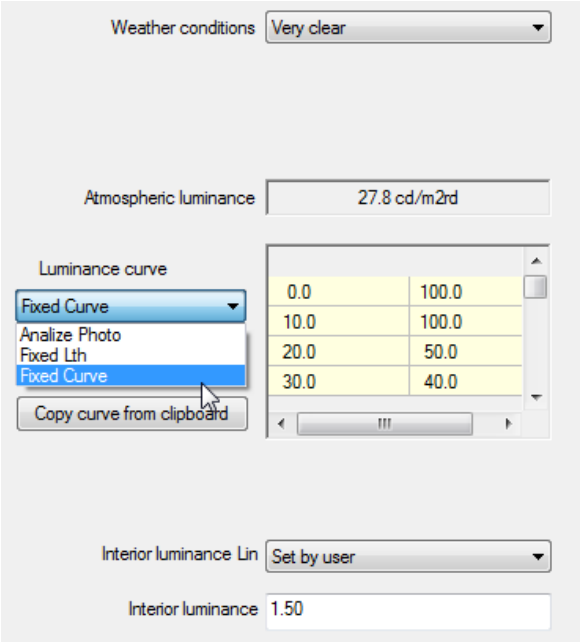
- ***Type of installation***: where to set the type of installation and relative qc. The installation may be:
  - Pro-beam (the luminaires are orientated in the direction of traffic);
  - Symmetrical;
  - Counter-beam (the luminaires are orientated in the opposite direction to that of the traffic)

Notes

In the case of short tunnels the program will proceed to halve the entry luminance values, visualized in the *Situation* TAB.

Luminance curve

- ***Road Conditions*** where:
  - Wet, indicates mainly wet surface conditions;
  - Dry, indicates mainly dry surface conditions;
- ***Type of Road:*** where to indicate whether it is a normal road or highway;
- ***Stopping Distance (dv)***: where according to the slope and speed values set, the distance necessary for stopping the vehicle is shown (reaction and stopping times);
- ***Road class***: where to select the lighting design classification of the road according to norm EN 13201;
- ***Traffic flow***: where to indicate the number of vehicles per hour (CIE88)
- ***Direction***: where to show whether the traffic flow inside the tunnel is one-way or two-way;
- ***Atmospheric Visibility***: indicates the conditions of visibility according to the geographical position of the gallery;
- ***Atmospheric Luminance (Latm)***: indicates the values of atmospheric luminance on the basis of the inserted data;
- ***Luminance curve***: where to select whether to calculate the curve on the basis of the veil distance or to set directly the steps of the curve. In the latter case by setting:
  - *Analyze Photo*, to proceed to the Adrian analysis;
  - *Fixed*, type the desired Le value in the box
  - *Set by user*, a table will be created in which to define the luminance values and stretch lengths;



- **Interior luminance (Li):** where is shown the interior luminance value, in accordance with norms, based on the selected lighting design classification, or where it is possible, by selecting *Set by User* from the dropdown menu, to type in a different value.

Notes

The slope values are taken directly from the trapezoidal table shown in the norm. Should the slope values associated with the speed exceed this table, in the Visibility Stopping Distance box will be shown the notice Out of Table. Negative slope values indicate downward sloping roads, whereas positive slope values indicate upward sloping roads.

Clicking on the *Copy curve from clipboard* key it is possible to paste a previously copied table, for example in Excel.

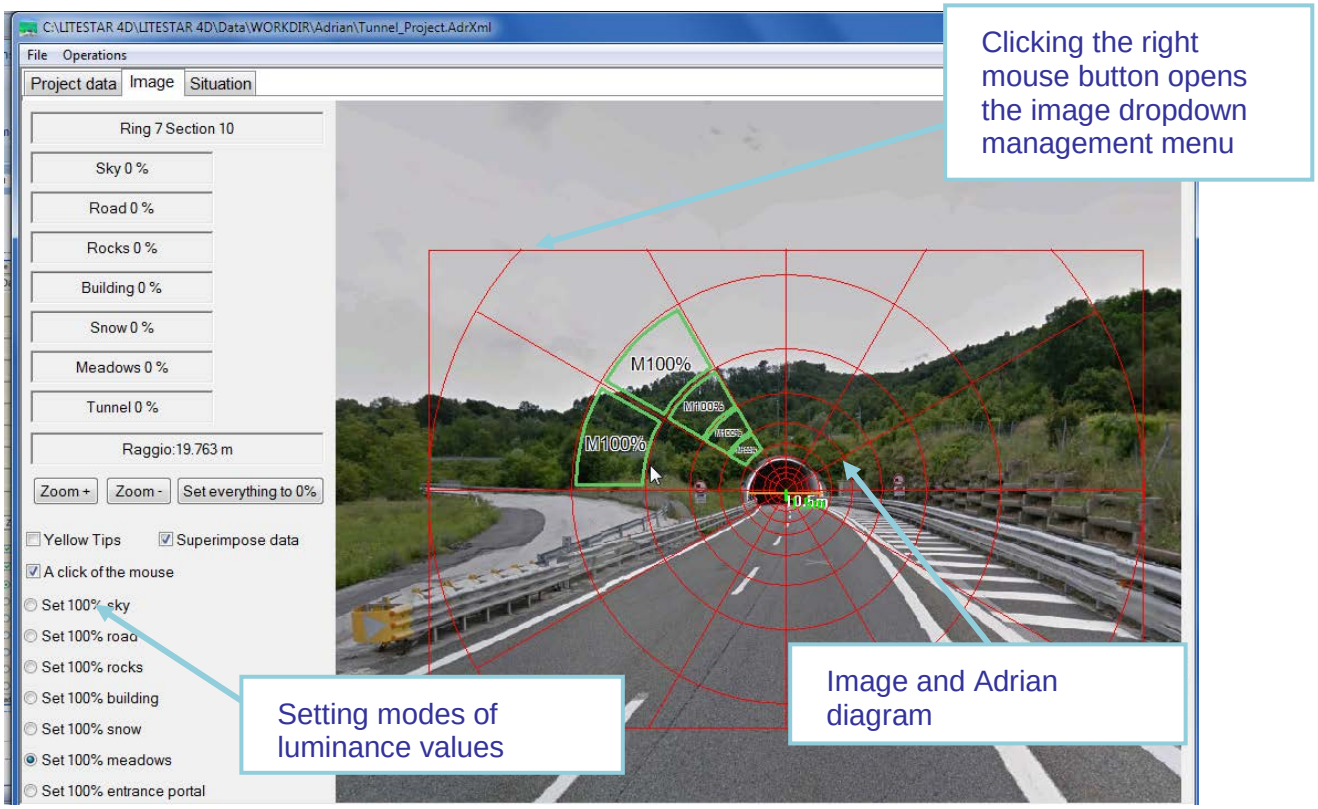
Luminance curve

Image TAB – Adrian diagram

Clicking on the *Image TAB* opens the window in which to set the data necessary for calculating the veil luminance using the Adrian diagram.

In this section it is possible to insert the photographs of the tunnels and calculate the relative veil luminance.

To insert the image just press the right mouse button and click on *Substitute/Insert Photo*, selecting it from the folder where it is saved.



Note

The dropdown image management menu contains the following:

- ***Set Center***: this indicates the point where the center of the entrance will be positioned;
- ***Measurement point 1***: this indicates the first point to take the reference measurement;
- ***Measurement point 2***: this indicates the second point to take the reference measurement;
- ***Values***: this opens the values table relative to the selected segment;
- ***Show Linear Measurement***: this shows the reference measurements;
- ***Hide Linear Measurements***: this hides the reference measurements;
- ***Substitute/insert photo***: to insert or substitute the reference image.

Luminance curve

Inserting an image

The first step in calculating the veil luminance, with a photo at your disposal, is to insert the image of the tunnel under examination.

To do this just click with the right mouse button in the center of the TAB, so as to visualize the dropdown menu in which to select *Substitute/insert Photo*.

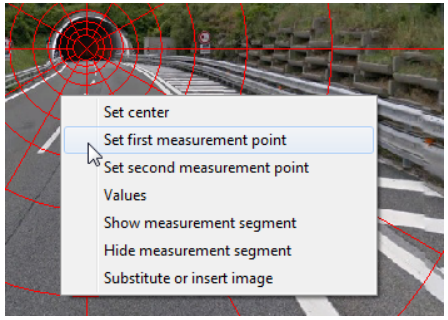
This will open a dialogue window which will allow you to look for the image to be uploaded.

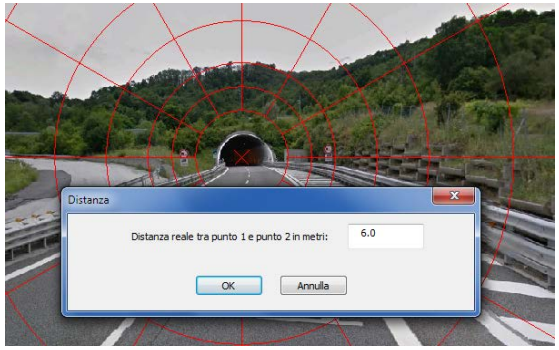
After inserting the photo, it will have to be centered in the diagram and rescaled, so that the diagram image and that of the tunnel are on the same scale.

To do this you must:

- Click with the right mouse button on the first point to be measured (for example the left side of the entrance), and select *Measurement point 1*;
- Click with the right mouse button on the second point to be measured (for example the right side of the entrance) and select *Measurement point 2*;
- A window will now open in which to type the reference value in meters;
- Finally to center the image in the center of the diagram at a height of 1.5m just click with the right mouse button on the central point of the entrance, at an estimated height of 1.5m and select *Center is here*.

The image will thus be visualized with the graph, with the reference value and insertion center highlighted (to hide these values just select *Hide Linear Measurements* with the right mouse button).





Notes

The photo of the tunnel, as required by the norms, must be taken at the center of the carriageway (if possible), but above all at a distance at least equal to the stopping distance and with a lens that covers a horizontal viewing angle that is greater than 60°.

If you do not have an image of the tunnel under examination or measurements are being performed with the luminance meter, it is possible to insert the veil luminance directly by selecting Fixed by the user in the Lv dropdown menu and typing the value in the box on the right of the menu.

Luminance curve

Calculating the veil luminance

To calculate the veil luminance each segment of the Adrian diagram must receive an “environmental” value.

To do this you must:

- Flag the field *A click of the mouse*, with the left mouse button, to activate the various values of luminance available, subdivided into types of environmental conditions (situated on the bottom left);
- Set the type you wish to highlight in the graph: for example 100% entrance means that all the selected segments will acquire the luminance characteristics relative to the entrance;
- At this point select the segments of the diagram belonging to that type with a click of the left mouse button inside the segment;
- Then position the mouse on the highlighted segment and click with the right mouse button to select the *Values* command, with which to modify the characteristics of the quadrant, should the zone not belong entirely to a single category (in the image below the highlighted sector presents characteristics that are 70% rock and 30% vegetation);
- Once the operation is complete, access the *Situation TAB* to visualize the luminance curve obtained.

Notes

The luminance values relative to the different types of environmental conditions can be viewed in the Situation TAB, and vary according to the settings in the *Project Data TAB*, in the *Traffic direction* field.

If some of the sectors are not highlighted it will not be possible to calculate the luminance curve. To verify the accuracy of the analysis just access the *Situation TAB* and verify that, in the summary graph on the top right, no sector is highlighted in red.

By setting *Yellow Window* it is possible to visualize a values summary window, relative to the individual sector. Just place the mouse cursor on the sector to visualize the window.

By selecting *% in the graph* the percentages in every single sector will be visualized.

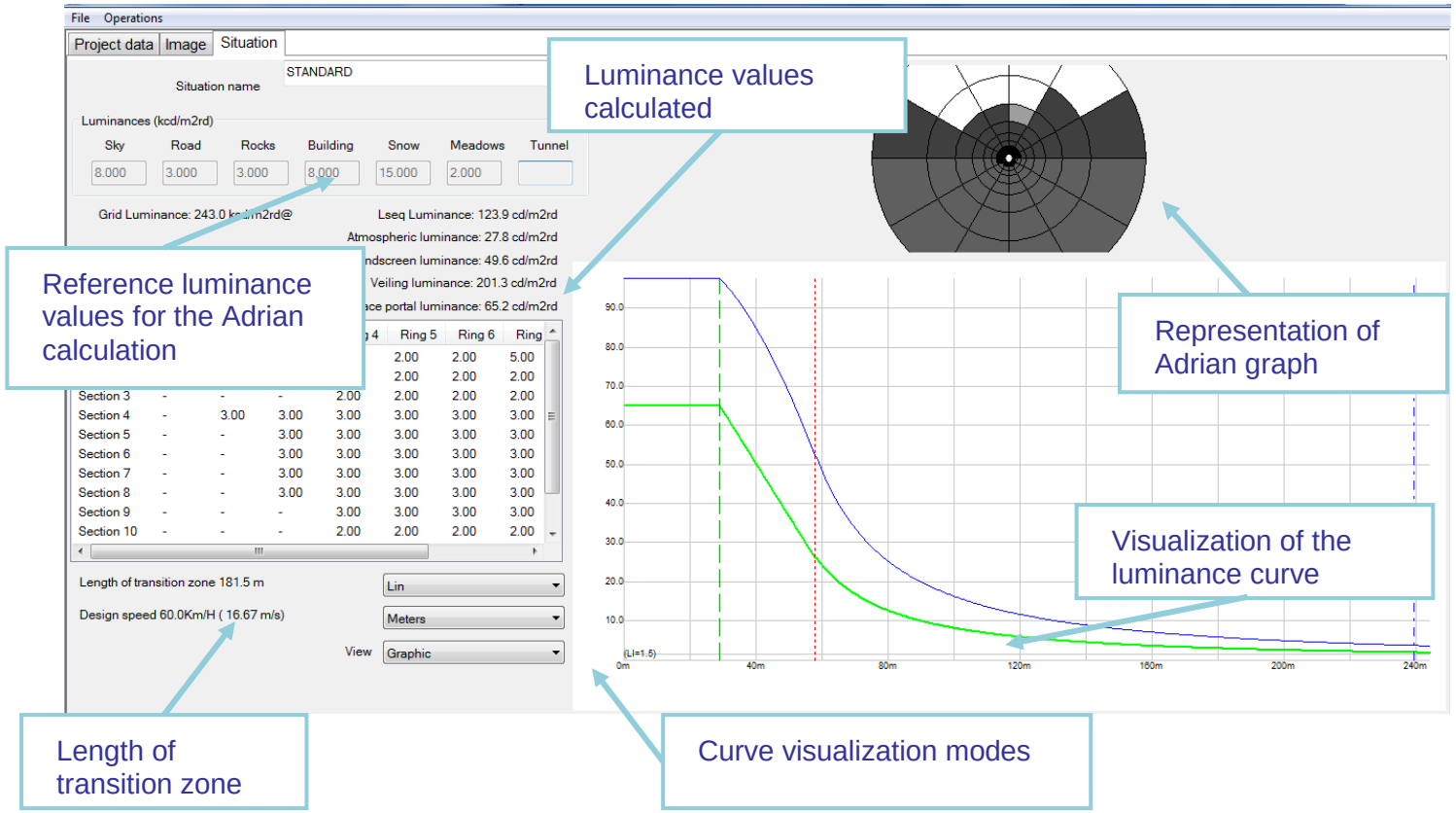
The *Reset to 0%* instead allows you to reset the values inside the image.

Luminance curve

Situation TAB – Luminance curve

Click on the *Situation TAB* to open the window where the results of the Adrian analysis are shown. In this section you can visualize the different luminance values calculated as per norm, the results obtained for the individual sectors and finally, the theoretical luminance curve.

In this section you can check that all the Adrian sectors have been examined (the sectors that have not been analyzed will be highlighted in red): should there be a sector that has not been examined the luminance curve will not be calculated.



Notes

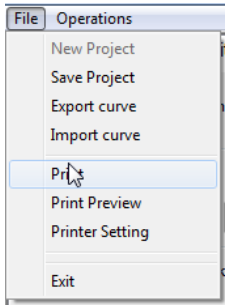
To set a new situation, in which to change the luminance parameters of the environment manually you must select *New Situation* in the *Operations* menu.

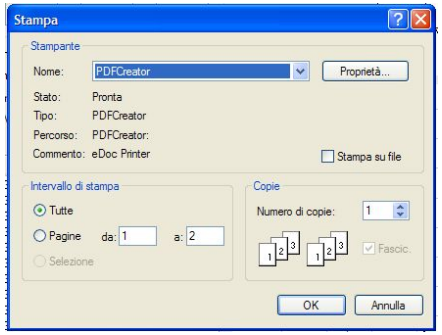
Luminance curve

Printing the curve

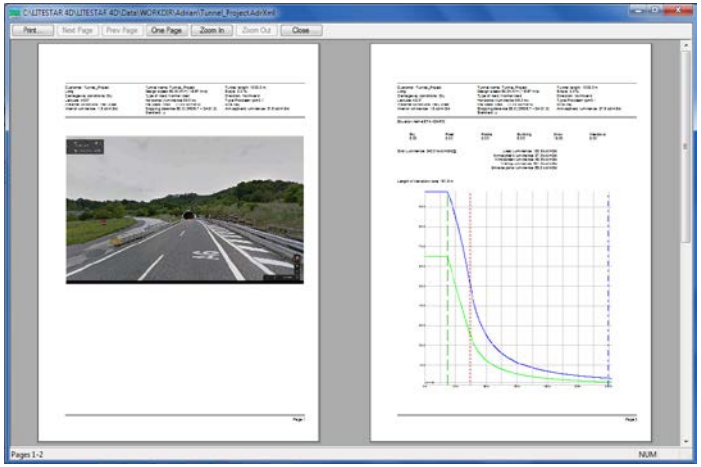
In the Adrian module it is possible to print the luminance curve obtained from the analysis of the parameters.

You can access the print window from the F*ile/Print* menu, where you can set the printer and the number of copies and pages to be printed.





Select *File/Print Preview* to visualize the preview of the pages that will then be printed.



Note

Print

From the drop-down menu *File/Print* you can access the dialog window of project printing (Print manager).

This window allows you to print the whole project and associated images, to insert information related to the project, to set up a cover, to choose the elements of the project to be printed.

Moreover here the printout language and favorite printer can be chosen.

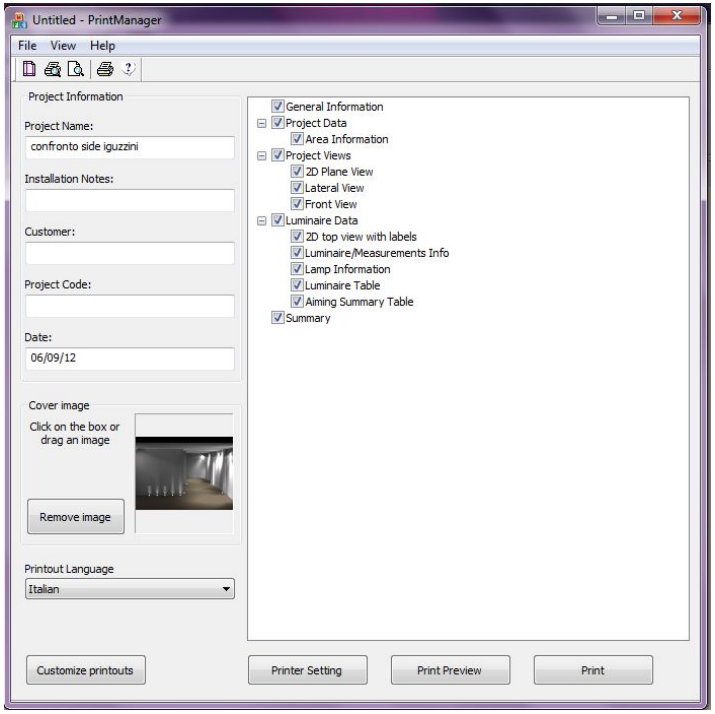
To select the items to be printed just flag the relative boxes (the window opens by default with all elements selected).

The data can be viewed in the print preview.

The window contains the following:

- ***Project information***: here you enter the information relating to the current project;
- ***Cover image***: here you configure the image to be entered on the first page of the printout:
  - Click on the box to choose the image to be inserted
  - Alternatively the image can be dragged with Drag&Drop from the window of origin directly into the box
  - The Remove image key allows you to remove the image from the preview and cover page
- ***Printout Language***: to choose the language in which you wish to print
- ***Customize printouts***: allows access to the printout customization window
- ***Printer setting***: allows default printer setting
- ***Print Preview***: to visualize the print preview
- ***Print***: to print the project

Finally on the right of the window there is a list of all the data that can be printed: the flag indicates that the information has been selected for print.



Notes

The results tables that are visualized and then printed directly depend on the lists present in the *Results TAB*, on the left of the screen.

We remind you that to visualize the results you must:

click on the *Summary* icon and select the tables to be visualized

To select a number of results at the same time, just keep the CTRL key pressed and click with the mouse on the items of interest.

The selected results will be inserted in the relative TAB and will be viewable in the design area with a double mouse click.

Print

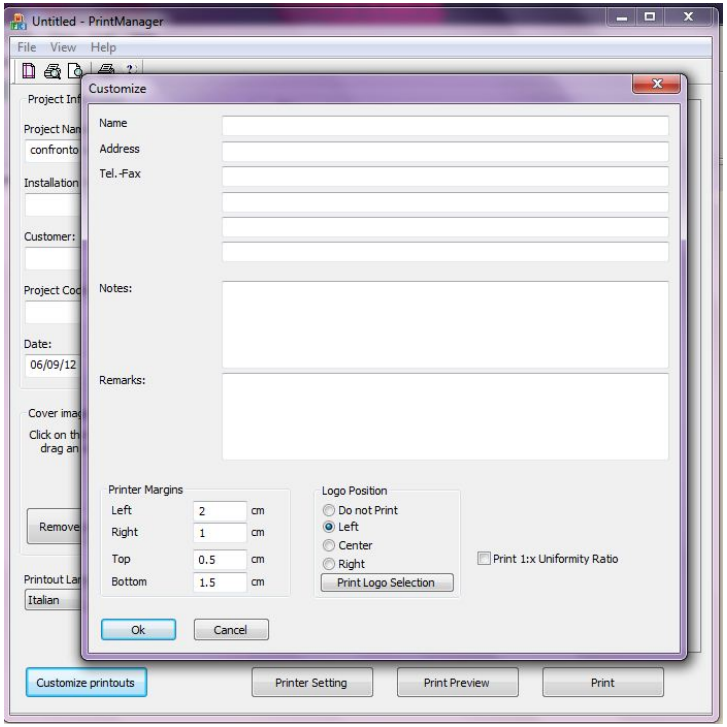
Customizing printouts and choosing the logo

The *Customize printouts* key gives access to the window where you can set:

- The data relating to the designer and project notes
- ***Printer margins***, that is the margins of the printout sheet
- ***Logo position***:
  - Do not print: to print no logo
  - Left: to print the logo in the top left
  - Center: to print the logo in the top center
  - Right: to print the logo in the top right
- ***Print logo selection***: to choose the print logo

Selection of the *Print logo selection* key opens a dialog window in which to search for the folder containing the logo to be used.

Once the settings relating to the logo (selection and position), printout margins and project data have been configured, they will be maintained for all the program modules.



Notes

Once the program has been installed, the printout **logo** can be directly linked with the following essential characteristics:

- Format: BMP
- Recommended dimensions: height max. 2cm, width max. 21cm

The logos that are not in scale will be automatically rescaled by the software with the risk of losing their proportions.

Scripting

Litecalc 4D is enforced with a Python scripting module version 2.6.5 in order to have an automatic engine to drive some operation.

Selecting *Scripting* from *Tools* menu will open a text window divided in two parts: in the upper one there is the text of the script (input window), in the lower one there is the output window.

At the bottom of the window some button allow to:

- ***Run***: Execute the code in the input window,
- ***Load File***: Open a File window in order to load a Python script , usually with a .py extension.
- ***Load Run***: Open a file and execute it.
- ***Clear Input***: clear the input window
- ***Clear Output***: clear the output window

The structure of the language is the one described in the Python Reference Manual, for a complete reference see in Bibliography.

Line structure

A Python program is composed by a number of logical lines.

Logical lines

The end of a logical line is represented by the token NEWLINE. Statements cannot cross logical line boundaries except where NEWLINE is allowed by the syntax (e.g., between statements in compound statements). A logical line is constructed from one or more physical lines by following the explicit or implicit line joining rules.

Physical lines

A physical line ends in whatever the current platform's convention is for terminating lines. On Windows, it is the ASCII sequence CR LF (return followed by linefeed).

Comments

The hash character (#) mark the beginning of a comment that will stop at the end of the line. It is not necessary that the comment begin at first position of the line.

```
# Beginning of the procedure
a = b + c      # a is the sum of b and c
```

Explicit line joining

Two or more physical lines may be joined into logical lines using backslash characters (\), as follows: when a physical line ends in a backslash that is not part of a string literal or comment, it is joined with the following forming a single logical line, deleting the backslash and the following end-of-line character. For example:

```
if 1900 < year < 2100 and 1 <= month <= 12 \
and 1 <= day <= 31 and 0 <= hour < 24 \
and 0 <= minute < 60 and 0 <= second < 60:
return 1
# Looks like a valid date
```

A line ending in a backslash cannot carry a comment. A backslash does not continue a comment. A backslash does not continue a token except for string literals (i.e., tokens other than string literals cannot be split across physical lines using a backslash). A backslash is illegal elsewhere on a line outside a string literal.

Notes

Commands should be invoked as methods of oxy module.

In Python window are available all the modules included in the standard language, hence if you want to add math capabilities to your script just type:

```
import math
print math.pi
```

This will print the value of Π.

Or, if you want to print the current version of Python, type:

```
import sys
v = sys.version[:3]
```

For a complete list of modules available please see:

http://docs.python.org/library/

Scripting

Implicit line joining

Expressions in parentheses, square brackets or curly braces can be split over more than one physical line without using backslashes. For example:

```
month_names = \
['Januari','April','Juli','Oktober',      # These are the
 'Februari','Mei','Augustus','November',  #  Dutch names
 'Maart','Juni','September','December']   #  for the months
                                          # of the year
```

Implicitly continued lines can carry comments. The indentation of the continuation lines is not important. Blank continuation lines are allowed. There is no NEWLINE token between implicit continuation lines.

Blank lines

A logical line that contains only spaces, tabs, formfeeds and possibly a comment, is ignored (i.e., no NEWLINE token is generated). During interactive input of statements, handling of a blank line may differ depending on the implementation of the read-eval-print loop. In the standard implementation, an entirely blank logical line (i.e. One containing not even whitespace or a comment) terminates a multi-line statement.

Indentation

Leading whitespace (spaces and tabs) at the beginning of a logical line is used to compute the indentation level of the line, which in turn is used to determine the grouping of statements.

First, tabs are replaced (from left to right) by one to eight spaces such that the total number of characters up to and including the replacement is a multiple of eight (this is intended to be the same rule as used by UNIX). The total number of spaces preceding the first non-blank character then determines the line's indentation. Indentation cannot be split over multiple physical lines using backslashes; the whitespace up to the first backslash determines the indentation.

Notes

Scripting

Creation instructions

- ***createAmbient***: create an Ambient
  Parameters
  - sequence of vertices in x,y,z coordinates,
  - the height of the room if interior,
  - zero if interior, not zero if exterior.

```
oxy.createAmbient( ( (-4.0, -4.0, 0.0 ), \
( 4, -4, 0.0 ), ( 4.0, 4.0, 0.0 ), \
( -4.0, 4.0, 0.0 ) ), 3.5, 0 )
```

- ***createElement***: add a object to scene object list
  Parameters
  - The object to be created
    - `sensor` add a sensor to the scene
    - `projector` add a projector to the scene

```
oxy.createElement( "sensor" )
oxy.createElement("projector")
```

Layer intructions

- ***layer***: manage the layers
  Parameters
  - action activated
    - `Create` create a new layer
    - `Assign` assign the specified the active object to layer
  - specified the name of the layer

```
oxy.layer( "create", "ext_walls" )
oxy.layer( "assign", "ext_walls" )
```

File instructions

- ***loadProject***: to load a stored project
  Parameters
  - A fully qualified .prj project previously stored

```
oxy.loadProject( "C:\\...\\_house_v3.prj")
```

- ***saveProject***: to store a project
  Parameters
  - A fully qualified .prj file name

```
oxy.saveProject( "C:\\Doc…\\Prt…\\Doc…\\house.prj")
```

- ***importFile***: to add external objects to scene objectlist
  Parameters
  - Type of file allowed to import:
    - Oxl – Litestar's Litepack
    - Lms – Litestar 3D object library
    - 3ds – Autodesk 3D studio file type
    - Obj – Wavefront .obj 3D geometry definition file format
  - A fully qualified file name

```
oxy.importFile( "oxl", oxlPath + " wallasher.oxl" )
oxy.importFile( "lms", objPath + "cube.lms" )
oxy.importFile( "3ds", objPath + "Siteplan_c.3ds" )
oxy.importFile( "obj", objPath + "Torre0x8x6.obj" )
```

Notes

A good practice is to move local path information to global variables.

Remind that the backslash sign used to divide the sequence of directories should be doubled.

```
objPath="c:\\..Data\\libraryDB\\meshes\\"
oxlPath="c:\\..\\Oxl\\”
```

OxyTech

Scripting

Positioning instructions

- ***rename**:* rename the selected object
  Parameters
  - A valid name

```
oxy.rename( "Light_4" )
```

- ***move**:* move an object. Active on the current selection
  Parameters
  - Values of translation in x, y, z
  - Type of translation (compulsory)
    - Absolute
    - Relative
  - Space – space of transformation (compulsory)
    - 0 – object
    - 1 – local
    - 2 - word

```
oxy.move( 6.450, 2.0, 2.5, absolute=1 )
```

- ***rotate**:* rotate an object. Active on the current selection
  Parameters
  - Values of translation in x, y, z

```
oxy.move( 0, 0, 180)
```

- ***orient**:* orient an object. Active on the current selection
  Parameters
  - Values of the goal point in x, y, z

```
oxy.orient(-98.167931,-51.276154 ,57.720081)
```

- ***scale**:* scale an object. Active on the current selection
  Parameters
  - x, y, z scale values
  - Type of translation (compulsory)
    - Absolute
    - Relative
  - Space – space of transformation (compulsory)
    - 0 – object
    - 1 – local
    - 2 - word

```
oxy.scale( 0.4, 0.4, 0.4, absolute=1 )
```

- ***select**:* select an object
  Parameters
  - Values that identifies the object

```
oxy.select(167931)
```

Notes

Scripting

Output instruction

- ***doPrint**:* activate the printing procedure
  Parameters
  - no parameters required

```
oxy.doPrint()
```

- ***output**:* activate the printing procedure
  Parameters
  - no parameters required

```
oxy.output(s)
```

- ***dumpInfo**:* store a file information of
  Parameters
  - name of the object
  - Fully qualified txt file
  - Name of the sensor to be dumped

```
oxy.dumpInfo( "lightControl", " C-5.txt", "Snsr_1")
```

- ***getSelection**:* returns the list of identification codes of objects selected in the scene.
  Parameters
  - no parameters required

```
oxy.getSelection()
```

- ***selectByName**:* select an object by name
  Parameters
  - Value or name that identifies the object

```
oxy.selectByName(“Light_2”)
```

- ***duplicate**:* duplicate an object. Active on the current selection. The name of the object will increment the counter: e.g. Light_1 will become Light_2, Light_3 and so on.
  Parameters
  - no parameters required

```
oxy.duplicate()
```

Notes

OxyTech

Scripting

Property instructions

- ***setParameter**:* change the parameter of an active luminaire.
  Parameters
  - "tnLight" – the properties of the luminaire
  - Value being changed
    - SpectrumRGB
      - Rgb
        - The three values for RGB color
    - Dimmer
      - Real – the type of value
        - The value of dimming from 0 to 1

```
oxy.setParameter("tnLight", "SpectrumRGB", "rgb", ( 0.45, 0.9, 0.45 ) )
oxy.setParameter("tnLight", "dimmer","real",0.0)
```

Calculation instructions

- ***startCalc**:* start the calculation procedure.
  Parameters
  - Type of calculation
    - 0 – do not calculate reflected light
    - 1 – calculate reflected light
  - Precision of calculation
    - 0 – lower
    - 1 –
    - 2 – medium
    - 3 –
    - 4 – grater

```
oxy.startCalc( 0, 2 )
```

Visualization instructions

- ***pointCamera**:* set the viewpoint of the camera.
  Parameters
  - "Perspective" – the view type
  - Coordinates x, y, z of the eye
  - Coordinates x, y, z of the target

```
oxy.pointCamera( "Perspective", (3,6.0,1.7), (-1.0,-1.00,2.0) )
```

- ***render**:* start the raytracing procedure.
  Parameters
  - Type of viewport
  - Resolution x
  - Resolution y

```
oxy.render( camera="Perspective", resx=1280, resy=720 )
```

Notes

Scripting

Example

Commands should be invoked as methods of oxy module, as in the following example:

```
# Variables - should be changed according to LITESTAR 4D settings
oxlPath = "c:\\Programmi\\OxyTech\\LITESTAR 4D\\Data\\libraryDB\\lights\\"
lmsPath = "c:\\Programmi\\OxyTech\\LITESTAR 4D\\Data\\libraryDB\\meshes\\"
oxy.createAmbient( ( (-4.0, -4.0, 0.0 ), ( 4, -4, 0.0 ), ( 4.0, 8.0, 0.0 ), ( 0.0, 8.0, 0.0 ), \
( 0.0, 4.0, 0.0 ), ( -4.0, 4.0, 0.0 ) ), 3.5, 0 )  # Creation of an environment
oxy.pointCamera( "Perspective", (-4.0,0.0,2.0), (2.0,2.00,2.0) ) # set of a point of view
oxy.importFile( "oxl", oxlPath + "2834_70_Corona.OXL" )      # import lights in the room
 oxy.rename( "Light_1" )                                      # rename light
oxy.move( 3.80, 1.50, 2.5, absolute=1 )                      #  move light in the room
oxy.duplicate()  # duplicate automatically rename, so oxy.rename is of no use
oxy.move( 3.80, 2.0, 2.5, absolute=1 )
oxy.duplicate()
oxy.move( 3.80, 2.5, 2.5, absolute=1 )
oxy.importFile( "lms", lmsPath + "Couch04.lms" )
oxy.move( 3.45, 2.16, 0.0, absolute=1 )
oxy.rotate( 0, 0, -90)
oxy.importFile( "lms", lmsPath + "Potted plant01.lms" )
oxy.move( 3.45, 3.7, 0.0, absolute=1 )
oxy.scale( 1.4, 1.4, 3.4, absolute=1 )
# loop nine times making each time a calculation and producing a radiosity image
# see results in .....\LITESTAR 4D\Docs\ImpExp\
 ciccio=0.1
while ciccio < 0.9:                  # set the colors of the lights
      oxy.selectByName( "Light_1")
      oxy.setParameter("tnLight", "SpectrumRGB", "rgb", ( ciccio, 0.0, 1-ciccio) )     oxy.selectByName(
"Light_2")
      oxy.setParameter("tnLight", "SpectrumRGB", "rgb", ( 0.0, ciccio, 0.0 ) )
      oxy.selectByName( "Light_3")
      oxy.setParameter("tnLight", "SpectrumRGB", "rgb", ( 1-ciccio, 0.0, ciccio ) )
      oxy.startCalc(1, 2 )
      ciccio=ciccio+0.1
      oxy.render( camera="Perspective", resx=1280, resy=720 )
```

Notes

Scripting

Bibliography – printed books

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- Allen B. Downey - Think Python - How to Think Like a Computer Scientist - 2008
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Bibliography – open source material

- Python Documentation
  http://www.python.org/
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  http://www.freenetpages.co.uk/hp/alan.gauld/
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Notes