Visual

Professional Edition User's Guide

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Visual User's Guide

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The Program includes lighting design and analysis tools and performs general lighting and ultra-violet germicidal irradiation (“UVGI”) calculations, using publicly available sources of data and/or user provided data. Calculated values are based on such input data, although photometry extrapolated from a test using a different *lamp* than indicated may be used. End-user environment and application (including, but not limited to, voltage variation and dirt accumulation) can affect uniformity, glare or other *photometric* issues, and can cause actual performance to differ from calculated values. As the user of the Program, You are solely responsible for the selection of the Program to achieve your intended results, for the installation and use made of the Program, and for the results obtained from the Program. For clarity, You are solely responsible for selection of appropriate lighting products and applications that meet the applicable project requirements for lighting and illumination, including requirements for lighting system suitability and safety. The designs, analyses and calculations provided by this Program are not a substitute for independent engineering analysis and testing, whether for lighting safety, system performance, suitability of products, or effectiveness of analyses for use in a particular application.

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Should you have any questions concerning this Agreement or the Programs, or the Documentation, please contact Acuity Brands Lighting, Inc. by calling (800) 279-8043.

System Requirements

Visual has been developed for the Microsoft Windows operating system. The minimum system requirements for Visual 2.7 are:

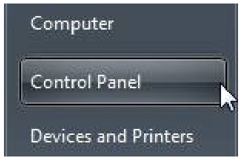
- Operating System: Microsoft Windows XP/Vista/Windows 7/ Windows 8
- Processor: Intel Dual or Quad Core (2.4 GHz minimum) 32 or 64 bit
- Memory: 2GB minimum, 4 GB recommended
- Video Card: 256MB RAM, 512MB recommended, supports Open GL
- Hard Drive: 80 MB to 120 MB available space
- Virtual Memory: Minimum set to 3000 MB Learn how to change your virtual memory

Windows Firewall

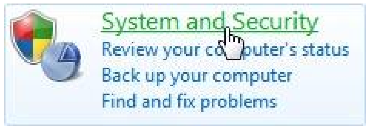
One of the security features that Microsoft provides to keep your information private is the Windows 7/8 Firewall. To get the most out of the firewall, you need to tell Windows to allow certain trusted programs to break through. Images from Windows 7 are shown. Individual system configuration may vary, but the commands necessary are in the same place(s).

A firewall is designed to keep your computer safe from outsiders by preventing anyone or any program from entering or exiting your computer via the Internet. Programs that you have that need to access the Internet, such as Visual Lighting Software, are going to be stopped dead in their tracks. To keep things running smoothly, you need to tell Windows Firewall which programs are safe.

Open the Windows Start Menu and select *Control Panel*.

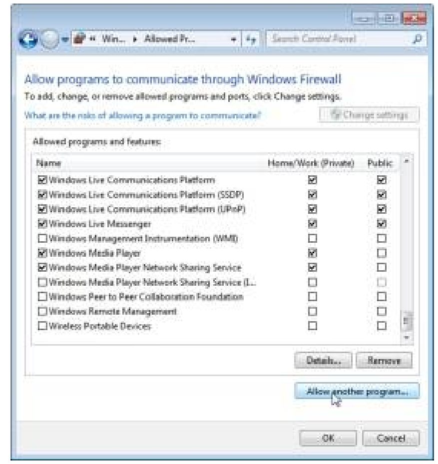


Select *System and Security*.



Select *Allow a program through Windows Firewall* .

Click *AllowAnother Program* at the bottom of the *dialog*.



Locate the entry “Visual 2012” and select *Add*.

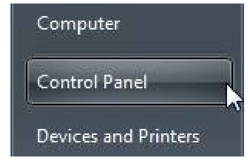
Close Control *Panel* by clicking the red X.

Use of other security and/or firewall software may impact program operation. Modification of settings in non-Windows applications is the responsibility of individual users and is not supported.

Proxy Servers

If you have a proxy server, you need to set it to work properly with Visual.

Open the Windows Start Menu and select Control *Panel*.

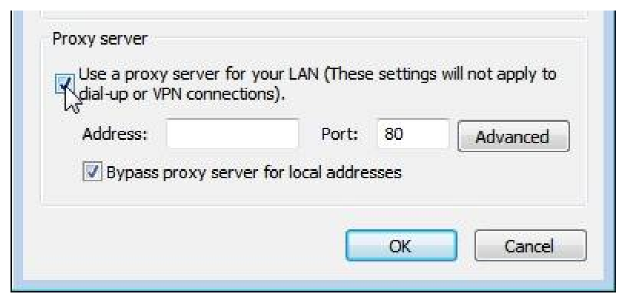


In the Control *Panel*, select Network and Internet.

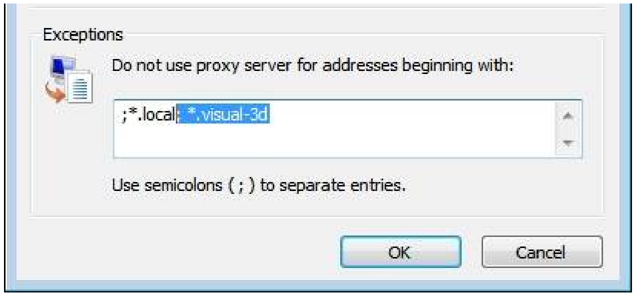
In the Network and Internet settings *dialog*, select Internet Options.

In the Internet Properties *dialog*, select the Connections *tab*. Then select LAN Settings at the bottom of the *dialog*.

In the Proxy Server section of the *dialog* that appears, click the checkbox if necessary and then click the Advanced button.



In the Exceptions section, add an entry for Visual that includes the separating semicolon and "*.visual-3d".



Close all dialogs that remain open by clicking OK as necessary. This setup is independent of the web browser(s) used on the computer.

Installation, Registration and Technical Support

Installation

1. Download the setup program from www.visual-3d.com/Software/Download.aspx .
2. The Visual Installation program will begin running. Follow the instructions that appear on your screen.
3. Visit www.Visual-3D.com to check for program news and updates.

Manual Comments

Comments on the User's Guide are welcome at: support@Visual-3D.com

If you search for an Index topic and it isn't there, please Email us your Index topics

Registration

It is important that we keep all users informed of updates for Visual. To *register* as a Visual user, please create an account on the Visual website: www.Visual-3D.com

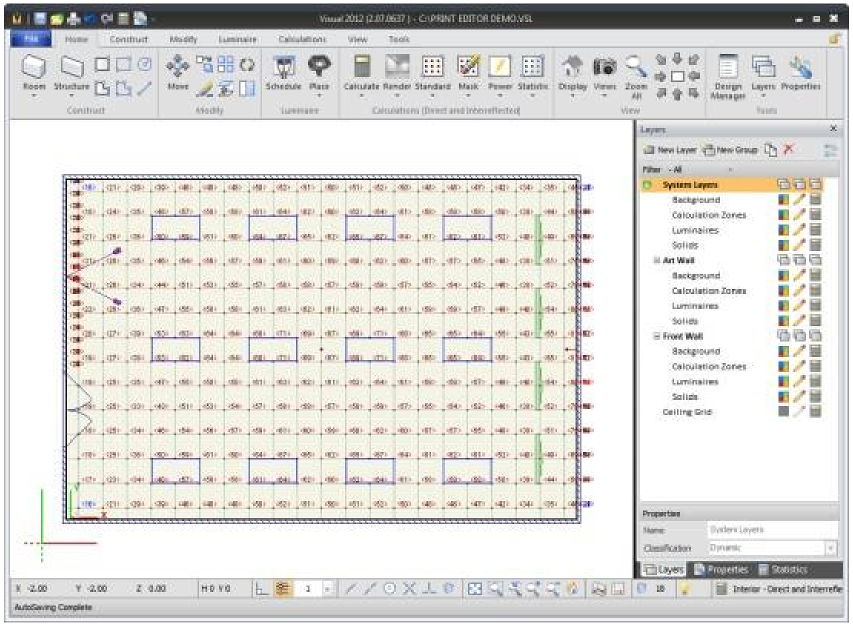
Technical Support

For technical support questions, please visit the Support section of the Visual website or contact the Visual Support Center via email or telephone:

- Internet: www.Visual-3D.com
- Email: support@Visual-3D.com
- Phone: 1-800-279-8043, Monday - Thursday 7:30 AM-5:30 PM EST and Friday 8:00 AM - 12:00 PM

Chapter 1 - Visual Interface

The Visual interface consists of the **Ribbonbar**, **Design Window**, **Status Bar**, and **Sidebar**. The following chapter is meant to provide an overview of the basic functionality and graphical layout of each of these program components. Details will be discussed in subsequent chapters.

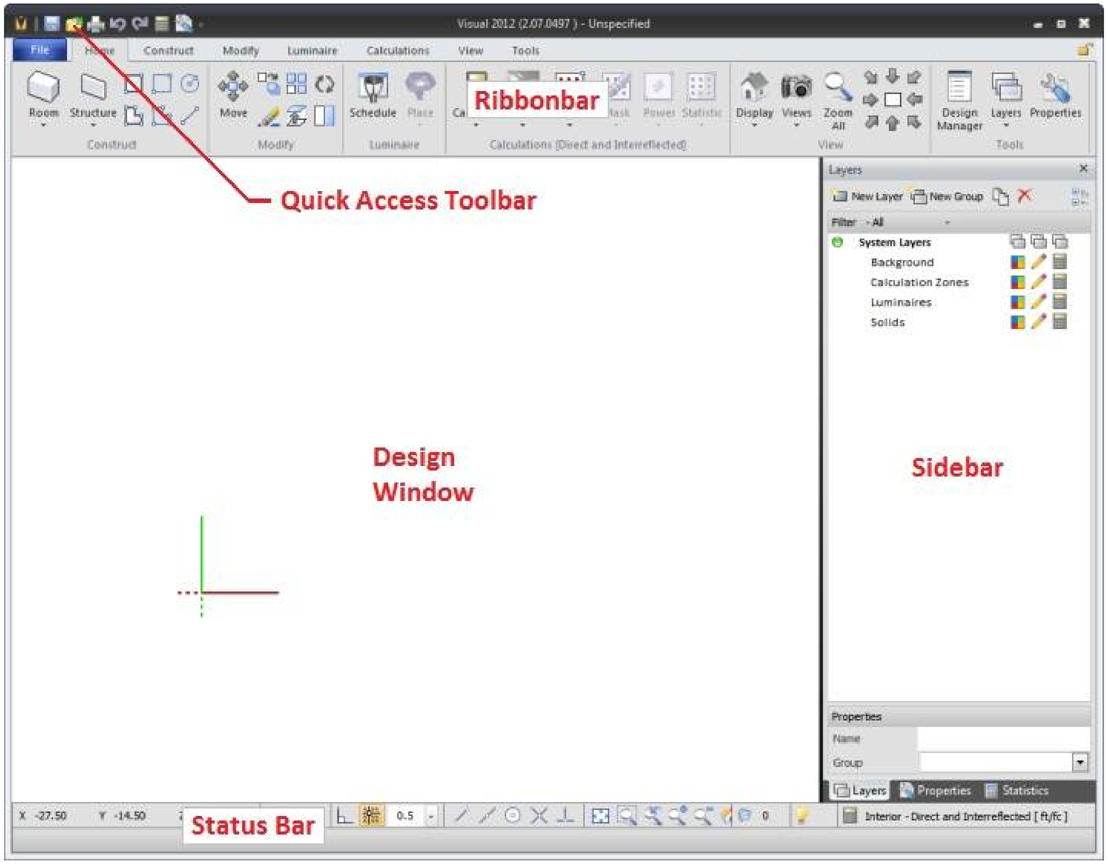


1.1 Design Environment

The **Design Environment** is the central element of the Visual interface and is where most user interaction takes place. It also serves as the gateway to all of the other elements. This is where the lighting *model* is constructed and analyzed to develop a final design.

The **Design Environment** has four components; **Ribbonbar**, **Design Window**, **Sidebar**, and **Status** bar. The **Quick Access Toolbar** is additionally located at the upper left to hold common commands. Each element handles a specific function that remains consistent throughout program operation.

An overview discussion of each is provided in this chapter, while specific command execution is discussed in other chapters.



1.1.1 Quick Access Toolbar

The **Quick Access Toolbar** in the upper left corner of the **Design Environment** provides convenient access to common commands in the Visual title bar.

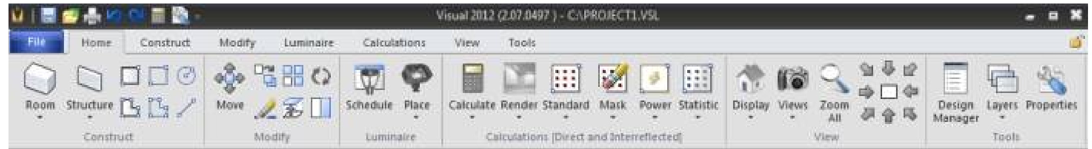
Default commands are **Save**, **Open**, **Print Editor**, **Undo**, **Redo**, **Calculate**, and **Properties**. The **Quick Access Toolbar** can be customized with commands useful to each user by clicking the down arrow on the right side of the buttons.

See Customize Dialog for more information.

1.1.2 Ribbonbar

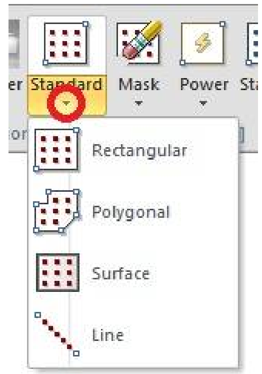
The **Ribbonbar** is the graphical menu interface housing all Visual commands. The commands on each *tab* are sub-grouped into *panels* to make navigation easier. Using a **Ribbonbar** style allows easier location of commands via images and text that then allows for more commands to be shown.

Common commands are located on the **Home** *tab*. Subsequent *tabs* group commands into different function families.

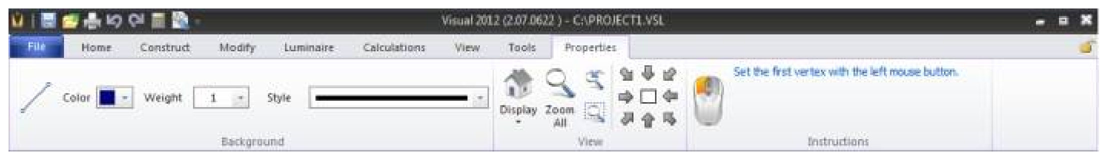


The presence of a small downward arrow below the button graphic indicates a sub-menu is available for more detailed selection.

For example, there are four options for placing a **Calculation Zone** as shown at right.

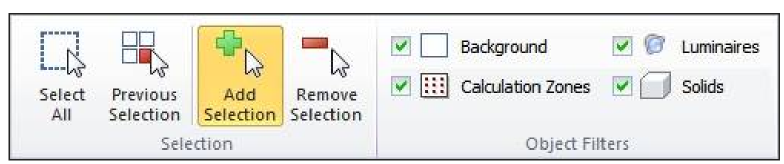


When executing a command, the *context-sensitive* **Properties** *tab* will appear. The **Properties** *tab* provides an interface for the specification of command parameters. As an example, the **Properties** *tab* that appears after executing the **Line** command is shown at right. This allows for the specification of object parameters at creation.



The **Lock** in the upper right corner of the **Ribbonbar** makes the **Ribbonbar** behave more like a menu system in that after navigating to a *tab* and executing a command, Visual will return to the **Home** *tab*. Otherwise, the selected *tab* continues to have focus.

While executing **Modify** commands (**Copy**, **Move**, **Erase**, etc) the **Properties** *tab* will display the **Selection** and **Object Filters** *panels*. These buttons and checkboxes allow you to decide which objects Visual will "grab" if selected. For more information about object selection, reference [Selecting Objects](#).



On command *tabs*, the **View** *panel* is shown to enable quick use of those functions as the design is completed.

Visual shows the **Instructions** *panel* on the **Properties** *tab* to provide step-by-step instructions related to commands.

For more information about navigation, reference Getting Started. For more information on each *tab* see The Command Tabs.

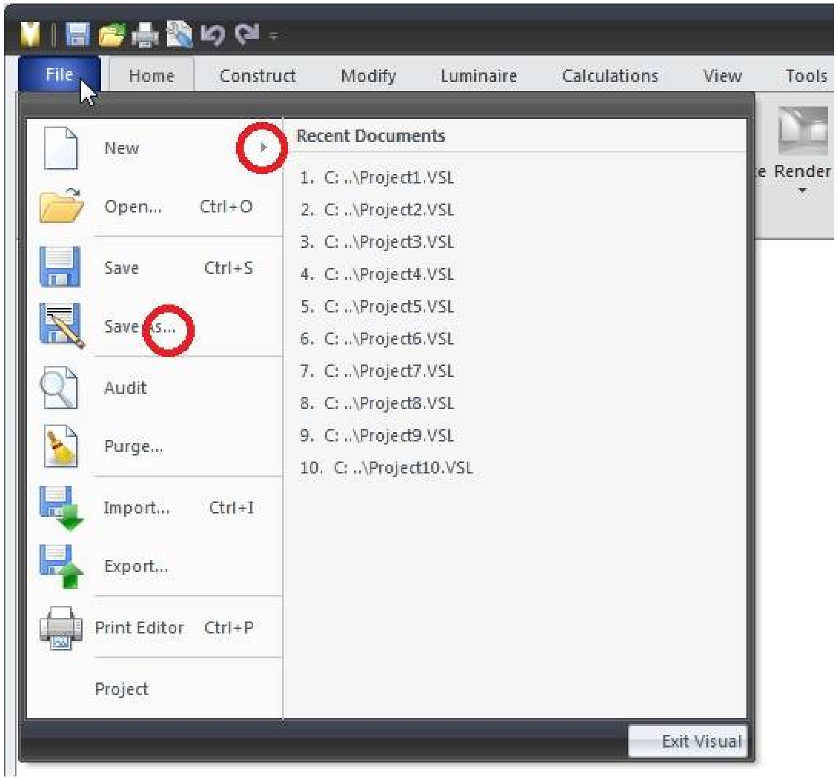
1.1.3 File Menu

The **File** menu is a part of the **Ribbonbar** but functions like a traditional menu instead of as part of the ribbon. The **File** menu is where new projects are created, VSL files are opened and saved, projects are verified with the **Audit** command, *DWG* and *DXF* files are imported and exported, and the **Print Editor** is accessed.

After clicking the **File** menu button, a drop-down menu will appear allowing further selection of several commands.

The presence of an ellipsis (...) following a menu command indicates that the command provides access to a *dialog* form, most of which should be familiar to users of other Windows-based applications.

The presence of a small right-arrow indicates that further command specification is required in the form of a sub-menu, and placing your mouse over that item will cause the sub-menu to appear at which point a selection can be made.

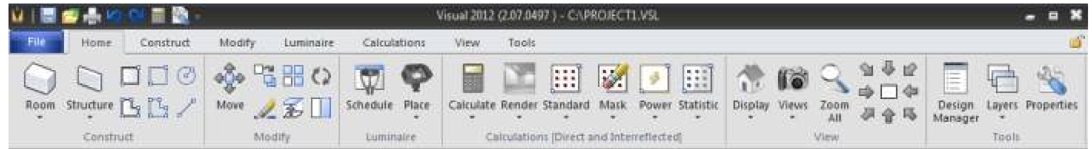


For more information see specific File Commands in the Chapter 12.

1.1.4 Command Tabs

Tabs group commands into different function families that align with the modeling process; construct objects, possibly modify them, then define *luminaires*, place calculation zones, and finally view the *model*. The commands on each *tab* are sub-grouped into *panels* to make navigation easier.

The **Home** *tab* contains common commands and sub-menus used the most. Remember that the presence of a down arrow means there is a sub-menu present; hover the mouse over buttons to see the sub-menu.



The **Construct** *tab* contains commands used to build a *model*. There a *panels* for both solid object commands and reference object commands. The Navigation *panel* is included to change the view.

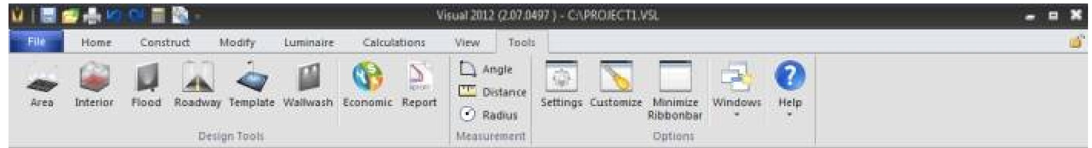
The **Modify** *tab* contains two kinds of commands to modify the design: some commands create objects from other objects and others modify the base object. The **Navigation** *panel* is included to change the view.

The **Luminaire** *tab* contains commands to build a **Luminaire Schedule**, place **Luminaires**, and modify **Luminaire** display. The **View** *panel* is included to change the view.

The **Calculations** *tab* contains commands to place **Calculation Zones** and remove (**Mask**) points from those zones to fit detailed scenarios, insert **Power Density Zones**, and sub-divide **Calculation Zones** into different **Statistical Zones** if necessary. This is also where the design is **Calculated** and **Rendered**. The **Navigation** *panel* is included to change the view.

The **View** *tab* contains commands to change how the *model* appears, provides access to saved views, and provides in-depth navigation commands to manipulate how the *model* is viewed.

The **Tools** *tab* contains links to web-based design tools, measurement commands, and buttons to initiate dialogs to change Visual options.



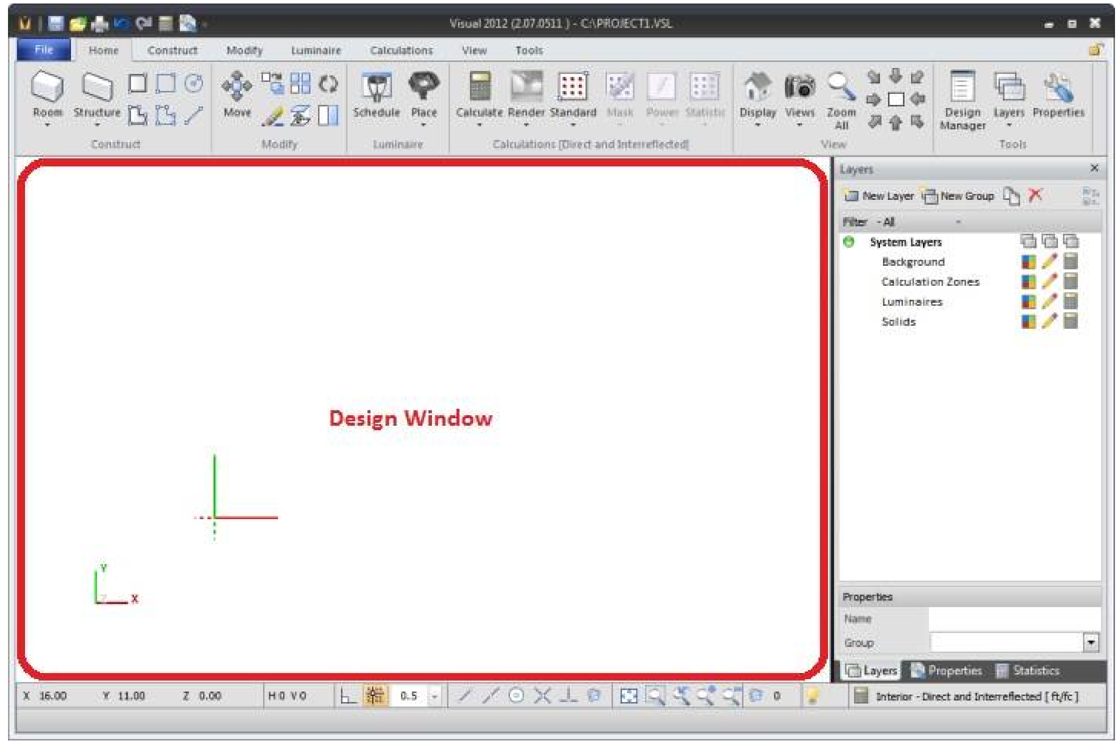
1.1.5 Design Window

The **Design Window** comprises the majority of the **Design Environment** screen. This is where lighting *models* are constructed, displayed and analyzed.

Think of the **Design Window** as the view port to the lighting *model*. There are a number of ways to manipulate the view port. It can be translated (left, right, up, or down), moved rotationally around the lighting *model* (also referred to as "orbiting"), and zoomed in and out. See View.

In Visual, the mouse cursor is a set of *crosshairs* colored for identification. The cursor changes to the standard arrow when it is outside the **Design Window**. See Mouse Pointer Navigation.

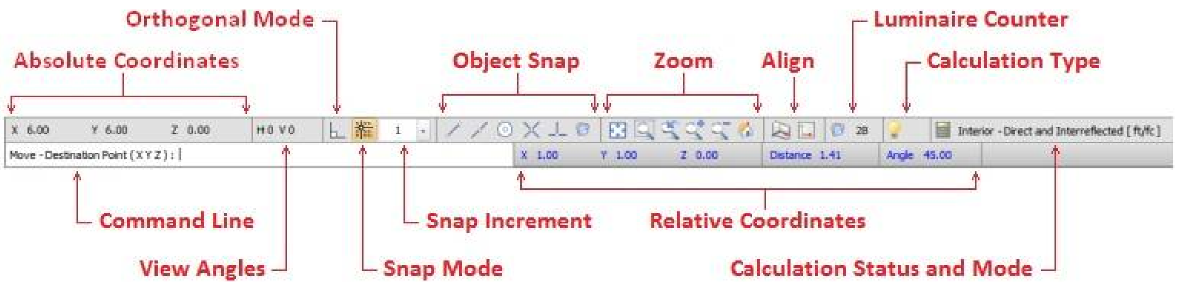
The **Global Axis** *icon* in the lower left of the **Design Window** can be turned on or off as desired. See Environment Settings.



For more information, reference Getting Started.

1.1.6 Status Bar

The **Status** bar is located at the bottom of the **Design Environment** screen, and provides continual feedback, handy tools, and command entry. The **Status** bar is always present at the bottom of the screen and contains various buttons and feedback mechanisms to make designing easier. A *toggle button* with a gold color indicates the mode associated with that button is in operation as is shown below for **Snap Mode**.



The purpose of the **Command Line** is to provide dynamic feedback and allow *coordinate* entry related to commands during program operation. Once a command has been initiated, the **Command Line** prompts the user for subsequent information such as *coordinate* and object selection. In certain cases, numerical *coordinate* entry is supported and the **Command Line** will convert to a *text box* to allow such data to be entered manually (as shown for the **Move** command). For more information, reference Entering Coordinates.

Absolute Coordinates reports the exact location (*Cartesian* X,Y,Z) of the mouse *crosshairs* within the modeling space with respect to the origin (0,0,0). For more information see Cartesian Coordinates.

Relative Coordinates reports the location (*Cartesian* X,Y,Z) of the *crosshairs* within the *model* space relative to a previously selected *coordinate* while in a command. Visual additionally displays polar *coordinates* (distance and an angle). **Relative Coordinates** are only reported for subsequent *coordinate* selections and are useful when relative distances are more convenient or intuitive than absolute locations. For more information also see Cartesian Coordinates.

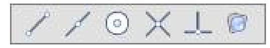
The **View Angles** section shows reference angles for how the lighting *model* is currently being viewed.

The **Orthogonal Mode** button allows the **Orthogonal Mode** to be turned on or off and indicates the mode is active when it has a gold background. This mode restricts movement to being perpendicular or parallel to the *coordinate* axes.

The **Snap Mode** button is a *toggle button* that allows the **Snap Mode** to be turned on or off and indicates the mode is active when it has a gold background. The **Snap**

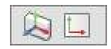
Increment *combo box* indicates what increment Visual will use if that mode is activated. Clicking the small down arrow initiates the list box for common selections (part of which is shown at far right. Custom values can be typed into the box. See Incremental Snap for more information.

The **Object Snap** buttons allow specific modes to be activated that help to draw objects more accurately. The icons provide visual cues to the modes of: endpoint, midpoint, center, intersection, and perpendicular. A mode is active when it has a gold background. See Entering Coordinates for more information.



The **Zoom** buttons allow the quick change of the view by: **Zoom All**, **Zoom Window**, **Zoom Previous**, **Zoom In**, **Zoom Out**, and **Zoom to Center**. For more information see Zoom and Basic Viewing.

The **Align Cursor to Plane** and **Align Cursor and Plane to Current View** buttons allow for easier construction of objects in specific *planes*. See



The **Calculation Status and Mode** indicates whether an interior or an exterior scheme will be used and if only direct *illuminance* will be calculated or if *interreflected illuminance* will also be calculated and presented. This field also displays units that are used; this can be feet or meters for length and footcandles or *lux* for *illuminance*. Left-click this field to display information about the last calculation time.

Calculation Type shows if electric lighting only or electric and daylighting is/are calculated. Daylighting is an additional module that can be included in Visual. See www.visual-3d.com for more information on installing daylighting capability.

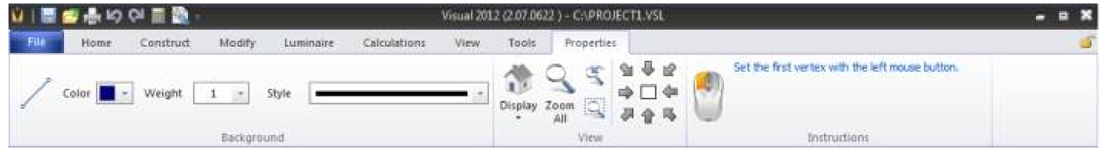
***Luminaire* Counter** as the name implies, provides an up-to-date count of the total number of *luminaires* in the lighting *model*.

1.1.7 Properties Tab

When executing commands, Visual will display the **Properties** *tab* in the **Ribbonbar**. This part of the **Ribbonbar** is a dynamic feature that allows unique attributes such as text description, *reflectance*, and height to be assigned to objects as they are being created.

The **Properties** *tab* is considered dynamic because its contents change depending on the active command.

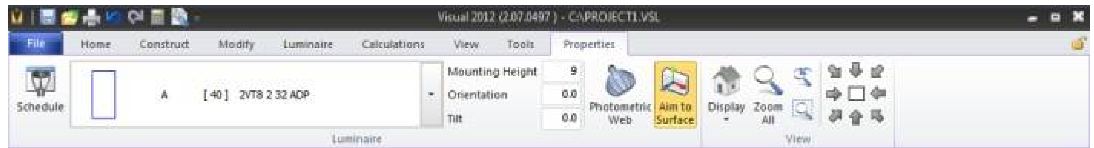
Specific elements of the **Properties** *tab* are discussed in the related section for each command that displays the *tab*.



The **Properties** *tab* works in conjunction with the **Command Line** in the **Status** bar to provide complete command specification while holding parameters constant that might be used with that command upon the next execution.

For example, specifying a 9ft *luminaire mounting height* when placing *luminaires* in one instance is likely to be applicable the next time the command is used.

Specifying a parameter does not change the Visual defaults.



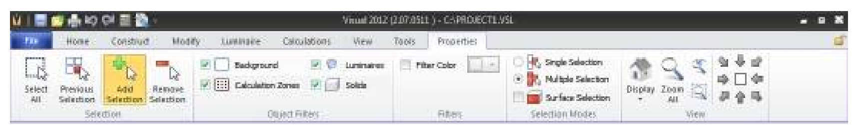
In commands where objects need to be selected, the **Properties** *tab* will include the **Selection**, **Selection Filters**, and **View** *panels*.

The **Selection** and **Selection Filters** *panels* assist in selecting objects. See [Selecting Objects](#) for more information.

The **View** *panel* is simply the **Navigation** *panel* as described in [Basic Viewing](#).

The **Properties** *tab* is separately shown when executing the **Properties** command. In this mode, additional tools are provided for advanced object selection.

In addition to the **Selection** and **Selection Filters** *panels*, the **Properties** *tab* will contain the **Filters** and **Selection Modes** *panels* that allow for further refinement of what objects Visual will add to the selection set. See [Ribbonbar Properties Tab](#) for more information.



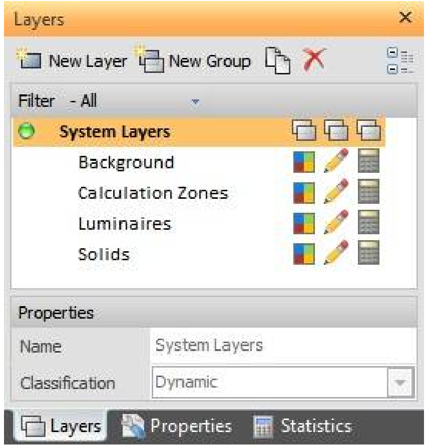
More information on specific **Properties** *tab* tools and function is included as necessary in this document as commands are discussed.

1.1.8 Sidebar

The **Sidebar** provides convenient access to three *tabs* of information that also allow for the modification of *model* object parameters and the display of calculation results.

The **Layers** *tab* contains the **Layer Manager** that controls the basic system layers as well as user-defined layers related to properties and visibility. See [Layer Manager] for more information.

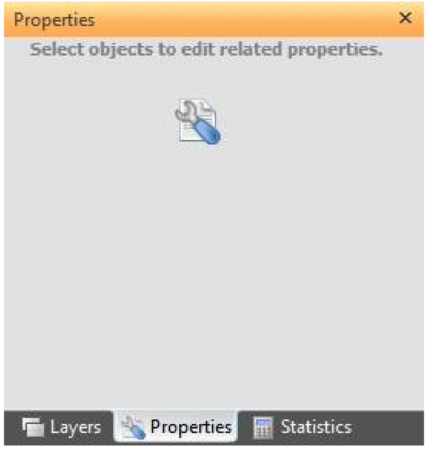
Most layer functionality is considered an advanced topic; layer functionality in Visual can be quite robust and complex. Complex designs can however be completed with simply the default **System Layers** and modest if any use of this *dialog*.



The **Properties** *tab* displays *context-sensitive* fields to control the four object types individually or in groups. When objects are selected, all parameters that can be user-modified will be displayed. See [Properties] for more information.

As with the **Layers** *tab*, most use of this *dialog* is an advanced topic.

The display name on the *tab* itself will change depending on which object type is being edited; for example, the *tab* will display "Luminaires" when ***Luminaires*** have been selected for modification. When different object types are selected, the *tab* will display "Shared Properties".

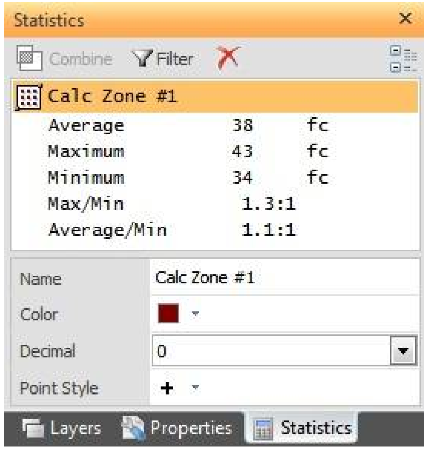


The **Statistics** *tab* displays information related to the various **Calculation Zones** and **Statistical Zones** placed in the *model*.

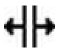
The typical statistical information is displayed, but additional fields can be added in the Settings *dialog*. See [Calculations Settings].

Clicking on a zone name will show the basic properties for that zone at the bottom of the *tab*. See [Statistics] for more information.

Use of the **Statistics** *tab* is a basic function in the use of Visual.



The **Sidebar** can be resized by left-click-drag after clicking the divider between the **Design Window** and the **Sidebar**. The cursor will change to a "double slider" to indicate the operation can occur.



(shown 2x normal size)

On occasion, Microsoft Windows and Visual don't communicate properly. This most often results in the *tabs* at the bottom of the **Sidebar** disappearing. To fix this issue see [Reset Windows]. This also resets the width of the **Sidebar** if it has been changed.

1.1.9 Command Line

One of the most important parts of the **Status Bar** is the **Command Line**. The **Command Line** provides feedback for each command related to necessary user inputs and allows for the input of *coordinate* information if desired.

Commands have a step-by-step process that must be followed. The **Command Line** provides text cues related to what type of input Visual needs to proceed. Examples being "Select Objects" and "*Base Point* (X Y Z)".

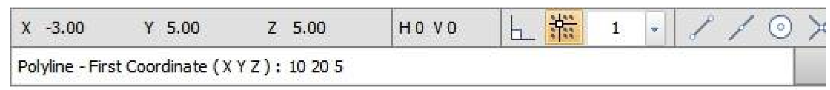
Reading the **Command Line** provides on-the-fly command reference as does the **Instructions** *panel* on the **Properties** *tab* of the **Ribbonbar**. Related information can be found in Selecting Objects.

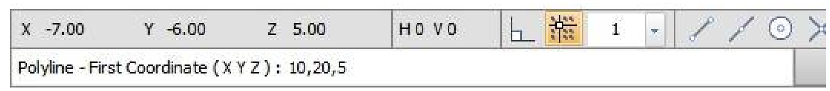
Note that all commands are moved from one step to the next by right-clicking the mouse or pressing the *Enter* key.

See Using the Mouse and Keyboard Commands for detailed information.

The **Command Line** is where *coordinate* information is input via the keyboard. It may be necessary to left-click on the **Command Line** to tell Visual to place focus there to accept input if focus has been previously placed somewhere in the Properties *tab*.

See Command Line Entry for detailed information.





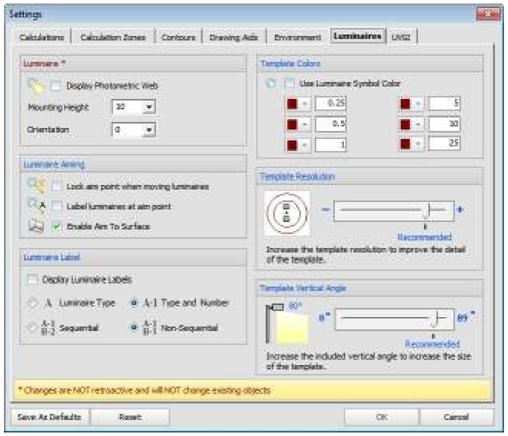
1.2 Settings Form

The **Settings** form is accessed through the **Tools** *tab* of the **[Ribbonbar]**. This is where parameters affecting the global operation of Visual are found.

The **Settings** form provides a means for customizing the interface to meet specific needs and/or user preferences.

Category selection is made from the *tabs* and the available options are shown in *panels* in each *tab*. **Settings** are logically grouped and labeled for easy identification within each category *tab*.

Graphics are included where appropriate.

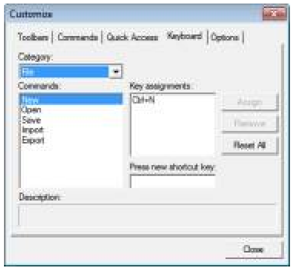


For more specific information related to the use of the **Settings** form or any of the Visual options, reference Settings Dialog.

1.3 Customize Form

The **Customize** form is accessed through the **Tools** *tab* of the **Ribbonbar**.

This multi-*tab* form is where you set the more program-specific options such as making a custom toolbar, modify Quick Access toolbar buttons, assign or change keyboard shortcuts, and change how menus behave.



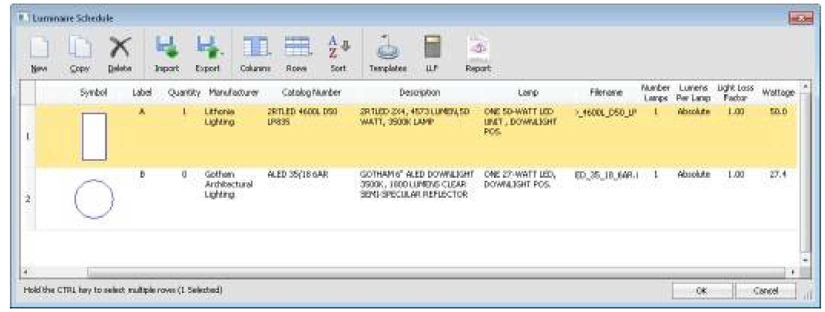
For more specific information related to the use of the **Customize** form or any of the Visual options, reference Customize Dialog.

1.4 Luminaire Schedule

The **Luminaire Schedule** is accessed through the **Luminaire** *tab* of the **Ribbonbar**. This is where the *luminaire* schedule is constructed to establish the various *luminaire* configurations available for use within the **Design Environment**.

Luminaire Types are arranged in a scrolling spreadsheet format for easy and intuitive assignment of *photometric* information, symbols, descriptions, and design templates.

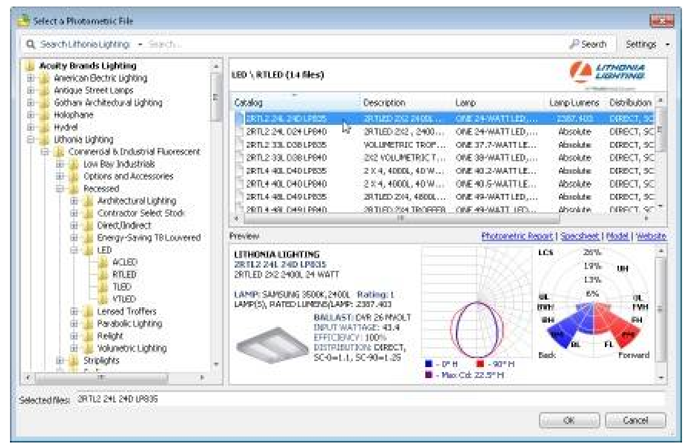
Photometric and descriptive information is accessed by selection of a valid *photometric file*, and you may then modify the *symbol*, assign templates as appropriate, and view a *photometric* report. **Schedules** can also be imported and exported in a VSC format only useful in Visual or exported in a CSV format for use in various spreadsheet programs.



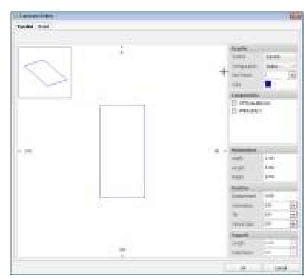
When selecting a new ***Luminaire***, Visual opens the **Select a *Photometric* File** *dialog* that is more complex but yet considerably more useful than the standard Windows *dialog* used for file selection elsewhere.

Visual includes an Acuity Brands *photometric* database but IES files from any manufacturer can be selected. When using Acuity Brands files, the *dialog* shows additional product information and graphics to make selection easier.

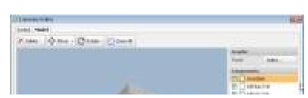
All IES files in a directory chosen in the left pane will be displayed in the upper right pane in a list format showing key parameters. After left-clicking a filename, Visual will display basic *photometric* information in the lower *panel*.



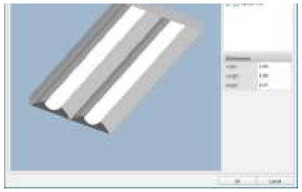
Once a *photometric file* has been chosen, it is possible to modify the ***Symbol*** by left-clicking the ***Symbol*** in the **Luminaire Schedule**, which initiates the **Luminaire Editor**. Visual chooses a ***Symbol*** that most closely resembles the basic form of the *luminaire* based on the luminous dimensions in the IES file, but any ***Symbol*** can be chosen.



The **Luminaire Editor** additionally allows for the selection and basic modification of complex solid *models* for **Shaded** and **Rendered** views. *Models* are included and automatically selected for Acuity Brands products. The inclusion of *models* for other



manufacturers is a manual process that first requires a valid *model* file to be available; creation is explained in the Luminaire Solid Models appendix.



For more specific information related to the use of the **Luminaire Schedule**, reference the Luminaire chapter.

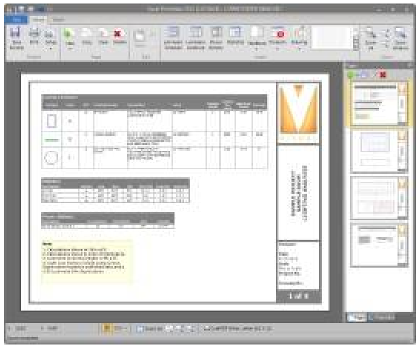
1.5 Print Editor

The **Print Editor** is accessed through the **File** option in the main menu. This separate window that opens on top of the main Visual window is where printable **Pages** are composed to illustrate the lighting design built in the **Design Environment**.

Multiple **Pages** can be built with different to-a-scale views, snapshots, schedules, notes, and statistics. Images, text, and PDF files can be placed, as well as specification sheets and images for Acuity Brands products.

The **Title Block** is customizable with graphics, borders, and other elements to provide a unique printed **Pages** if desired.

The layout and content of some elements can be saved as the default for future use.



For more specific information related to the use of the **Print Editor**, reference Print Editor.

1.6 Updating Visual

Updates to Visual are continually posted in order to improve program performance and address issues related to specific lighting *model* creation resulting from different user approaches to construction.

When Visual is started, a license check is done via the internet. In that process, version numbers are compared and Visual will display an **Update Available** button at the right end of the **Ribbonbar**.

Clicking the button launches the Visual download *page* in a web browser to allow for download.

Chapter 2 - Getting Started

The Visual user interface incorporates standard elements of software design to allow for easy basic operation of the program. There are many elements that will be familiar to users of Windows-based programs in general, and users of Computer Aided Design (*CAD*) software will find further similarities to those programs in both how Visual looks and how it operates.

This chapter discusses basic navigation using the mouse and keyboard as well as some of the basic file functions necessary to work with Visual.

2.1 Cartesian Coordinates

The *Cartesian coordinate* system is the basis for location information in Visual. This system uses 3 numbers to describe point locations from an origin.

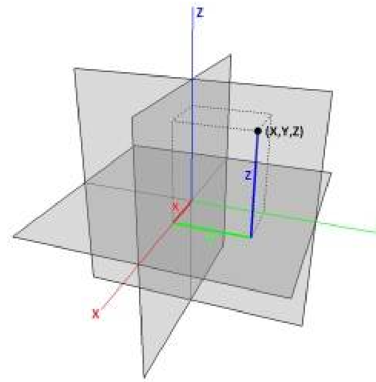
The X and Y-axes generally correspond to dimensions of length and width while the Z-axis corresponds to that of height as indicated in the diagram at right.

Distances are given in a triplet of dimensions written as (X,Y,Z). As defined (noting it is dependent on view angle as in the view at right), the X-axis is oriented left-to-right, the Y-axis is oriented top-to-bottom, and the Z-axis is oriented up-to-down (or in and out of the *plane* of the screen).

Visual assumes a Z-dimension of zero if *coordinates* are specified as a couplet (X,Y).

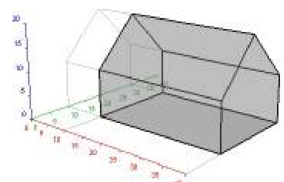
Positive dimensions are to the right, toward the top, and up or out of the screen. Conversely, negative dimensions are to the left, toward the bottom, and out of the screen.

Isometric views that are from an angled vantage point are labeled like a compass. In the example to the right, the diagram is viewed from the NE direction.

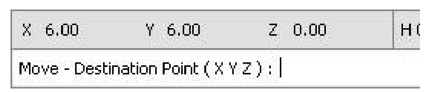


The origin (0,0,0) is not labeled in Visual and it is not necessary to construct objects starting at the origin. Objects can be placed anywhere in the *model* space.

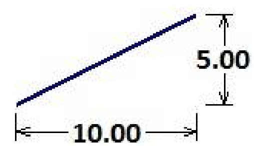
An **[Axis]** can be drawn for reference in the **Design Environment** as is shown at right for all three axes, noting that the color of each axis has been changed to *coordinate* to the axis colors used in Visual.



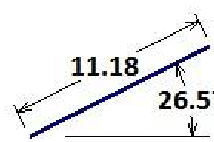
Absolute Coordinates are those that are specified and entered with reference to the origin (0,0,0). These *coordinates* are displayed in black in the top of the **[Status Bar]**. Visual displays the *coordinates* of the cursor in this part of the **Status Bar** at all times. **Absolute Coordinates** can be displayed at/with the mouse *crosshairs*, see [Environment Settings].



Relative Coordinates are displayed in the **Status Bar** while in a command. The origin for **Relative Coordinates** is the initial point of user input. For example, Visual will display an (X,Y,Z) of (10,5,0) in the blue *coordinates* on the bottom of the **Status** bar if the mouse is moved 10 units to the left (+X) and 5 units up (+Y). The Z-dimension is 0 because the *drawing* is assumed to be done in a *plane* unless user input changes that. **Relative Coordinates** can be displayed with the mouse *crosshairs*, see [Environment Settings].



As an additional part of **Relative Coordinates**, Visual displays the polar *coordinates* as a length and an angle. These reference a line created by extending from the first (or last) selection point made in the command to the current mouse position. The angle shown is between this same line and the X-axis. The "line" may be imaginary depending on the command executed; e.g. when *drawing* a rectangle.



Coordinate entry is further explained in Entering Coordinates and as required for specific commands.

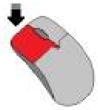
2.2 Using the Mouse

Users with Computer Aided Design (*CAD*) experience will find the manner in which Visual uses mouse clicks to be very familiar. Mainly, left-clicking selects objects, and right-clicking ends commands or initiates *context-sensitive* menus. The advanced user should have no trouble seeing where and what to click and when to click to provide the input indicated in the **Status Bar**.

In Visual, the following mouse operations are recognized:

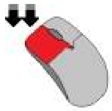
- Left-click - Click the left mouse button once
- Double-click - Click the left mouse button twice rapidly
- Right-click - Click the right mouse button once
- Roller wheel (if equipped)

Use left-click to:



- Select a menu item, **Ribbonbar** button, or other graphical control
- Select a *coordinate* location
- Select an object
- Begin a selection *fence* or window
- End a selection *fence* or window
- **3D orbit** in the **Design Window** (holding the left button down while orbiting)

Use double-click to:



- Select and open/import a file
- Select all text in a field for editing

Use right-click to:

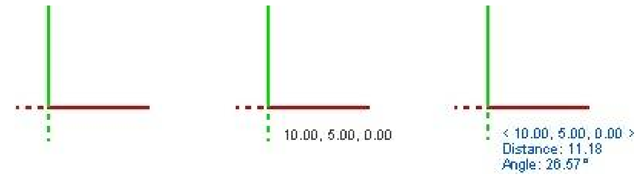
- End the current command
- Move to the next segment of a command, such as closing a *polygon*
- Reissue the previous command when inside the **Design Window**
- Initiate *context-sensitive* menus in the **Sidebar**
- Pan in the **Design Window** (holding the right button while panning)

Use roller wheel to:

- **Zoom In** (roll forward) and **Zoom Out** (roll rearward) when the mouse cursor is in the **Design Window**

Holding a mouse button while dragging the mouse is referred to in this manual as left-click-drag or right-click-drag.

As the mouse cursor traverses the screen, the pointer changes from *crosshairs* while inside the **Design Window**, to an arrow when outside. Upon selecting a text field (left-click), the pointer becomes an I-beam. This indicates that text information can be entered or edited. Occasionally, the mouse pointer will change to the "wait cursor" as set by the operating system to indicate that the system is currently busy and that data entry is momentarily suspended; the exact behavior is dependent on the operating system and the settings therein.



The *crosshairs* size can be small as at right or can be modified to fill the screen; see Drawing Aids Settings. **Absolute Coordinates** and **Relative Coordinates** can be displayed at the mouse *crosshairs*. See Environment Settings.

While executing a command, holding the *Ctrl* key and the left mouse button will **3D Orbit** without ending the command. Likewise, holding the *Ctrl* key and the right mouse button will **Pan** in the **Design Window**.

When *coordinate* selection is required in a command, Visual will indicate alignment with an existing (**Background** or **Solid**) object based on the **Object Snap** properties selected in the **Design Environment**. See Entering Coordinates.

The view in the **Design Environment** can be manipulated with the mouse as described in Mouse Navigation.

2.3 Keyboard Commands

Visual incorporates a number of keyboard commands (*hotkey*) to make navigation and command execution easier. Since operating the mouse is a single-handed operation, it can be very efficient to execute common commands with the other hand in lieu of using the **Ribbonbar**. For any *hotkey*, reference the section related to that command for more information. In the Help manual, keyboard keys are shown in *italics*.

The **Hot Keys** command found after clicking **Help** on the **Tools** *tab* of the **Ribbonbar** opens a PDF of shortcut keys as it is currently available on the Visual website.

Generic hot keys:

Hot Key	**Description**
Tab	Cycles the *Active Plane* through the three *Cartesian planes* of movement
Home	Returns the *Active Plane* to X-Y at Z=0
Up Arrow	Moves the location of the mouse *crosshairs* one unit of the **Snap Increment** in the positive direction of the inactive *coordinate* axis. For example, if working in the X-Y *plane*, the up arrow will move the Z- *coordinate* up one snap increment. If **Snap** is not on, the mouse *crosshairs* move one unit distance.
Down Arrow	Converse of the Up Arrow
Esc	Cancels the current command
Numpad "+"	Increase mouse sensitivity; mouse movement causes more movement on screen
Numpad "-"	Decrease mouse sensitivity; mouse movement causes less movement on screen
Shift + Numpad "+"	Increase display gamma factor; default is 2.2
Shift + Numpad "-"	Decrease display gamma factor; default is 2.2
F1	Help
F2	Endpoint object snap on/off
F3	Midpoint object snap on/off
F4	Center object snap on/off
F5	Intersection object snap on/off
F6	Perpendicular object snap on/off
F8	Orthogonal mode on/off
F9	Snap mode on/off

Default command shortcut *hotkey*:

Hot Key	**Command**	***Tab* Group**
A	Array, Rectangular	Construct
Shift + C	Calculate	Calculations
Ctrl + C	Circle (background not solid)	Construct
C	Copy	Modify
D	Distance	Tools
Numpad 6	East Elevation	View
E	Erase	Modify
Shift + E	Explode	Modify
Ctrl + Shift + E	Export	File
X	Extend	Modify
Ctrl + E	Extrude	Modify
G	Group	Modify

Ctrl + I	Import	File
J	Join	Modify
L	Line	Construct
Ctrl + M	Mirror	Modify
M	Move	Modify
Numpad 8	North Elevation View	View
Numpad 9	Northeast Isometric View	View
Numpad 7	Northwest Isometric View	View
Ctrl + O	Open	File
Numpad 5	Plan View (Top View)	View
Ctrl + P	Print Editor	File
P	Properties	Tools
Ctrl + R	Redo	n/a
R	Rotate	Modify
Ctrl + S	Save	File
S	Scale	Modify
Numpad 2	South Elevation View	View
Numpad 3	Southeast Isometric View	View
Numpad 1	Southwest Isometric View	View
Shift + S	Statistics	Tools
T	Trim	Modify
Ctrl + Z	Undo	n/a
Numpad 4	West Elevation View	View
Z, Numpad 0	Zoom All	View

When a command is not being executed, the numeric keypad provides hot keys that mimic the 9-button **View** *panel*. When in a command, the numeric keypad will provide the numeric input expected. See Basic Viewing for more information on the **View** *panel*. Hot keys can be completely defined by the user; see Customize Dialog for more information.

Selection Hot Keys - The following keyboard commands are only available when selecting objects in a command.

Hot Key	**Description**
A	Add objects to the selection set, changes the selection mode toggle to add when selecting objects
P	Previously selected objects will be added to the selection set
R	Remove objects from the selection set, changes the selection mode toggle to remove when selecting objects
L	All objects in the **Design Window** will be selected

2.4 Opening a Project

Because of the complexity and the related tax on computer system resources, only one Visual project can be open at any one time. The **File** menu can be used to make new projects or otherwise operate on existing project files. It is possible to have multiple instances of Visual open at the same time, but this may lead to confusion and may over-tax more basic hardware.

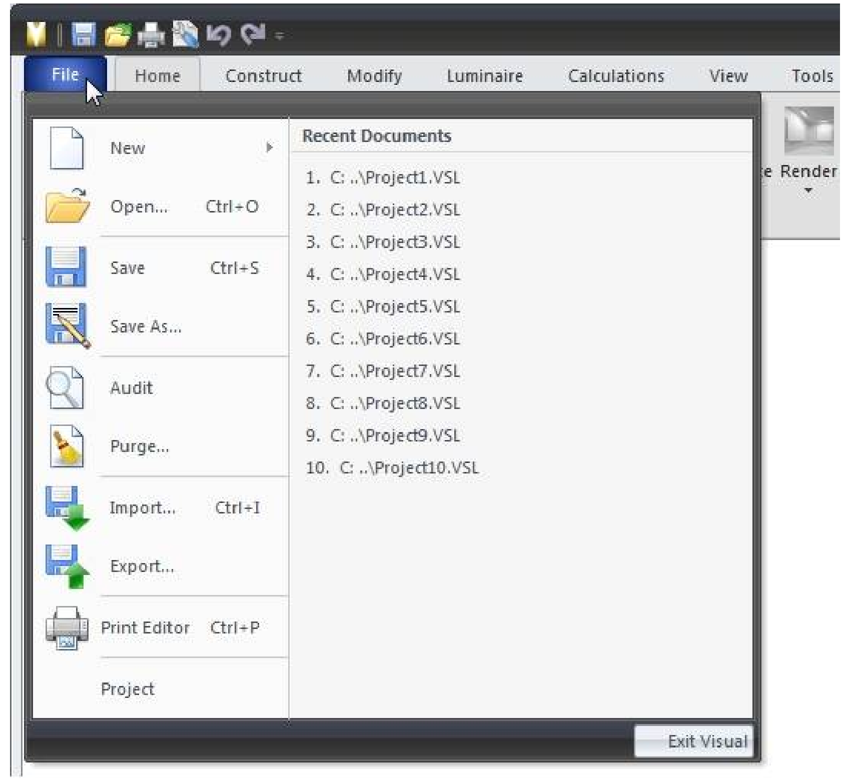
When Visual is started, a new interior project is already created.

The difference between the appearance and operation of Visual in the **Interior** and **Exterior** modes is minimal and primarily a matter of convenience. The **Calculation Mode** is set to calculate direct and *interreflected* light for an **Interior Project**, and to calculate only direct light for an **Exterior Project**. Assumptions regarding user intent are made to speed the design process and certain terminology is modified to reflect tradition. However, there is nothing that precludes either type of application from being modeled in either mode.

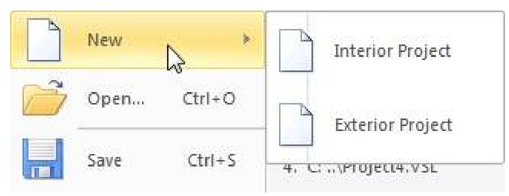
There are two ways to start a project in Visual: start a new project or open an existing project.

To open an existing VSL project file, select **Open** from the **File** menu and a standard Windows *dialog* will appear to navigate to an select the file desired.

Alternately, Visual lists the most recent files in the **Recent Documents** list on the right of the **File** menu.

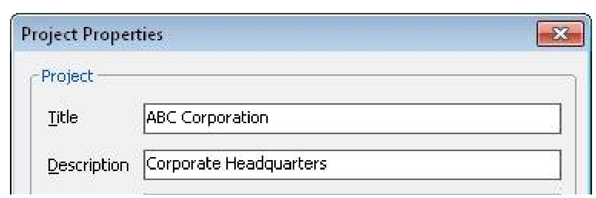


To begin a new project while Visual is already open, select **New** and then **Interior Project** or **Exterior Project** as appropriate.

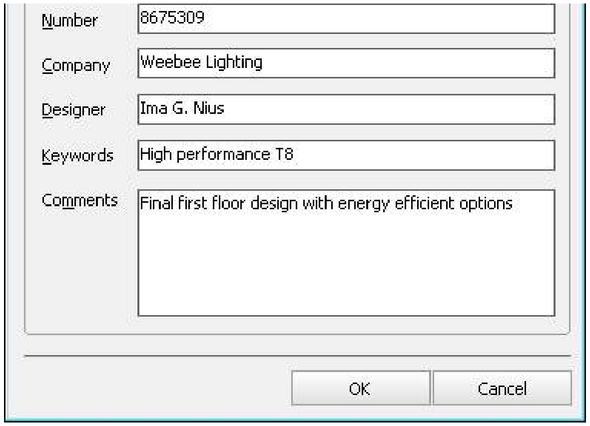


Another important aspect of starting a new project is entering project information. For administrative reasons, Visual allows project information to be entered and saved with the electronic file. Selecting **Project** from the **File** menu will launch the **Project Properties Form**.

All fields are optional and this information may be entered at any stage of the modeling process. Project information is used to uniquely identify Visual lighting *models* and to

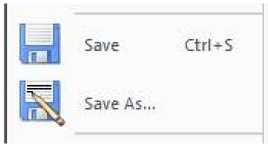


expedite the documentation process as field input are transferred to the **Print Editor** automatically.



2.5 Saving a Project

Visual projects may be saved at any time.



To save a project, simply choose **Save** or **Save As** from the **File** menu. Visual will initiate a standard *dialog* common in other Windows-based software.

The **Save** command will only prompt for a file name and directory the first time that it is issued because the file has not been previously saved. Subsequently, the **Save** command will assume that the same file name and directory are intended, thus over-writing the file automatically.

The **Save As** command always prompts for a file name and directory. The **Save As** command is useful to save the file without over-writing the previous version.

2.6 Automatic Recovery and File Backup

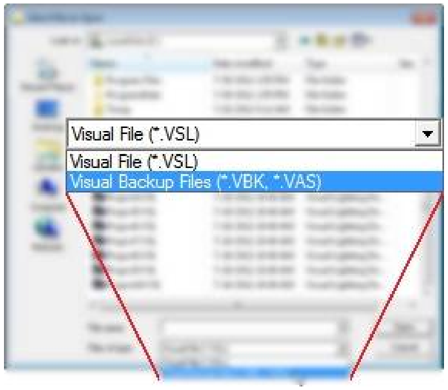
Visual automatically saves project files and it is possible to recover information in the event of an unexpected program closure.

Visual is equipped with an **Auto-Save** feature that periodically saves the current project. Should Visual be unexpectedly terminated, the program will automatically be restored to the last auto-saved state upon re-entry if the user so desires; Visual asks about restoring the file at restart. This feature may be turned on or off and the time interval between auto-saves may be modified in Environment Settings.

Visual creates a backup copy of every saved file that is made as <*filename*>.*VBK*. These files can be found in the directory *x:\Documents and Settings\All Users\Shared Documents\Visual\Support*, where "x" is the drive on which the Windows operating system is installed.

To open a backup file, select the "Visual Backup Files (*.VBK, *.VAS)" option from the "Files of type" list in the **Select File to Open** *dialog*. Otherwise, Visual only searches directories for VSL files as the default.

Visual automatically removes any backup files that are older than a given number of days, which is specified in the **Settings** form.



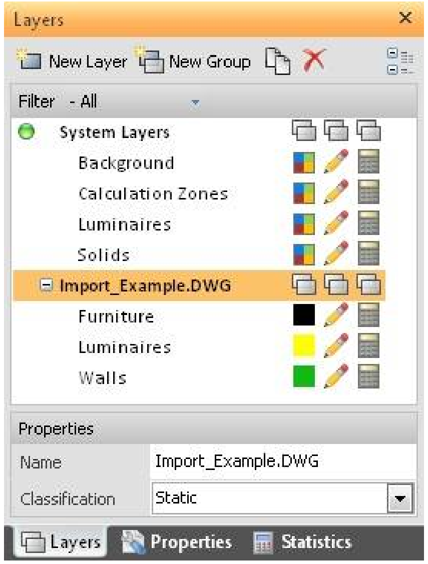
For more information on the Settings form, see Environment Settings for more information.

2.7 Importing and Exporting Files

Electronic information exchange is an important aspect of the overall architectural design process. Visual has the ability to import and export *DWG* and *DXF* format *CAD* files to allow for integration with other architectural software.

To import *DWG* and *DXF* files, choose **Import** from the **File** menu and a standard *dialog* will be opened to allow for file selection.

Visual imports objects on their original **Layers** and creates a **Static Group** to house those **Layers** which will be visible in the **Layers** *tab* of the **Sidebar**. Objects are imported in 3-D. Each **Layer** can be controlled individually to allow for clarity of display.

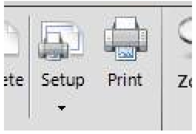


Visual is also capable of exporting the **Design Environment** to *DXF* and *DWG* format files. Selecting **Export** from the **File** menu while in the **Design Environment** will open a standard file *dialog*. The result is the creation of a file containing all 3-D *model* geometry and text as it exists within the **Design Environment**.

Objects in any **Dynamic Group** (including **System Layers**) are placed on the "0" **Layer** in the *DWG* file. Objects on other **Layers** are placed on that **Layer** in the *DWG* file. Objects on **Layers** in **Static Groups** are placed on a **Layer** named "<groupname> - <layername>".

Visual can additionally export print pages from the **Print Editor** environment. When in the **Print Editor**, selecting **Export** from the **File** menu will result in the creation of a file containing the 2-D information as it appears within the **Print Editor** for plotting and not 3-D objects.

Visual can create PDF files, but this operation is not strictly an export function. PDF files are created by printing to a PDF-capable printer driver from within the **Print Editor**.



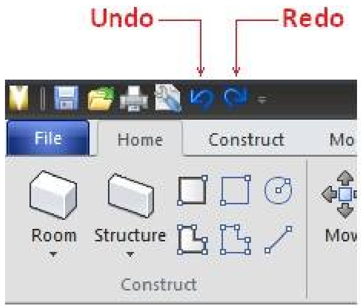
For more information on layers in Visual, see Layer Manager. For detailed information on using the **Print Editor**, see the Print Editor chapter.

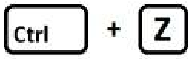
2.8 Undo and Redo

As with many Windows-based applications, Visual incorporates **Undo** and **Redo** commands to minimize the potential loss of information due to an inevitable "oops".

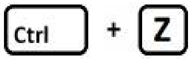
The twenty commands previously issued in the **Design Environment** can be undone, one at a time and in reverse order, by repeatedly choosing **Undo** from the **Quick Access** bar or using the *Ctrl-Z hotkey* to execute the **Undo** command.

The **Redo** command tracks the last twenty **Undo** operations performed by the **Undo** command allowing that operation to be restored in the event that too many **Undo** operations were inadvertently performed. The **Redo** command resides adjacent to the **Undo** command in the **Quick Access** bar.





During any command, executing the **Undo** command will remove the last specified *coordinate* (*vertex*); for example, when specifying the *vertices* of a ***Polygon***.

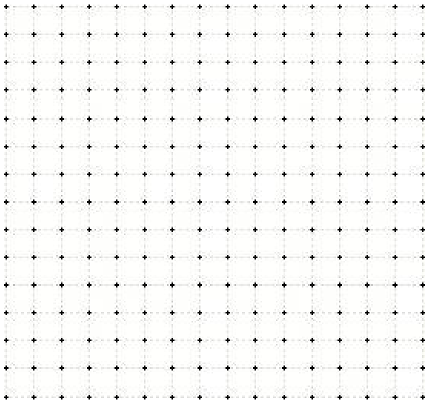


Saving the current project file resets the **Undo** *register*. The auto-save process leaves the **Undo** *register* intact.

2.9 Incremental Snap

Incremental Snap is a feature incorporated in most graphical software systems to allow precision location of the mouse cursor.

Incremental Snap means that the graphics pointer is only permitted to occupy distinct locations and that mouse movement causes the mouse pointer to "snap" to the next valid location rather than glide continuously.

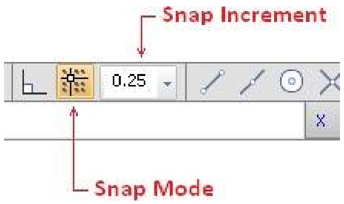


A **Snap Increment** of five, for instance, would only allow the mouse pointer to move in increments of five feet or meters starting from the global origin of (0,0,0); 5,10,15,20, etc.

Snap Increment is important because it allows rapid selection of exact locations (especially with 2x2 and 2x4 ceiling grids) and can help to keep lines truly parallel and perpendicular. In Visual, **Snap Increment** is used for *coordinate* selection and object alignment in both the **Design Environment** and the **Print Editor**.

Learning to set the **Snap Increment** to an appropriate value while entering information in Visual will dramatically affect both the speed and quality of data entry. Too large an increment disallows detailed data entry while too small an increment can result in tedium. It is common to change the **Snap Increment** periodically during the course of constructing a lighting *model*.

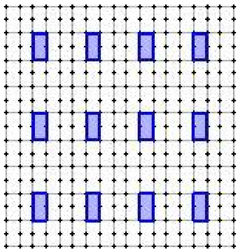
The **Status Bar** has been designed to include elements to provide a convenient mechanism for toggling the snap on/off, and for choosing the **Snap Increment**.



To toggle **Snap Mode** on and off, left click on the **Snap Button**. A gold background on the button indicates **Snap Mode** is on.

To change the **Snap Increment**, simply click on the down arrow on the right side of the **Snap Increment** ***Combo Box*** and select an appropriate value. Alternately, any value may be entered, including decimal fractions, by left clicking on the *text box* and entering the desired increment.

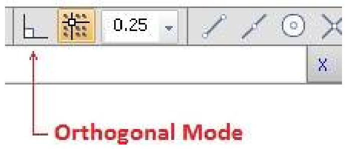
It is best to choose a **Snap Increment** that represents the finest level of detail required for a given task. It is possible to set **Snap Increments** that differ in each *cardinal* dimension (X,Y,Z). For more information on this, reference Drawing Aids Settings.



For example, an increment of two feet would be appropriate for entering a 2 X 4 ceiling grid. This 2ft increment can easily be set from the **Status Bar**, whereas setting a 2ft and a 4ft increment would require opening advanced dialogs and doesn't necessarily yield a better result.

A further restrictive element of **Incremental Snap** is **Orthogonal Mode**. In **Orthogonal Mode**, the mouse pointer moves only in the *cardinal* directions (X,Y,Z). **Orthogonal Mode** is useful when constructing *models* whose elements lie only in the *cardinal planes* (no skewed or angled surfaces). In **Orthogonal Mode**, most standard architectural geometry can be entered very quickly.

To toggle **Orthogonal Mode** on or off, left click on the **Orthogonal Button** in the **Status Bar**.



2.10 Entering Coordinates

Entering *coordinate* information is fundamental to the use of Visual. *Coordinates* define the location of all entity types.

Coordinate information can be entered in one of three ways discussed in this chapter:

- **Mouse Pointer Navigation** allows for movement of the cursor to a specific location where a left-click will cause Visual to use that location as input.

- **Object Snap** allows for the specification of a location that is related to an existing entity.

- **Command Line Entry** allows for keyboard entry of specific absolute and *relative coordinates*.

Advanced Visual users will fine-tune productivity by using all three input methods where appropriate and convenient.

2.10.1 Mouse Pointer Navigation

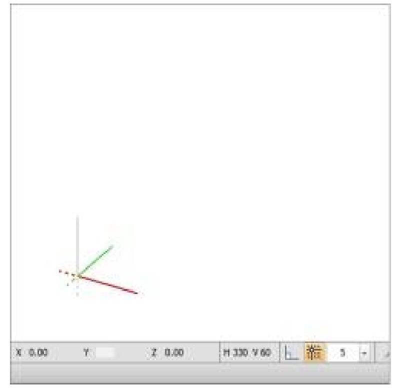
Coordinates are most often selected by moving the mouse pointer within the **Design Window** while referencing imported **Background Objects**.

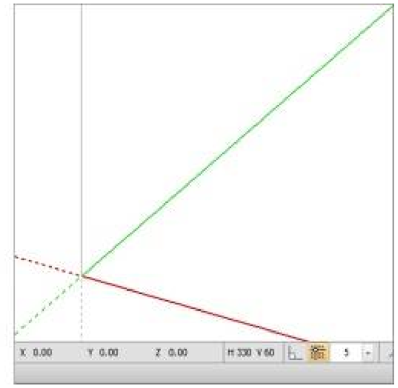
The mouse *crosshairs* can be a fraction of the screen or extend to the **Design Window** boundary. See [Drawing Aids Settings](#).

The values at the bottom of the screen are the (X,Y,Z) triplet location of the mouse pointer, and to the right of that, the horizontal and vertical viewing angles.

In this section of the manual, note the *crosshairs* in each view. The colored solid-line axes indicate that the mouse pointer is currently moving in that *plane*. Red is always the X-axis, green the Y-axis, and blue the Z-axis.

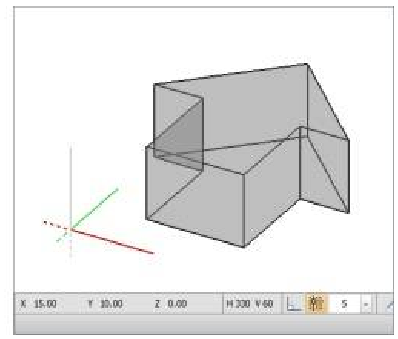
The solid *crosshairs* are a reminder showing the positive direction in those axes.





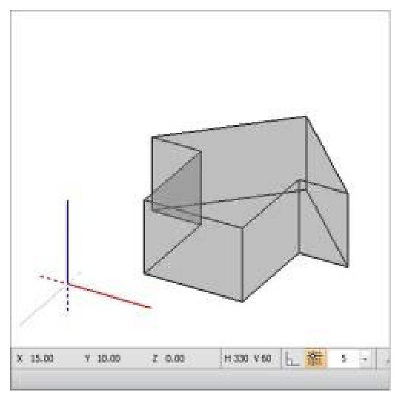
The mouse pointer always moves in two orthogonal (perpendicular) dimensions defined by the mouse *crosshairs*. The mouse *crosshairs* can appear perpendicular or skew on the screen depending on the view.

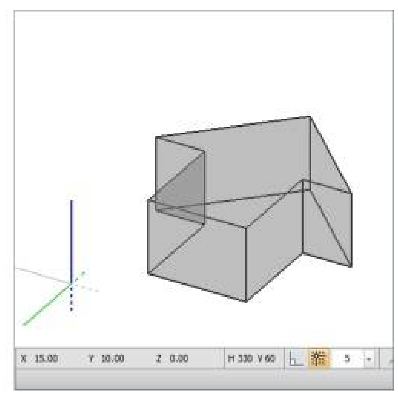
For example, the left image is a plan view and on the right the image is of the SouthEast 3-D view of the same object.



It is possible to change the *plane* of movement in 3-D views as depicted in the figures at right. Pressing the *Tab* key while the mouse pointer is in the **Design Window** causes the pointer to cycle through the three *cardinal planes* of movement (X-Y, X-Z, and Y-Z).

In both the 3-D views at right, the mouse pointer is in precisely the same location but the *plane* of movement is different. The *crosshairs* indicate the *plane* of movement. When the *Tab* key is pressed to change the *plane* of movement, the *coordinate* of the inactive dimension becomes fixed at its present value. The mouse pointer is said to be moving in X-Y, for instance, at Z = 10. This is referred to as the working *plane*.





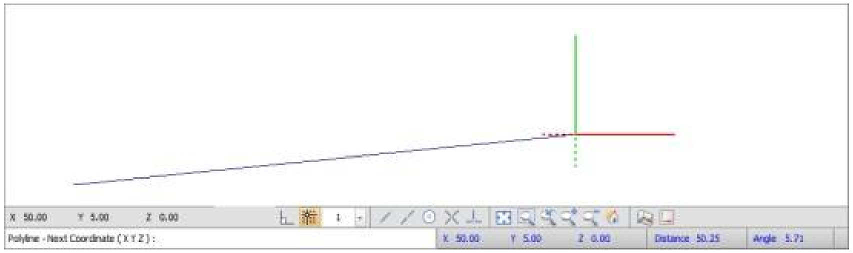
It should be apparent that any 3-D location can be pinpointed from a single view by moving sequentially through different working *planes*. A floodlight mounted at grade, for instance, can be aimed into the *plane* of a vertical facade by moving the mouse pointer in the horizontal (X-Y) *plane* to the base of the wall. Then, by pressing the *Tab* key to change the working *plane* to that of the wall, the mouse pointer can be simply moved upward to locate the desired aiming point.

Occasionally it is convenient to remain in the same *cardinal plane* of movement such as X-Y, but a different location in the fixed Z dimension is desired. Pressing the *Up Arrow* and *Down Arrow* keys changes the working *plane* in this way. It shifts the working *plane* one snap increment at a time in the direction of the perpendicular axis. The *Up Arrow* is positive and the *Down Arrow* is negative as defined by the *coordinate* axis in question.

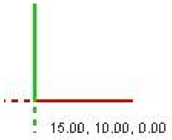
Another important key to remember is the *Home* key. Pressing the *Home* key at any time returns the working *plane* to X-Y, at Z = 0 (ground level).

In a command, Visual displays the *relative coordinates* of the *crosshairs* with respect to the last *coordinate* entered. These values are shown in blue at the bottom of the **Status Bar**. *Cartesian* and polar *coordinates* are always provided.

At right, in the **Line** command, Visual shows (in blue) that the mouse has moved 50 units in the X-axis, 5 units in the Y-axis, and 0 units in the Z-axis since *drawing* is done in plan view. Note that the global *coordinates* are also (50,5,0) because the origin of the Line is at (0,0,0).



Visual can display both **Absolute** and ***Relative Coordinates*** in conjunction with the *crosshairs*. See [Environment Settings] for more information.



See [Using the Mouse] for additional information.

2.10.2 Object Snap

At times it is convenient to point to an object that already exists in the **Design Environment** and select a *coordinate* location that corresponds to a point on the object. **Object Snap** is particularly useful when importing drawings because the imported **Background Objects** can be easily chosen as points of reference. **Object Snap** is supported for all **Background** and **Solid Objects** as well as the insertion point of **Luminaires**.

Object Snap modes may be accessed in the **Status Bar**. Multiple **Object Snap** modes can be activated at once. Active modes are highlighted in gold; at right, **Midpoint** and **Intersection** are active.

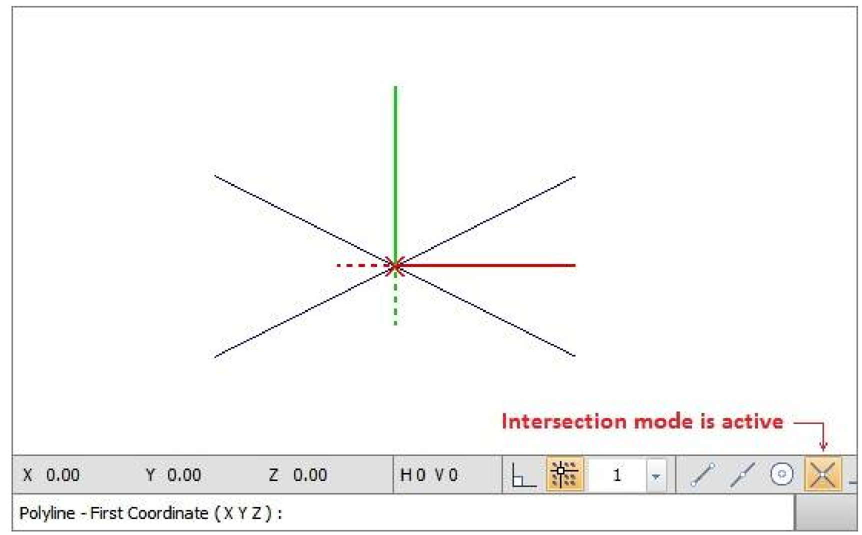
Visual illustrates which **Object Snap** has been located by adding to the mouse pointer and *crosshairs*. The mouse cursor additions are shown below next to the buttons for each **Object Snap** mode.

At right, Visual has found the **Intersection** of two **Lines**. Note that the **Intersection Object Snap** button is highlighted in the lower right corner.

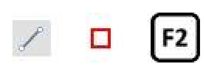
Visual will show **Object Snaps** when the mouse cursor is in the vicinity of a viable "target". The mouse cursor does not have to be exactly at the point.

Lines that comprise **Rectangles**, **Polygons**, **Polylines**, and **Solid Objects** are valid.

Object Snap modes can be turned on and off with the keyboard using the keys F2 through F6.

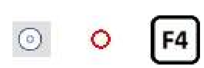


Endpoint selects the nearest endpoint of a **Line**, ***Polyline*** segment, or **Arc**.

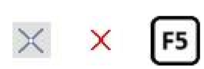


Midpoint selects the point midway between endpoints of the nearest **Line** or **Line** segment.

Center selects the center point of the nearest **Arc** or **Circle**. Note that **Arcs** may in fact be **Polylines** and therefore a **Center** is invalid; i.e. an entity may look like an **Arc**, but it might not be an **Arc**.



Intersection selects the nearest intersection of two lines. The **Objects** (the bounding edges) must truly intersect in 3-D space however; apparent **Intersections** are not valid.



Perpendicular selects the point on the nearest **Object** that is perpendicular to the previously selected point.   F6

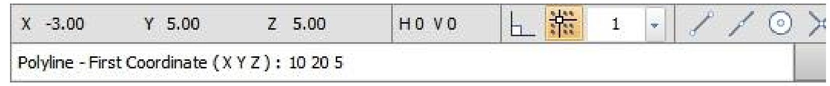
Luminaire selects the insertion point of the ***Luminaire*** on which the mouse is placed.  

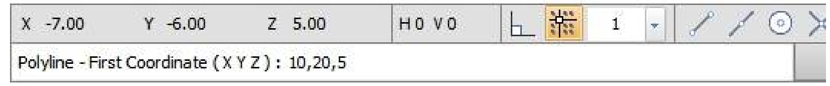
2.10.3 Command Line Entry

Entering *coordinates* via the **Command Line** is useful whenever exact *coordinates* or distances are known. This method is useful when entering information from a dimensioned *drawing* or sketch.

The **Command Line** appears in the **Status Bar** anytime Visual is expecting a *coordinate* location to be entered. *Coordinates* are entered in the format X Y Z separated by a single space or as X,Y,Z separated by a comma and followed by the *Enter* key or a right-click of the mouse.

In the examples at right, the *coordinates* X = 10, Y = 20, and Z = 5 were entered. Note that the global *coordinates* are random values related to where the mouse cursor happens to be located; they have nothing to do with the *coordinate* entry with the keyboard.

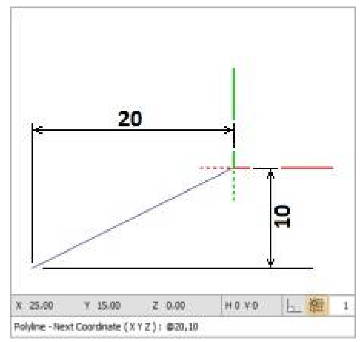


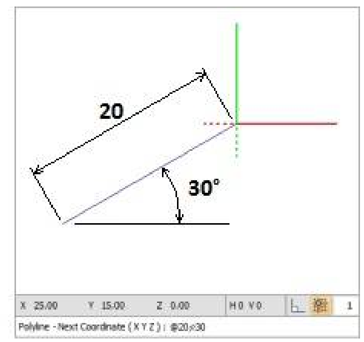


When entering *coordinates* with the keyboard, Visual will assume the Z-value is "0" relative to the ***Active Plane*** if no other value is given. If the global *coordinates* are such that Z = 10 globally, entering only X = 5 and Y = 20 will indicate to Visual that the <u>global</u> *coordinates* (5,20,10) are to be used for input.

An alternative way to enter *coordinates* with the keyboard is to indicate the *relative coordinates* to the previous location entered.

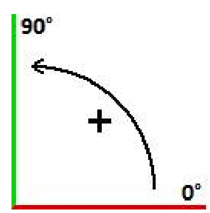
The at *symbol* "@" is entered first to indicate relative *coordinate* entry, providing an analog to the English concept of "draw a line <u>at</u> a distance of..." The @ is either followed by the relative X Y Z *coordinates* or a distance followed by the "

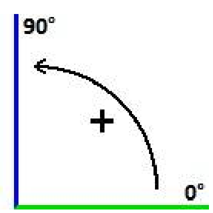




Note that relative coordinates can be used to reference the last coordinate entered in the previous command whether that coordinate was input with the mouse, **Object Snap**, or the keyboard.

Direction angles are measured positive in a counterclockwise manner starting from the positive X-axis in the X-Y and X-Z *planes* and the positive Y-axis in the Y-Z *plane*.



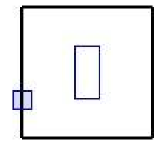


2.11 Selecting Objects

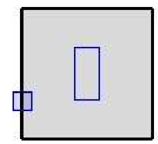
Many Visual commands require that objects within the lighting *model* be selected either for modification or reference. Generally speaking, these commands may be applied to objects either individually, or in groups. The process typically consists of object selection followed by the specification of any information necessary to complete the particular command. Because the object selection process is a common occurrence, Visual incorporates a consistent routine for the sake of simplicity.

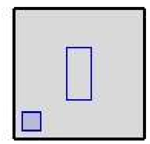
Upon initiating any command involving object selection, the **Status** bar will prompt for the selection of objects. For example, the **Move** command at right.

The mouse *crosshairs* will temporarily change to a *pick-box* indicating that Visual is using the **Pick** selection method. To select **Background** objects, **Solid** objects, and **Calculation Zones**, simply place the *pick-box* over any element of the desired object and left-click the mouse.

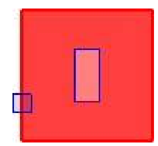


In **Transparent** and **Rendered** **Display Modes**, Visual allows both the perimeter and interior of **Solid Objects** to be clicked to indicate selection.





The object will turn the selection color (the system default is red, but can be user-modified in Environment Settings) to indicate that it is selected. If more than one object is in the *pick-box* area then only a single object will be selected. To toggle through the objects under the *pick-box* simply left-click the mouse again and the next object will be selected while the previous object will be unselected. Continue clicking until the desired object is selected.



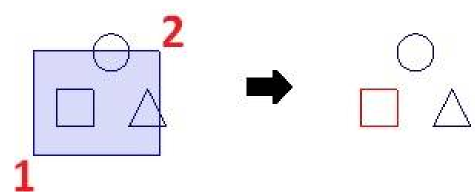
The selection order of objects is based on the Z-order. This means that the object closest to the camera is selected first. If a second click is made on visually coincident objects, the next farthest object will be selected, and so on. For example, in a **Top View**, when clicking as in the above example, the object selected would be the "ceiling", a second click in the same spot would select the "wall" below, and a third click would select the "floor". If a fourth click where made, the cycle is completed by the "ceiling" being the selected object again.

In **Transparent**, **Shaded**, or **Rendered** display mode, **Solid** objects can be selected by clicking on any part of the surface. In **Wireframe** display mode, a bounding edge must be clicked.

The selection order of objects is based on the Z-order. This means that the object closest to the camera is selected first. If a second click is made on visually coincident objects, the next farthest object will be selected, and so on. For example, in a **Top View**, when clicking as in the above example, the object selected would be the "ceiling", a second click in the same spot would select the "wall" below, and a third click would select the "floor". If a fourth click where made, the cycle is completed by the "ceiling" being the selected object again.

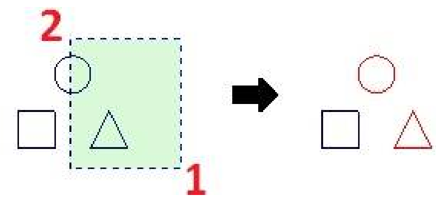
Moving to the right after the first left-click creates a rectangle with a solid border and light blue shading, indicating the ***Window*** selection method. When using the ***Window*** selection method, any object that resides entirely within the window will be selected.

In the example at right, the square is fully contained and the triangle and circle are not; thus only the square is made part of the selection set.



Moving to the left after the first click creates a rectangle with a dashed border and a light green shading, indicating the ***Fence*** selection method. When using the ***Fence*** selection method, objects having any portion within the *fence* will be selected.

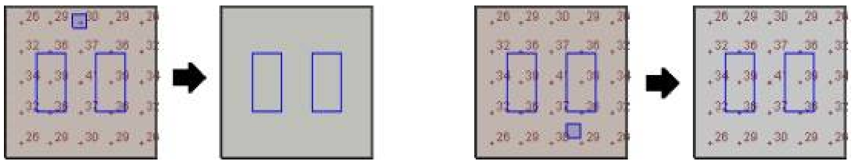
In the example at right, the triangle is fully contained, the square is not contained, and the *fence* crosses the circle; thus the triangle and the circle are made part of the selection set.



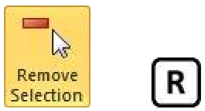
The **Properties** *tab* will include the **Selection** *panel* to assist in selecting objects for **Modify** *tab* commands. Visual defaults to adding clicked objects to the selection set, signified by the **Add Selection** button being highlighted in yellow.

The **Properties** *tab* will include the **Object Filters** *panel* to assist in selecting objects for **Modify** *tab* commands and other times when objection selection is required; e.g. specifying a surface on which to place a **Calculation Zone**. A checkbox is present for each of the four object types. Unchecking a box tells Visual to ignore objects of that type when selecting objects.

As both an example of **Object Filters** and a usage tip: **Power Zones** and **Calculation Zones** are often created such that they are coplanar. When selecting either type for modification, it is likely to be unclear which zone type has been selected. To be sure which is selected, change to **Transparent** [Display Mode](). Secondly, use the **Object Filters** to remove **Solids**. This allows selection of a calculation point to select a **Calculation Zone** or simply selecting "empty space" as shown at far right to select the coplanar **Power Zone.** (This example is selecting first the **Calculation Zone** and alternately the **Power Zone**.)



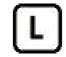
The selection process also allows objects to be removed from the selection set. To toggle to the **Remove** selection mode, press the **Remove Selection** button or press the *R* key on the keyboard while the *pick-box* is active.



In addition to the **Remove Selection** button being highlighted in yellow, the **Status** bar will also indicate that the subsequently selected items will be removed from the current selection set.

Click the **Add Selection** button or press the *A* key to return to the **Add** selection mode if necessary.

Clicking the **Select All** button selects all objects in the **Design Environment**. Pressing the *L* key while in selection mode also causes all objects to be selected.



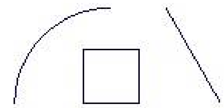
Clicking the **Previous Selection** button or pressing the *P* key while in selection mode causes objects previously selected (in the last command executed) to be selected again for use in the currently active command.

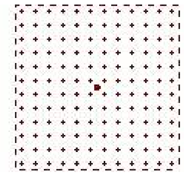
The **Pick**, **Window**, and ***Fence*** methods can be used repeatedly in both **Add** and **Remove** modes until the selection set contains only the desired objects. The process is terminated with a right-click of the mouse, and Visual ends the command or moves to the next step in the command depending on the command executed.

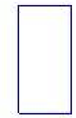
Command-specific information about selecting objects is found later in the manual where necessary.

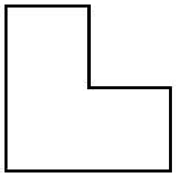
Chapter 3 - Visual Objects

There are four fundamental types of objects that may be included in a Visual lighting *model*. They are **Background Objects**, **Solid Objects**, ***Luminaires***, and **Calculation Zones**. With these four fundamental elements, virtually any type of interior and/or exterior lighting system can be modeled to include the effects of obstructions and diffusely reflective surfaces.









3.1 Background Objects

Background Objects, as the name would imply, are graphical elements that may be included in the lighting *model* for visual reference only.

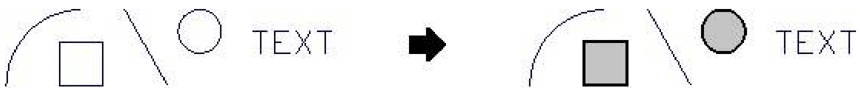
Background Objects consist solely of lines, rectangles, polygons, circles, arcs and text.

The most common kind of **Background Objects** are those imported from *CAD* files. Imported *CAD* files are automatically converted to **Background Objects** exclusively.

Lines identifying the location of islands or stalls in a parking lot, for instance, would classify as **Background Objects**. They are useful for establishing valid locations for ***Luminaire*** placement and for communicating such placement in relation to other objects or pertinent elements of the *model*.

Visual includes a variety of commands to create and manipulate **Background Objects** to aid in *model* construction and otherwise describe a lighting *model*.

Valid **Background Objects** (closed areas such as circles, rectangles, and polygons) may be converted to **Solid Objects** if desired. For more information on converting object types, reference Convert to Solid.



Background Objects do not affect lighting calculations in any way nor do they change with changes in **Display Mode**. See Display Modes for more information.

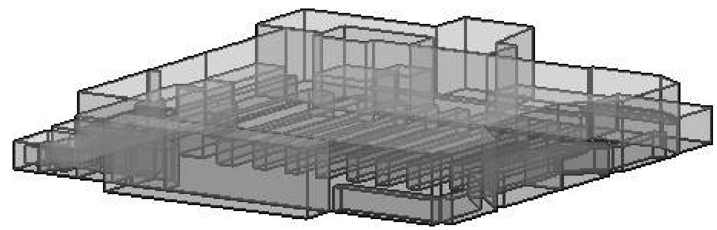
3.2 Solid Objects

Solid Objects (**Solids**) are *planar* surfaces, and/or collections of *planar* surfaces, that impede or alter the flow of light.

Solids may simply block light (**[Direct Only Calculation Mode]**) or they may reflect or transmit it according to an assigned ***Reflectance*** or ***Transmittance*** value. The specified ***Reflectance*** value, applies to both sides of a **Solid Object** and is related to **Color**.

As implied by the term "surface" that is often used to describe them, **Solid Objects** must be comprised of an enclosed area such as a circle, rectangle, or *polygon*. A line, for instance, cannot be a **Solid Object** because it has no two-dimensional area.

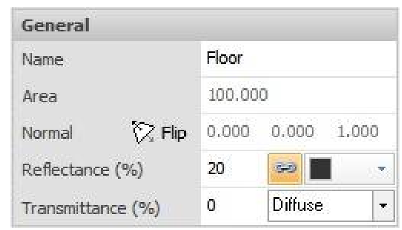
Solids are used to *model* physical objects such as walls, ceilings, and partitions among other architectural elements and can be created in a group using the **Room** or **Structure** commands.



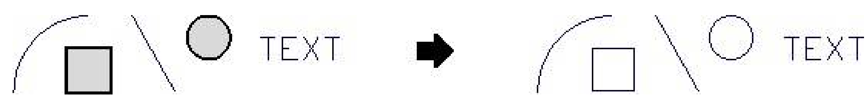
Transparent Display Mode

A ***Transmittance*** can be assigned (after creation) by editing the object Properties.

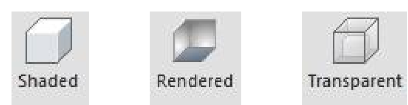
Solid Objects may be calculationally inactivated, individually or in groups, from within the Properties *tab* of the **Sidebar** as well.



Solids are always drawn with thick, black lines and they can be converted to **Background Objects**, if desired. For more information on converting object types, reference section Convert to Background.



The appearance of **Solid Objects** in the **Design Environment** can be changed with the **Shaded**, **Rendered**, and **Transparent** Display Modes.



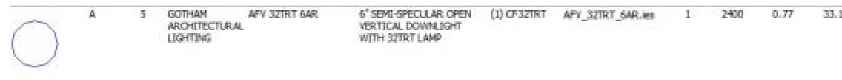
Note that **Solids** are shown in this manual as they appear in **Transparent Display Mode** and are therefore shaded/filled.

3.3 Luminaires

In Visual, the term ***Luminaire*** applies to the *photometric*, graphical, and descriptive characteristics of objects (***Luminaire* Types**) created within the ***Luminaire* Schedule Editor**.

In the most simple case, ***Luminaires*** are a single entity like a *downlight*.

For more information on ***Luminaire*** configuration, reference the Luminaire chapter.

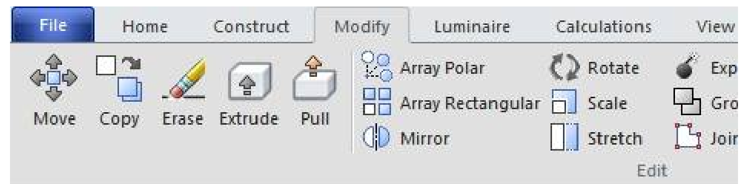


A ***Luminaire*** can also be a more complex assembly of multiple optical assemblies ("heads") arranged in a particular manner at the top of a *pole*.

The most complex assembly uses different *photometric* files for different heads.

Once placed, ***Luminaires*** are treated like any other graphical object within the **Design Environment** in that they can be manipulated with most commands on the **Modify** *tab* of the **Ribbonbar**.

Move, **Copy**, **Erase**, **Array Polar**, **Array Rectangular**, **Mirror**, and **Rotate** are commands that operate on ***Luminaires*** .



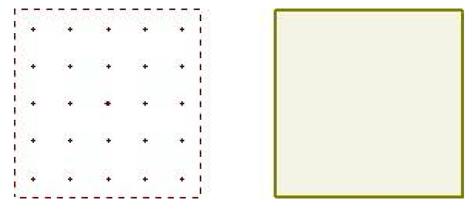
Luminaires may be calculationally inactivated in the Layer Manager.

Luminaire Properties can be modified in the **Properties** *tab* of the **Sidebar**.

3.4 Calculation Zones

Calculation Zones are regions where calculations are computed and reported. These zones may be lighting-based or power-based.

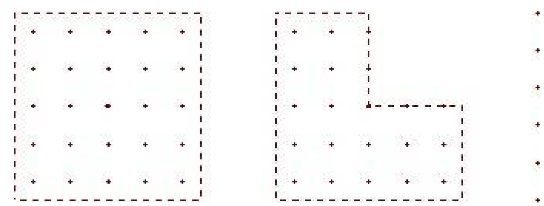
Calculation Zones can be lighting-based (***Illuminance***, ***Luminance***, etc) or power-based (**Lighting Power Density**). By default, Visual shows L**ighting Calculation Zones** in dark red and **Lighting Power Density Zones** are shown with a olive border and are furthermore shaded.



Lighting Calculation Zones can be defined by rectangular areas, areas bounded by a *polygon*, or can be locations along a *linear* path. **Calculation Zones** can also be placed directly on surfaces (**Solid Objects**).

The boundary of the **Calculation Zone** is indicated by a dashed line and points indicated by crosses are placed in an array defined by the user.

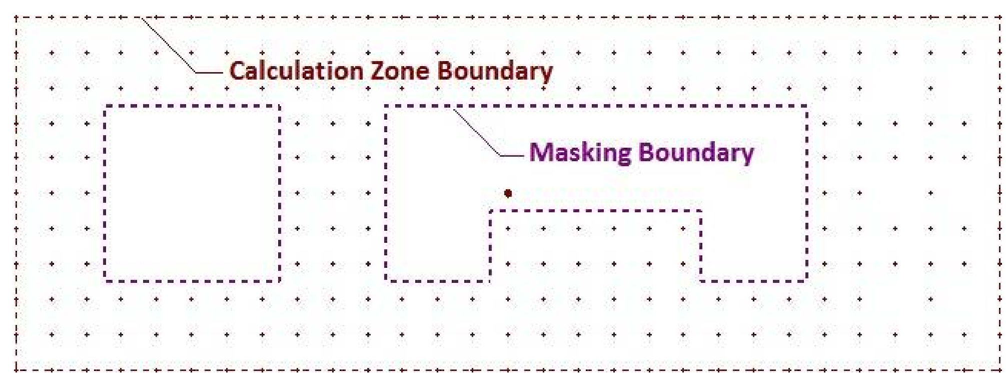
Visual assumes the light meter orientation to be perpendicular to the defining (bounding) *plane*. This can be modified at creation or by editing **Properties** after creation.



Lighting Calculation Zones can be modified to remove points that are unwanted using the ***Masking*** commands. Points can be **Masked** with rectangles, polygons, by surface, or individually.

Mask boundaries are shown with a dashed purple line.

The display of the **Mask** boundary can be turned on or off in the **Settings** *dialog*.

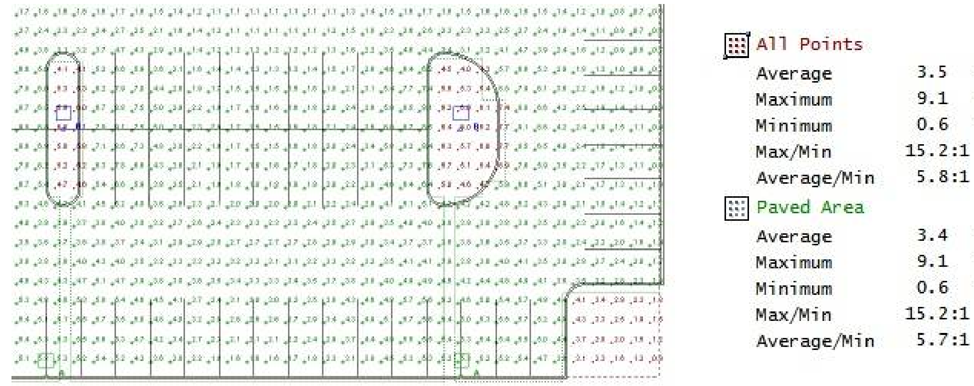


Statistical Zones can be created to report information about part of a **Lighting Calculation Zone**. **Statistical Zones** are displayed in the **Statistics** *tab* of the **Sidebar** separately from their parent zone.

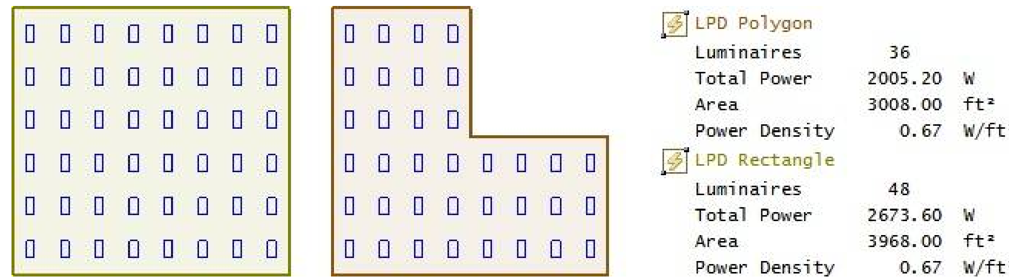
Statistical Zones can be created with rectangles, polygons, or by selecting surfaces. **Statistical Zones** can be grouped in the **Sidebar** for an additional level of reporting and analysis.

Statistical Zone boundaries are shown with a dashed dark green line. Notice how the internal points are omitted by astute boundary selection. Calculation points included in the **Statistical Zone** have a different *symbol*.

For example, only the paved area could be shown for a parking lot. Points in the **Statistical Zone** are indicated with green asterisk symbols by default.



Lighting Power Density (**LPD**) **Zones** can be defined by rectangular areas, areas bounded by a *polygon*. They have associated *luminaires* specifically applied to the calculation. **LPD Zones** can also be placed directly on surfaces (**Solid Objects**).



Calculation Zones may be calculationally inactivated in the [Layer Manager].

The **Properties** of **Calculation Zones** can be modified in the **Properties** *tab* of the **Sidebar** (see [Calculation Zone Properties]). Global changes can be made to attributes, like default color, in the **Settings** *dialog* (see [Calculation Zones Settings]).

Chapter 4 - New Features

Visual 2.7 incorporates new features to increase productivity and allow for easier use with the most complex *models*:

The **Sidebar** provides convenient access to three *tabs* of information that also allow for the modification of *model* object parameters and the display of calculation results.

The **Layers** *tab* is located in the **Sidebar** and contains the **Layer Manager**. The **Layer Manager** shows **System Layers** and user-defined **Layers** and allows control of **Layer** behavior to provide lighting *model* organization based on what is appropriate for a project or useful for a user.

The **Design Manager** provides quick access to all objects in the lighting *model* in a floating *dialog* window. The *dialog* lists all objects in a treed fashion based on object type. Objects can be selected and identified or modified.

An **Audit** is performed before each **Calculation** and provides feedback related to known and possible problems with the lighting *model*. **Audits** can be done at any point to verify *model* components. The Audit window *dialog* sits on top of the **Design Environment**.

The **Properties** *tab* is located in the **Sidebar**. The *tab* is dynamic in that the content will change depending on which of the four object types is chosen in the selection process.

Several videos have been produced to illustrate features. The currently available videos can be found at:

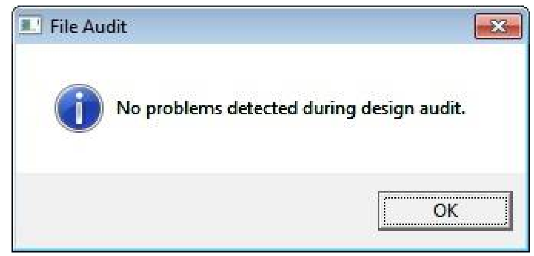
http://www.visual-3d.com/support/TrainingVideos/2012.aspx

4.1 Audit

The **Audit** command is located on the **File** menu. An **Audit** is performed before each **Calculation** and provides feedback related to known and possible problems with the lighting *model*. **Audit** results do not preclude a calculation from being performed; results are an alert that the calculation result may not be what was expected.

An **Audit** can be performed without a calculation by executing the command from the **File** menu.

If Visual finds no issues, a pop-up is displayed.

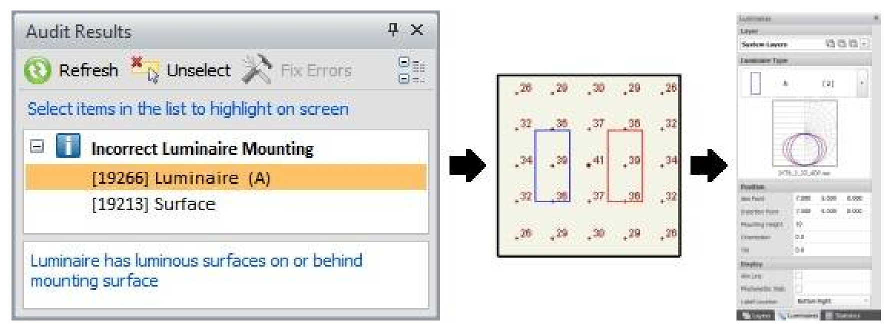


If issues are found, Visual displays a notification bar at the top of the **Design Window**. Clicking the **View Audit Results** button initiates the **Audit Results** *dialog*. Clicking an entry will highlight the objects related to the issue in the **Design Environment**.

To identify an element in the **Audit**, left-click the name of an object. Visual will highlight the object in red in the **Design Environment**, just as in any other selection process.

The **Properties** *tab* of the **Sidebar** will be populated with the parameters for the selected object for verification or modification.

The **Audit Results** *dialog* is closed by clicking the "X" in the upper right corner of the *dialog*.



Visual provides different symbols for the various issues that can be analyzed.

Possible **Problem** issues:

Audit Message	**Description**
Luminous Dimensions Conflict	A *luminaire symbol* and its luminous dimensions are different
Luminaires Intersect	Multiple *luminaires* are detected to overlap
Luminaire Intersects a Surface	A *luminaire* intersects a surface
Incorrect *Luminaire* Mounting	A *luminaire* has luminous surfaces on or behind the mounting surface

Possible **Information** issues:

Audit Message	Description
Invisible Objects	Objects that participate in the lighting calculation are on invisible layers
Objects Intersect	A closed room or object intersects or overlaps another closed room or object
Luminaire Outside Project Extents	A *luminaire* may be outside of the project extents
Calculation Zone Not Illuminated	A calculation zone is inside an unilluminated closed room or object
Surfaces Intersect	A surface is intersecting another surface
Identical Surface	A surface is identical to another surface

Possible **Critical** issues:

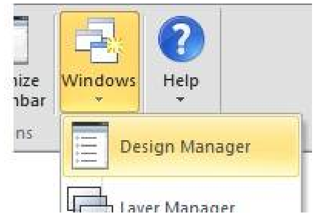
Audit Message	Description
Duplicate *Luminaires*	Multiple *luminaires* are detected at the same location
Large *Drawing Coordinates*	*Drawing coordinates* are too large to perform a calculation. Move the entire *drawing* closer to 0,0.

The **Audit** tool does not ensure that the lighting *model* is free of errors or that the resultant calculation is "correct" given the many possible intents of user input. It is ultimately the responsibility of the user to ensure the lighting *model* approximates reality in an appropriate way.

4.2 Design Manager

The **Design Manager** provides quick access to all objects in the lighting *model* in a floating *dialog*.

The **Design Manager** is opened by clicking the button in the **Tools** *panel* of the **Home** *tab* of the **Ribbonbar** the button in the **Windows** sub-menu of the **Tools** *tab*.

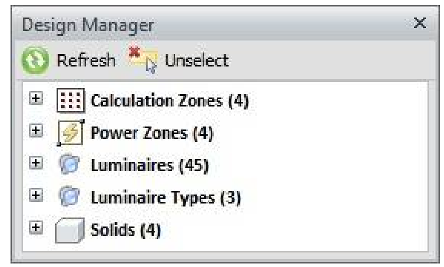


The **Design Manager** *dialog* is always on top of the **Design Environment** window and can be repositioned with a left-click-drag motion of the title bar as with all Windows applications.

The number after each main entry is the quantity of that type currently placed in the *model*.

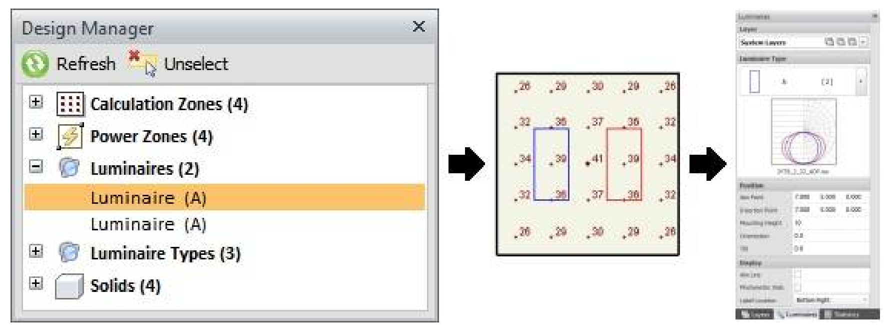
Each section (branch of the tree structure) is opened and closed by either double-left-clicking the branch names or clicking the "+" and "-" buttons.

The **Design Manager** is closed by clicking the "X" in the upper right corner of the *dialog*.

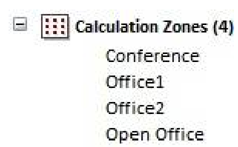


To identify an element in the *model*, left-click the name of an object. Visual will highlight the object in red in the **Design Environment**, just as in any other selection process.

The **Properties** *tab* of the **Sidebar** will be populated with the parameters for the selected object for verification or modification.



Clicking a **Calculation Zone** name will highlight the zone in the **Design Environment**.



Power Zones involve both *luminaire* and an attributed area, so both are included. This allows for easy verification of the *luminaires* included in a **Power Zone** calculation. Clicking the zone name highlights the attributed area in the **Design Environment**. Clicking the ***Luminaire*** name highlights the ***Luminaire*** in the **Design Environment**.

The ***Luminaires*** section includes all ***Luminaires*** placed in the **Design Environment**. Clicking a ***Luminaire*** name highlights the ***Luminaire*** in the **Design Environment**.

The ***Luminaire* Types** section shows all ***Luminaires*** defined in the ***Luminaire* Schedule** and the sub-branch shows each ***Luminaire*** placed in the **Design Environment**. This provides the same functionality as the ***Luminaires*** branch but with different organization. Clicking a ***Luminaire* Type** name has no function. Clicking a ***Luminaire*** name highlights the ***Luminaire*** in the **Design Environment**.

Solids are grouped in the **Design Manager** if they are grouped in the **Design Environment**; i.e. **Rooms** and **Structures** will be shown by the names given to them upon creation and **Solids** will be shown below that object name.

Clicking a **Solid** name highlights that **Solid** in the **Design Environment.**

Individually created **Solids** will be shown without a **Collapse**/**Expand** button since it is a single entity and has no sub-branches in the tree; e.g. "Divider" shown at right.

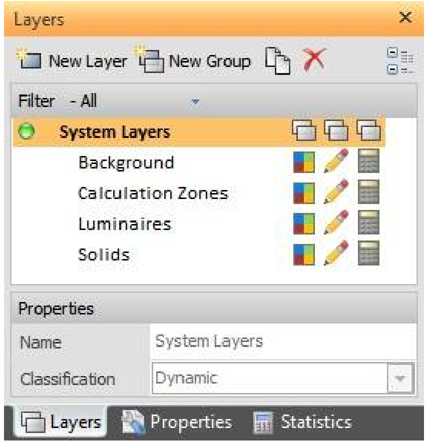
The number of **Solids** in each **Group** is shown after the **Group** name.

Since **Background** objects are for reference, they are not displayed in the **Design Manager**.

4.3 Layers

Layers can be used for complex projects to organize as well as control display and calculatability.

All Visual *models* have the default **System Layers Group** in the **Layer Manager** and therefore in the *model*. The **Group** and its associated **Object Layers** cannot be deleted. A complete and complex *model* can be constructed without using **Layers**; Visual uses **Layers** as necessary in a transparent fashion if the user doesn't need or want to use the feature.



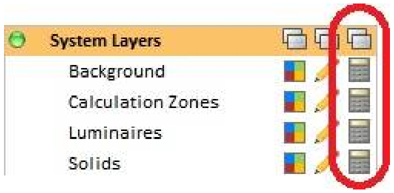
Layers are controlled in the **[Layer Manager](#)** discussed in this section.

4.3.1 Calculation State

The **Layer Calculation State** is controlled in the **Layer Manager** found in the **Layers** *tab* of the **Sidebar**.

The **Calculation State** button controls whether or not objects associated to that **Group** or **Layer** are included in calculations.

The **Calculation State** button has different states than can be assigned and therefore different symbols will appear indicating the different states. The position of the **Calculation State** button remains constant.



The default state for all **Layers** is **Calculated**. This means objects on that **Layer** will be included in calculations.

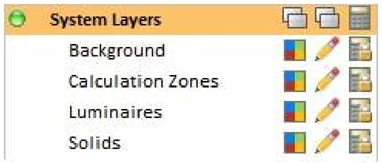
The **Inactive** state tells Visual to not include objects associated to that **Layer** or **Group** when performing calculations.

The default state for all **Groups** is **By Layer**. This means that the **Calculation State** for each **Layer** in the **Group** is set individually.

Choosing an **Calculation State** at the **Group** level means that all **Layers** in that **Group** will have the same state.

Individual **Layer Calculation State** cannot be modified in this case, which Visual indicates with lock symbols on top of each **Layer Calculation State** button.

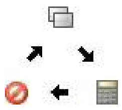
To modify **Layer Calculation** in this situation, set the **Group Calculation State** to **By Layer**, and then modify the **Layer Calculation State(s)** as desired.



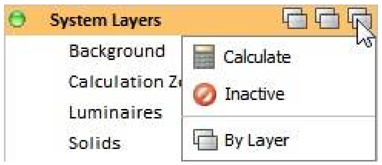
There are two methods for changing **Calculation State:**

Left-clicking the **Calculation State** button will change to the next state type. Continually left-clicking will cycle through the four **Calculation States.**

Note that **By Layer** is not a valid state for **Layers**; it only applies to **Groups.**



Alternately, right-clicking the **Calculation State** button for a **Layer** or **Group** will pop-up a menu showing the three states and a choice can be made by left-clicking the desired state.



The ability to control the **Calculation State** for **Background** objects is included for completeness. It is of course the case that **Background** objects do not contribute to calculations.

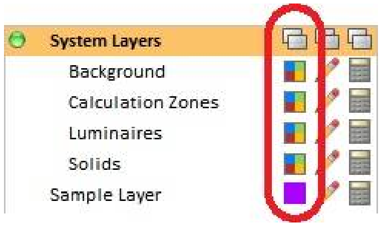
4.3.2 Colors

Layer Colors are controlled in the **Layer Manager** located in the **Layers** *tab* of the **Sidebar**.

The **Color** of each **Group** or **Layer** is controlled with the **Color** button.

The **Color** button has different states than can be assigned and therefore different symbols will appear indicating the different states. The position of the **Color** button remains constant.

Clicking the **Color** button opens the **Color** *Dialog* for selection. See [Using the Color Dialog] for more information.



The default state of the **Color** button for all **Layers** is "**By Entity**"; **Properties** of the **Object** control the **Color**.

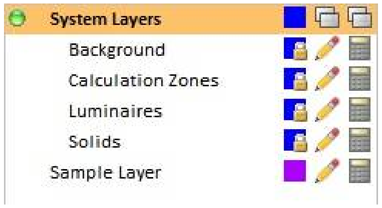
Assigning a **Color** to a **Layer** will override Object Properties **Color** choices; the **Color** of **Objects** will be the **Color** of the **Layer**.

The default state of the **Color** button for all Groups is "**ByLayer**"; each **Layer** has a separate **Color** and can be assigned

The **Group Color** can be chosen by clicking the By **Group Color** button, which opens the **Color** ***Dialog***. Assigning a **Group Color** overrides **Color** selection for all **Layers** and Visual will show a lock *symbol* on the **Group** member **Color** buttons indicating this.

In the example at right, the **Group Color** is set to blue and the **Color** of the **Layers** in the **Group** are locked due to that choice.

Layer Colors can be assigned (unlocked) by choosing "**By Layer**" as the **Color** for the **Group**.

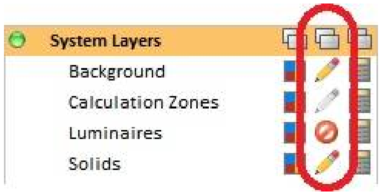


4.3.3 Editability

The **Layer Editability State** is controlled in the **Layer Manager** found in the **Layers** *tab* of the **Sidebar**.

The **Editability** of each **Group** or **Layer** is controlled with the **Editability State** button.

The **Editability State** button has different states than can be assigned and therefore different symbols will appear indicating the different states. The position of the **Editability State** button remains constant.



The default state for all **Layers** is **Editable**. This means objects on that **Layer** can be selected and are of course visible.

The **Uneditable** state makes objects gray in color, and they cannot be selected.

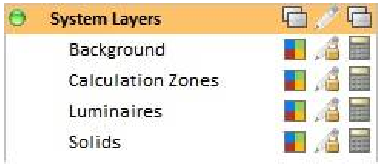
The **Invisible** state makes objects on that **Layer** Invisible.

The **By Layer** state is applicable only to **Groups** and means that the **Editability State** of **Layers** in the **Group** is set for each **Layer**.

Choosing an **Editability State** at the **Group** level means that all **Layers** in that **Group** will have the same state.

Individual **Layer Editability State** cannot be modified in this case, which Visual indicates with lock symbols on top of each **Layer Editability State** button.

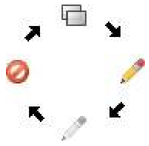
To modify **Layer Editability** in this situation, set the **Group Editability State** to **By Layer**, and then modify the **Layer Editability State(s)** as desired.



There are two methods for changing **Editability State:**

Left-clicking the **Editability State** button will change to the next state type. Continually left-clicking will cycle through the four **Editability States.**

Note that **By Layer** is not a valid state for **Layers**; it only applies to **Groups.**



Alternately, right-clicking the **Editability State** button for a **Layer** or **Group** will pop-up a menu showing the four states and a choice can be made by left-clicking the

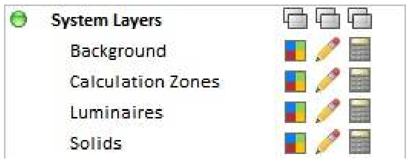
desired state.

4.3.4 Groups

Layer Groups are controlled in the **Layer Manager** found in the **Layers** *tab* of the **Sidebar**. **Groups** provide many ways to organize a project but the use of **Groups** is not required for even complex projects.

A **New Group** can be created to organize **Layers**. The **Group** type can be selected as **Static** or **Dynamic** in the **Properties** *panel* at the bottom of the **Layer Manager**.

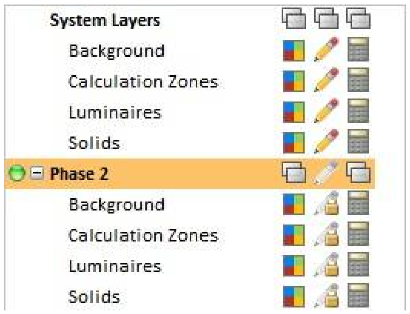
All Visual files contain the **Dynamic System Layers Group**.

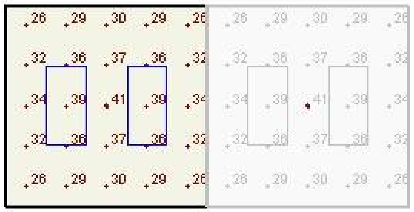


Dynamic Groups are those that have the four **Object Layers** : **Background**, **Calculation Zones**, ***Luminaires***, and **Solids**.

Objects created when a **Dynamic Group** is active are automatically associated to the appropriate **Object Layer**; i.e. **Solids** will be associated to the "**Solids** " **Layer** of the **System Layers Group** .

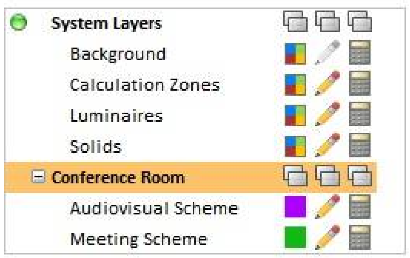
Example1: a future phase of a project could be placed in a **Dynamic Group** , and then removed from the first phase presentation very easily at printing by turning off the entire **Group**. At right, the Phase 2 **Layer** is made **Uneditable**.

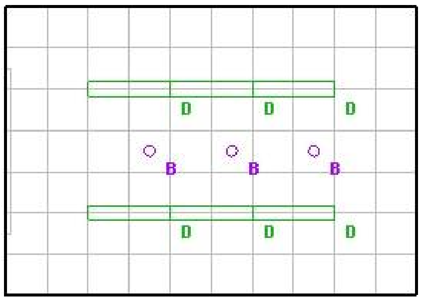




Static Groups are those where **Layers** can be clustered in a logical fashion. **Layers** can be associated to **Static Groups** and controlled collectively. Any of the four **Object** types can be created on a layer and may then be part of a **Static Group**.

Example2: in a conference room, the **Background** and **Solid Objects** for the "meeting" and "audiovisual" schemes would be the same and could be created on the **System Layers** . Different lighting systems (and possibly different **Calculation Zones**) could then be created on different **Layers** and made visible individually in the **Print Editor** to clearly illustrate the lighting in both schemes.





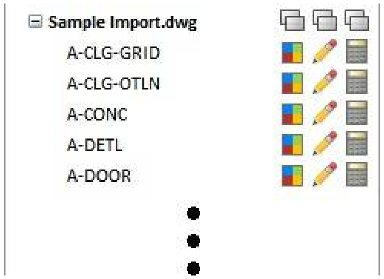
Note that in the two above examples that it is possible to achieve the same or similar results using **Static Groups**, **Dynamic Groups**, and **Layers** in many different ways. **Layer Groups** are provided to allow the user to segment a project in the way that is most logical for a project or is favored by the user.

When *CAD* files are **Imported**, Visual automatically creates a **Static Group** and all **Background Objects** will be placed on **Layers** just as they are in the *CAD* file otherwise.

The **Static Group** will have the name of the *CAD* file.

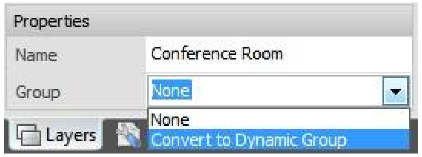
Layer Color is set to **By Entity** to then further preserve the look of the file as it was last saved in the creating program.

Note that some **Layers** may be set to Inactive based on the **Layer State** in the creating program.



Layers can be associated to a **Static Group** by clicking the **Layer** name to make it active and then editing the **Classification Properties** at the bottom of the **Layer Manager** to assign it to the desired **Group**. The process is undone by assigning the **Layer** to the "None" **Group**.

Layers can also be converted to a **Dynamic Group** such that all **Objects** on the selected **Layer** will be separated into the four Visual **Object** types.



The use of **Static** and **Dynamic Groups** is largely one of user preference in that to a large degree either can be used to achieve an efficient design process, clear lighting model construction, and clear presentation.

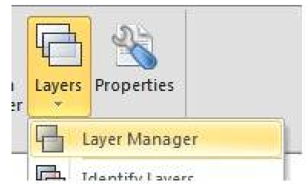
4.3.5 Manager

The **Layer Manager** is located in the [**Sidebar**]() and synonymous with the **Layers** *tab*. The **Layer Manager** shows **System Layers** and user-defined **Layers** and allows control of **Layer** behavior to provide lighting *model* organization based on what is appropriate for a project or useful for a user.

If it is not visible, the **Layer Manager** (**Sidebar** with **Layers** *tab* focus) can be shown by clicking in one of two places:

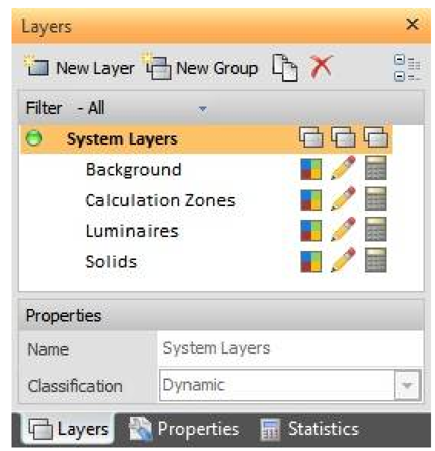
- **Home** *tab*, **Tools** *panel*, **Layers** sub-menu, **Layer Manager**

- **Tools** *tab*, **Options** *panel*, **Windows** sub-menu, **Layer Manager**

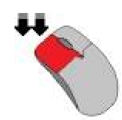


After clicking **Group** and **Layer** names, **Properties** can be edited in the **Properties** *panel* at the bottom of the **Layer Manager**.

The **Layer Manager** also contains a toolbar at the top with several buttons to add and manipulate **Layers** and **Groups**.



To make a **Layer** or **Group** active, and therefore have new **Objects** associated with it, double-click the **Layer** or **Group** name. Alternately, right-click and select "**Active Layer**" from the menu; see information below.

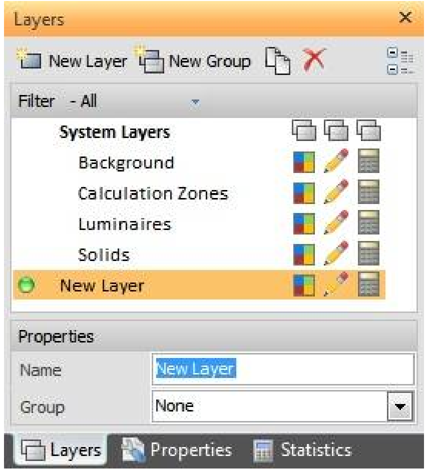


The active **Layer** or **Group** is signified by the green *icon* next to the name. This is separate from the yellow highlight.

Layers that are part of a **Dynamic Group** cannot be made active; the **Dynamic Group** is what is active and Visual places **Objects** on the appropriate Object **Layer** as they are created. Conversely, a **Static Group** cannot be made active; **Layers** that are part of a **Static Group** are made active.

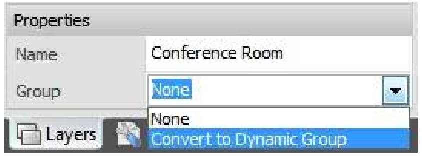
A **New Group** can be created to organize **Layers**. The **Group** type can be selected as **Static** or **Dynamic** in the **Properties** *panel* at the bottom of the **Layer Manager** . See [Layer Groups]() for more information.

Layers can be created by clicking the **New Layer** button at the top of the **Layer Manager**. Visual creates the new **Layer** temporarily and populates the **Properties** *panel* at the bottom of the **Layer Manager** with the preliminary name "New Layer". Focus is placed on this preliminary name so it can be easily renamed to something more meaningful to the current project.



Layers can be associated to a **Static Group** by clicking the **Layer** name to make it active and then editing the **Classification Properties** at the bottom of the **Layer Manager** to assign it to the desired **Group**. The process is undone by assigning the **Layer** to the "None" **Group**.

Layers can also be converted to a **Dynamic Group** such that all **Objects** on the selected **Layer** will be separated into the four Visual **Object** types.

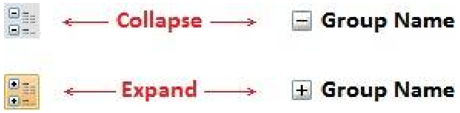


To **Copy** a **Layer** or **Group**, select the desired items and click the **Copy** button at the top of the **Layer Manager**.

To **Delete** a **Layer** or **Group**, select the desired items and click the **Delete** button at the top of the **Layer Manager**.

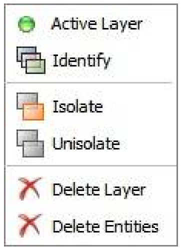
Visual presents a *dialog* to determine if the deleted objects are to be removed or kept after the **Layer** is **Deleted. Delete Layers Only** will move the associated **Objects** to the appropriate **Layers** in the **System Layers Group** (i.e. ***Luminaires*** are placed on the ***Luminaires*** **System Layer**, etc.). Alternately, **Delete Layers and Entities** removes all entities on the **Deleted Layer** and the selected **Layer**.

Display of **Layer Groups** can be compacted by pressing the **Collapse** button in the upper right corner of the **Layers** *tab* to then only show **Layer Group** names. After the button is pressed it changes to the **Expand** button and will be highlighted in yellow. Pressing the **Expand** button reverts to the original state of showing all **Layer** names.



Groups can also **Collapse** and **Expand** by clicking (alternately) on the "-" and "+" next to the **Group** name.

Right-clicking a **Layer** name will pop-up a menu showing multiple command shortcuts:



Left-clicking a choice operates on the selected **Layer**. **Active Layer** changes the **Layer** on which the right-click was initiated to the current **Layer**.

For more information on these and other **Layer** commands, see Layers Tools.

4.3.6 Tools

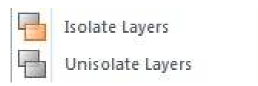
Visual includes several **Layers Tools** to aid in working with **Layers** in complex projects. The **Layers** sub-menu button is located on the **Home** *tab* of the **Ribbonbar**, although the commands are also found in the **Layer Manager** (**Layers** *tab* of the **Sidebar**).

Layers Tools are found in the submenu initiated with the **Layers** button on the **Tools** *tab* of the **Ribbonbar**.

The **Layer Manager** command in the sub-menu activates the **Layer Manager** in the **Sidebar** (the **Layers** *tab*) if it has been closed or switches to that *tab* in the **Sidebar** if it is not currently active. See Layers or more information.

Identify Layers allows for selection of an object to determine the **Layer** on which it resides. Select an object and then right-click to end the command. Visual will highlight the **Layer** in the **Layer Manager**. If objects on multiple **Layers** are selected, Visual will identify all **Layers**.

Isolate Layers allows for the selection of a on object, and the **Layer** on which it resides will be left **Visible** while all other **Layers** will be made **Invisible**. **Unisolate Layers** makes all **Layers Visible**.



Deactivate Layers allows for selection of an object, and the **Layer** on which the object resides will be made **Inactive**. "Inactive" in this context is a coupling of both the **Inactive Calculation State** and being **Invisible**.

Purge Empty Layers removes all **Layers** that have no associated objects. This is particularly useful after a *CAD* Import to allow for more clarity since *CAD* software add-ins can be elaborate. This operation cannot be undone, so Visual displays a warning message as a reminder.

4.4 Properties

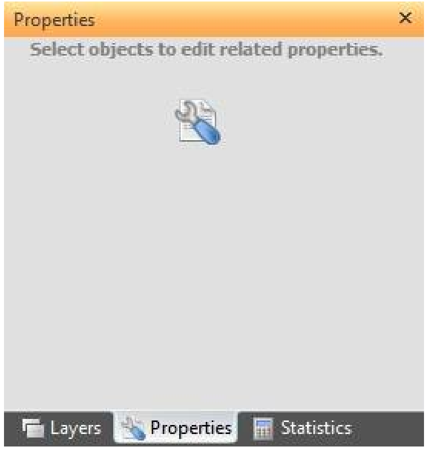
The **Properties** *tab* is located in the **Sidebar**. The *tab* is dynamic in that the content will change depending on which of the four object types is chosen in the selection process.

Object properties can be accessed and modified by executing the **Properties** command in one of four ways:

1) Left-click the **Properties** button in the **Tools** *panel* on the **Home** *tab* of the **Ribbonbar**.

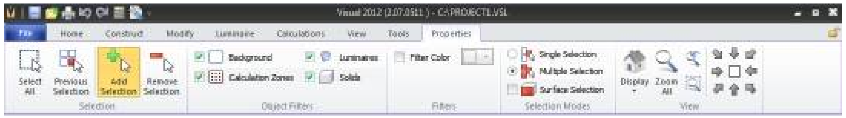
2) Select the menu item from the **Windows** sub-menu in the **Options** *panel* of the **Tools** *tab* in the **Ribbonbar**. Note that the letter "P" next to the command indicates that the *hotkey* for the command is the "P" key.

3) Left-click the **Properties** button is located on the **Properties** *tab* of the **Sidebar**.

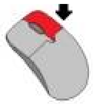


4) The Visual *hotkey* "P" can be pressed on the keyboard to execute the command.

Executing the **Properties** command causes Visual to display the **Properties** *tab* in the **Ribbonbar** discussed in the next sub-section.



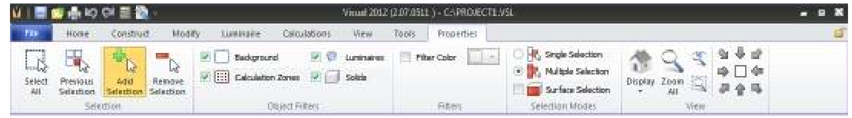
After **Properties** have been suitably modified, click the right mouse button to end the command and apply parameter modifications.



4.4.1 Ribbonbar Properties Tab

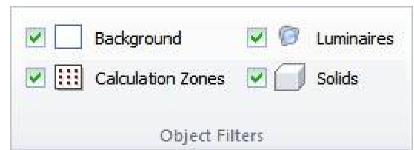
Properties of various entities are modified in the **Sidebar** as described in subsequent sections. Selecting objects to modify is done in the **Properties** *tab* in the **Ribbonbar** after the command has been executed.

Executing the **Properties** command causes Visual to display the **Properties** *tab* in the **Ribbonbar**. The *tab* includes a variety of ways to aid in selecting objects.



The **Properties** *tab* will include the **Selection** *panel* to assist in selecting objects for **Modify** *tab* commands. Visual defaults to adding clicked objects to the selection set, signified by the **Add Selection** button being highlighted in yellow.

The **Properties** *tab* will include the **Object Filters** *panel* to assist in selecting objects for **Modify** *tab* commands and other times when objection selection is required; e.g. specifying a surface on which to place a **Calculation Zone**. A checkbox is present for each of the four object types. Unchecking a box tells Visual to ignore objects of that type when selecting objects.



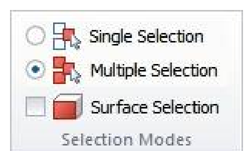
Placing a check in the **Surface Color** checkbox allows a **Color** to be chosen. When selecting **Solid** objects with one of the various methods described here, Visual will then filter the objects to include only those having the color specified. This selection refinement (filter) works only with **Solid** objects.

Selection Modes allows for fine-tuning of how objects are selected.

Single Selection - Left-clicking an object makes that object the only member of the selection set.

Multiple Selection - Each left-click of an object adds to the selection set. See Selecting Objects for information on selecting objects that are "stacked".

Turning **Surface Selection** on by checking the box will select individual surfaces that are part of **Rooms**, **Structures**, or **Grouped Solid** objects.



See Display Modes and Basic Viewing for information on the **View** *panel*.

Note that many selection and filtering methods can be combined to quickly select desired objects. Discussion of the use the **Properties** *tab* in the **Sidebar** for each of the four object types follows in this chapter.

4.4.2 Background Properties

Background properties are shown in the **Sidebar** when the **Properties** command is active and **Background** objects are selected.

To activate the **Properties** command, click the **Properties** button on the **Home** *tab* of the **Ribbon Bar** or in the **Sidebar**, or press the "P" *hotkey*. When a **Background** object is selected, Visual displays the properties for that object in the **Sidebar**.

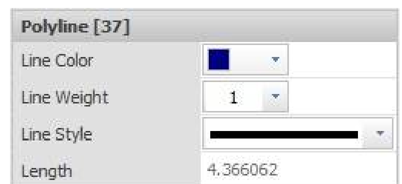
For ***Polyline*** objects Visual displays the following *panels*:

The **Layer** *panel* indicating on which layer the object resides. The layer may be changed by clicking the *drop-down menu* arrow on the right. "**System Layers**" is the default and is in fact a **Layer Group**, which indicates the object is on the **Background** layer of the **System Layers** group. See Layers for more information.

The **Status** *panel* contains a **Visible** menu that allows control of individual objects. Selecting "Yes" means the object(s) will be visible. Selecting "No" means the object(s) will not be visible. "ByLayer" indicates that control of object visibility is controlled by selections made in the Layer Manager for Editability.

Once an object has been made not visible with this *dialog*, the only way to get access to the object is through the Design Manager where the object can be selected and made visible again, for example.

For ***Polyline*** objects, Visual displays the ***Polyline*** *panel*, which contains:



Line Color showing the currently selected **Color** and allows for modification with the **Color** *dialog*.

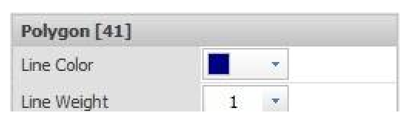
Line Weight showing the current width in pixels and allows for modification with the drop-down menu and the associated *text box*.

Line Style showing the currently selected style and the menu allows selection of one of the 9 styles.

Length is the sum of all segments in feet or meters.

Since **Background** objects cannot be named, a reference number for identification is displayed in square brackets in the *panel* title. This reference number is indexed for **Polylines** and **Polygons** together.

For ***Polygon*** objects, Visual displays the ***Polygon*** *panel*, which adds the following:



Area is shown in square feet or square meters inside the *polygonal* solid boundary.

Center is the X,Y,Z triplet *coordinates* for the centroid of the ***Polygon***. See http://en.wikipedia.org/wiki/Centroid for more information.

Normal is the direction the perpendicular to the surface points in a unit *vector*. i.e. (0,0,1) would indicate the front surface is in the positive Z direction. See http://en.wikipedia.org/wiki/Surface_normal for more information.

Line Style	
Area	11.25
Center	
Length	13.5
Normal	

The ***Coordinates*** *panel* shows the *coordinates* of each *vertex* in X,Y,Z triplets. These are not editable.

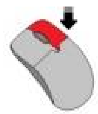
Coordinates

	X	Y	Z
1	17.750	10.000	0.000
2	16.000	9.250	0.000
3	15.750	7.500	0.000
4	17.000	6.500	0.000
5	19.250	6.750	0.000
6	19.000	9.000	0.000
7	17.000	7.750	0.000

Multiple objects can be selected and modified. **Properties** that do not have the same value will have an ellipsis entry indicating multiple values. The ellipsis can be clicked and parameters modified as normal, thus setting that value to all objects; for example, color or layer.

(...)

After **Properties** have been suitably modified, click the right mouse button to end the command and apply parameter modifications.



Drop-down menus in the **Properties** *tab* allow for parameter selection just as in the commands that create objects. Reference specific commands for detailed information on parameters.

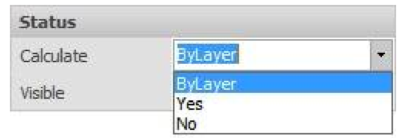
4.4.3 Calculation Zone Properties

Calculation Zone properties are shown in the **Sidebar** when the **Properties** command is active and **Calculation Zone** objects are selected.

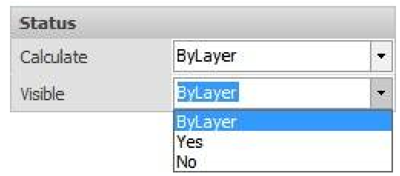
To activate the **Properties** command, click the **Properties** button on the **Home** *tab* of the **Ribbon Bar** or in the **Sidebar**, or press the "P" *hotkey*. When a **Calculation Zone** object is selected, Visual displays the properties for that object in the **Sidebar**.

For **Calculation Zone** objects, Visual displays:

The **Status** *panel* contains **Calculate** and **Visible** menus that allow control of individual objects. Selecting "Yes" means the object(s) will be used in calculations or will be visible. Selecting "No" means the object(s) will not be used in calculations and will not be visible. "ByLayer" indicates that control of object visibility and use in calculations is controlled by selections made in the Layer Manager for Editability and Calculation State.



Once an object has been made not visible with this *dialog*, the only way to get access to the object is through the Design Manager where the object can be selected and made visible again, for example.



The **Layer** *panel* indicating on which layer the object resides. The layer may be changed by clicking the *drop-down menu* arrow on the right. "**System Layers**" is the default and is in fact a **Layer Group**, which indicates the object is on the **Background** layer of the **System Layers** group. See Layers for more information.

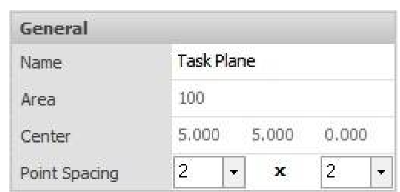
The **General** *panel* contains:

Name is the user-specified name or the Visual default.

Area is shown in square feet or square meters inside the *polygonal* solid boundary.

Center is the X,Y,Z triplet *coordinates* for the geometric center of the ***Polygon***.

Point Spacing shows the spacing of points in X and Y axes respectively and allows modification with drop-down menus and the associated text boxes.



The **Calculation Points** *panel* contains:

Color shows the currently selected **Color** and allows for modification with the **Color** *dialog*.

Lower Limit defines the **Color** of the value highlight and allows specification of the type of highlight. **Minimum** indicates only the lowest value is highlighted. Choosing a value from the drop-down or typing a value will highlight values less than or equal to that value.

Upper Limit defines the **Color** of the value highlight and allows specification of the type of highlight. **Maximum** indicates only the highest value is highlighted. Choosing a value from the drop-down or typing a value will highlight values greater than or equal to that value.

Decimal indicates how many digits are displayed.

Point Style illustrates the selected *symbol* used to indicate each calculation point and allows modification to one of 5 choices.

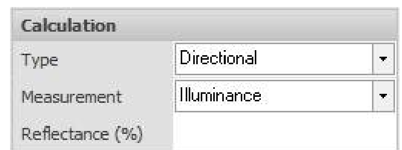
The **Display** *panel* contains:

Calculation Points is a checkbox indicating if points are shown or not.

Contours is a checkbox indicating if the iso-*illuminance* contours are displayed or not on a per-zone basis. Once **Contours** are turned on in the **Calculations** *tab* of the **Ribbonbar,** this allows for individual zone contours to be displayed or not.

Shaded is a checkbox indicating if pseudo-color shading is turned on or off.

The **Calculation** *panel* contains:



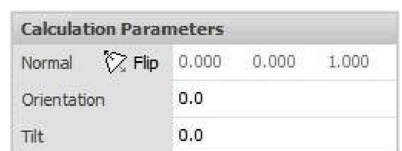
Type is a *drop-down menu* for selection of one of the 7 ways in which Visual handles meter orientation.

Measurement is a *drop-down menu* allowing selection of one of 4 calculation units/methods.

Reflectance is a *text box* for specification of the necessary parameter for non-***Illuminance*** calculations.

See [Calculation](#) for more information.

The **Calculation Parameters** *panel* contains:



Normal is the direction the perpendicular to the surface points in a unit *vector*. i.e. (0,0,1) would indicate the *plane* of the **Calculation Zone** is in the positive Z direction.

Orientation indicates the rotation of the "meter" associated to each point of the **Calculation Zone** with respect to the 0° X-axis.

Tilt is the angle of inclination of the "meter" associated to the **Calculation Zone** with 0° being straight up, 90° being at the horizon, and 180° being straight down.

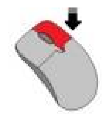
When modifying a **Calculation Zone** created with the **TV** option, Visual displays the location of the camera for modification. See [Calculation Types](#)

The **Flip** button rotates the surface **Normal** 180°. When using the **Calculation Zone Surface** command, Visual places the grid on the "front" face of the solid. Depending on the order in which the *vertices* were chosen, the result of this command may not place the grid on the desired side. Therefore, the **Flip** button would make the other side of the solid the "front" and Visual would place the grid on the opposite side.

Multiple objects can be selected and modified. **Properties** that do not have the same value will have an ellipsis entry indicating multiple values. The ellipsis can be clicked and parameters modified as normal, thus setting that value to all objects; for example, color or layer.

(...)

After **Properties** have been suitably modified, click the right mouse button to end the command and apply parameter modifications.



Drop-down menus in the **Properties** *tab* allow for parameter selection just as in the commands that create objects. Reference specific commands for detailed information on parameters.

4.4.4 Luminaire Properties

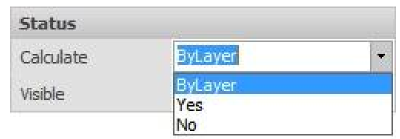
Luminaire properties are shown in the [Sidebar] when the **Properties** command is active and ***Luminaire*** objects are selected.

To activate the **Properties** command, click the **Properties** button on the **Home** *tab* of the **Ribbon Bar** or in the **Sidebar**, or press the "P" *hotkey*. When a ***Luminaire*** object is selected, Visual displays the properties for that object in the **Sidebar**.

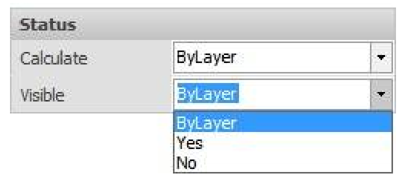
For ***Luminaire*** objects, Visual displays the following *panels*:

The **Layer** *panel* indicating on which layer the object resides. The layer may be changed by clicking the *drop-down menu* arrow on the right. "**System Layers**" is the default and is in fact a **Layer Group**, which indicates the object is on the **Background** layer of the **System Layers** group. See Layers for more information.

The **Status** *panel* contains **Calculate** and **Visible** menus that allow control of individual objects. Selecting "Yes" means the object(s) will be used in calculations or will be visible. Selecting "No" means the object(s) will not be used in calculations and will not be visible. "ByLayer" indicates that control of object visibility and use in calculations is controlled by selections made in the Layer Manager for Editability and Calculation State.



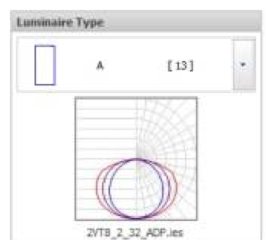
Once an object has been made not visible with this *dialog*, the only way to get access to the object is through the Design Manager where the object can be selected and made visible again, for example.



The ***Luminaire*** **Type** *panel* contains:

Luminaire **Selector**, which is a reduced drop-down version of the ***Luminaire*** **Schedule**. showing ***Luminaire Label*** and **Count**. The *drop-down menu* shows the truncated schedule ***Label***, **Count**, and **Catalog Number**.

Candela **Distribution** showing the shape of the *luminaire* output with the name of the *photometric* file below the polar plot.

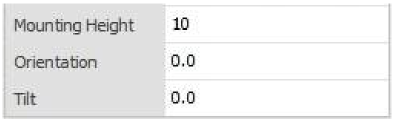


The **Position** *panel* contains:

Aim Point is an editable X,Y,Z triplet indicating where the ***Luminaire*** is aimed. Unless the *Luminaire* was inserted with **Place & Aim**, Visual assumes the aim point

to be in the Z=0 *plane*.

Insertion Point is an editable X,Y,Z triplet indicating where the ***Luminaire*** is placed. Unless the ***Luminaire*** was inserted with **Place & Aim**, Visual assumes the placement to be in the Z=0 *plane*.

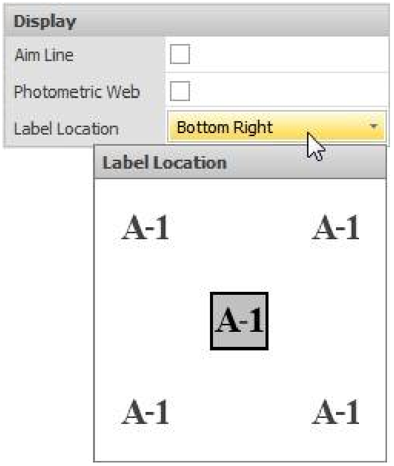


Mounting Height of a ***Luminaire*** is set when a ***Luminaire*** is placed and can be modified to any value to suit the design intent.

Orientation indicates the rotation of the ***Luminaire*** with respect to the 0° X-axis. See [3.2 The Luminaire Editor] for more information.

Tilt is the angle of inclination with 0° being straight down, 90° being at the horizon, and 180° being straight up.

The **Display** *panel* contains:



Aim Line is a checkbox that turns on or off the display of the line from the ***Luminaire*** to the **Aim Point**. This can be very useful to illustrate where *luminaires* are aimed for certain project types like facade lighting.

Photometric **Web** is a check box that turns on or off the display of a pseudo-scaled 3-D mesh illustrating the shape of the *candela* distribution for the selected ***Luminaire***.

Label **Location** is a drop-down menu with 5 location choices to avoid possible overlap of **Labels** when displayed in certain situations.

Multiple objects can be selected and modified. **Properties** that do not have the same value will have an ellipsis entry indicating multiple values. The ellipsis can be clicked and parameters modified as normal, thus setting that value to all objects; for example, color or layer.

After **Properties** have been suitably modified, click the right mouse button to end the command and apply parameter modifications.

Drop-down menus in the **Properties** *tab* allow for parameter selection just as in the commands that create objects. Reference specific commands for detailed information on parameters.

4.4.5 Solid Properties

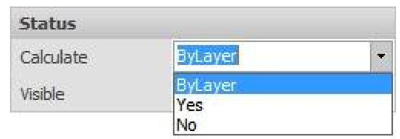
Solid properties are shown in the **[Sidebar](#)** when the **Properties** command is active and **Solid** objects are selected.

To activate the **Properties** command, click the **Properties** button on the **Home** *tab* of the **Ribbon Bar** or in the **Sidebar**, or press the "P" *hotkey*. When a **Solid** object is selected, Visual displays the properties for that object in the **Sidebar**.

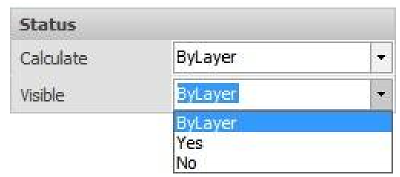
For **Solid** objects, Visual displays the following *panels*:

The **Layer** *panel* indicating on which layer the object resides. The layer may be changed by clicking the *drop-down menu* arrow on the right. "**System Layers**" is the default and is in fact a **Layer Group**, which indicates the object is on the **Background** layer of the **System Layers** group. See [Layers Tab](#) for more information.

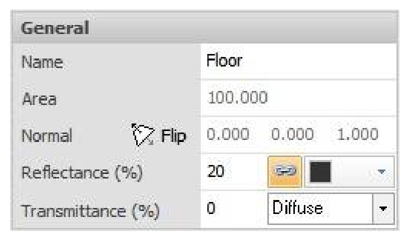
The **Status** *panel* contains **Calculate** and **Visible** menus that allow control of individual objects. Selecting "Yes" means the object(s) will be used in calculations or will be visible. Selecting "No" means the object(s) will not be used in calculations and will not be visible. "ByLayer" indicates that control of object visibility and use in calculations is controlled by selections made in the [Layer Manager](#) for [Editability](#) and [Calculation State](#).



Once an object has been made not visible with this *dialog*, the only way to get access to the object is through the [Design Manager](#) where the object can be selected and made visible again, for example.



The **General** *panel* contains:



Name is the user-specified name or the Visual default.

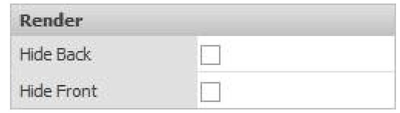
Area is shown in square feet or square meters inside the *polygonal* solid boundary.

Normal is the direction the perpendicular to the surface points in a unit *vector*. i.e. (0,0,1) would indicate the front surface is in the positive-Z direction. The **Flip** button orients the **Surface Normal** 180° from its current position and thus changes the "front" to the "back".

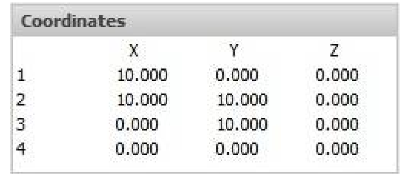
Reflectance is the numerical value and associated color of the solid.

Transmittance is set to 0% and *diffuse* by default when creating an object. ***Transmittance*** can be modified to be higher and/or **Transparent**. ***Diffuse Transmittance*** is like an opal acrylic where a clear image cannot be seen through the material.

The **Render** *panel* allows for one or both sides of a **Solid Object** to be hidden in [Rendered Display Mode](). Placing a check in the box indicates that selection will be hidden.



The ***Coordinates*** *panel* shows all *vertex coordinates* in X,Y,Z triplets and is not editable.

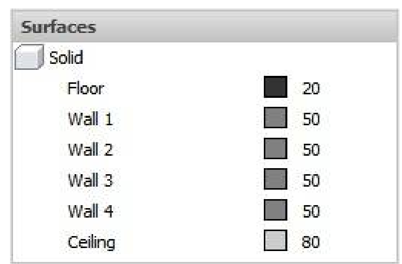


The **Flip** button rotates the surface **Normal** 180°. When using the **Calculation Zone Surface** command, Visual places the grid on the "front" face of the solid. Depending on the order in which the *vertices* were chosen, the result of this command may not place the grid on the desired side. Therefore, the **Flip** button would make the other side of the solid the "front" and Visual would place the grid on the opposite side.

The **Link** button connects the solid ***Reflectance*** to the **Color**. When **Color** and ***Reflectance*** are **Linked**, Visual will adjust the ***Reflectance*** value based on the chosen **Color**. In complex designs not involving **Rendering**, it may be advantageous to color objects differently in the *model* for identification without impacting the calculations.

When a **Room** or **Structure** is selected, Visual displays the associated **Solids** in the **Surfaces** section of the **Sidebar**. Selecting one of the **Surfaces** in the **Sidebar** populates the **General** and ***Coordinates*** sections with the associated information.

See [Ribbonbar Properties Tab]() for information on how **Single Selection** and **Multiple Selection** impact selection of **Grouped** objects.

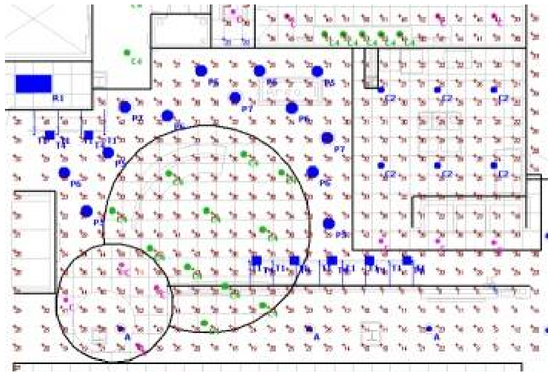


Multiple objects can be selected and modified. **Properties** that do not have the same value will have an ellipsis entry indicating multiple values. The ellipsis can be clicked and parameters modified as normal, thus setting that value to all objects; for example, color or layer.

After **Properties** have been suitably modified, click the right mouse button to end the command and apply parameter modifications.

Drop-down menus in the **Properties** *tab* allow for parameter selection just as in the commands that create objects. Reference specific commands for detailed information on parameters.

Chapter 5 - Model Construction



Flexibility is one of Visual's most powerful attributes. Achieving maximal benefit of flexibility without over-complicating the data entry process can be quite challenging however.

A method was sought to provide a simple means of constructing lighting *models* to any level of complexity without compromising the speed with which more common or basic configurations can be entered.

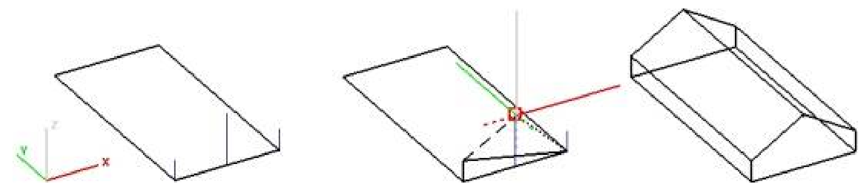
The solution lies in a flexible, graphic-based system similar in function to *CAD* programs. The following chapter introduces the basic components of a Visual lighting *model* and describes the process by which they are created and located within the *model* space.

5.1 Constructing Background Objects

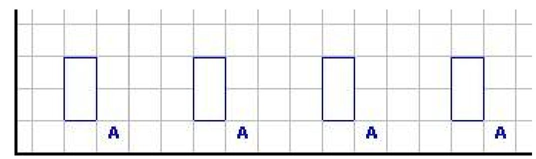
Background Objects are very useful for communicating visual information independent of the lighting analysis.

Background Objects can be invaluable as an aid in the construction of complex *models*. **Lines** may be initially placed so that their endpoints terminate at key locations in the *model* space. **Solid Objects** can then be added using the **Endpoint Object Snap** method so that the **Lines** essentially act as a skeletal map for construction.

Since **Lines** may be extended and trimmed (see Modify), this is often the easiest way to enter complex geometry such as multiple sloped *planes*. **Lines** used as a construction aid are easily erased or made invisible once the *model* has been completed.



A common use for **Background Lines** is to represent ceiling grid. The **Lines** can be made **Inactive** (but still **Visible**) to disallow selection of them while moving ***Luminaires*** but ***Luminaires*** may be placed with the **Intersection Object Snap** and moved into the center of a "tile". See Placing and Orienting Luminaires.

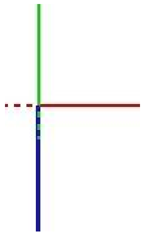


5.1.1 Arcs

Arcs are **Circle** segments constructed in Visual by selecting start and end *coordinates*, and a "bulge" *vector*.

To construct an **Arc**, select the command from the **Reference** *panel* of the **Construct** *tab* in the **Ribbonbar**.

Select the **Arc** start and end *coordinates* by either navigating the mouse *crosshairs* to the appropriate *coordinate* location, entering the *coordinates* numerically at the **Command Line**, or by selecting an object using one of the **Object Snap** methods.

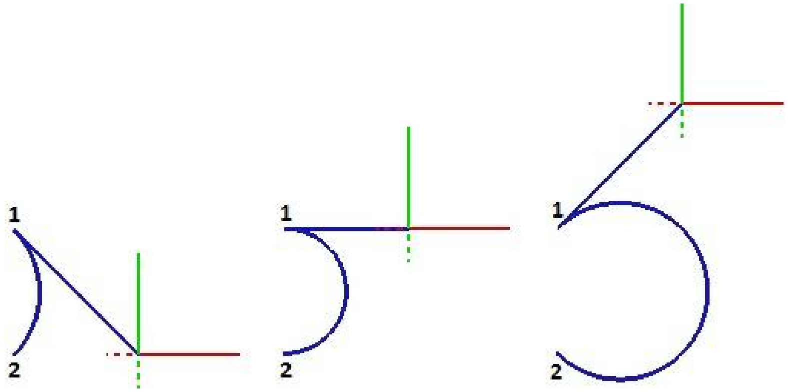


After both start and end points are specified, Visual displays the "bulge" *vector* that is *tangent* to the **Arc** at the endpoint.

Visual also draws the implied **Arc** to show the result prior to final *coordinate* selection.

Moving the mouse to the opposite side of the line connecting the start and end points will cause the mirror-image **Arc** to be drawn.

Left-click to select the *coordinate* location that results in the desired **Arc** and end the command.



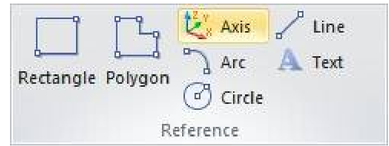
While executing the command, **Color**, **Weight**, and **Style** can be selected from the **Properties** *tab* in the **Ribbonbar** that will automatically be shown. See [Using the Color Dialog] for information on selecting **Color**.

Remember that construction of any object can occur in different *planes* by pressing the *Tab* key.

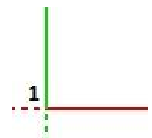
5.1.2 Axis

Visual can draw numbered axes to allow for *coordinate* identification in the **Design Environment** and when making a printed ***Page*** in **Print Editor**.

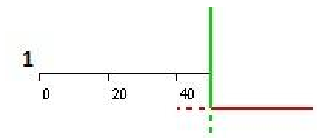
The **Axis** button can be found on the **Construct** *tab* of the **Ribbonbar**.



To create an **Axis**, select the **Base Point** with the mouse, keyboard, or **Object Snap**.

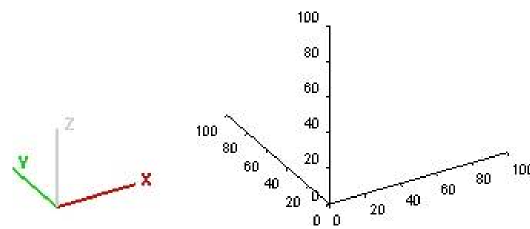


Movement of the mouse in the command shows the implied **Axis** that will be drawn in the ***Active Plane***.

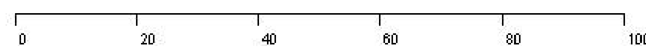


Axis Increment indicates how far apart **Axis** tick marks and labels are created.

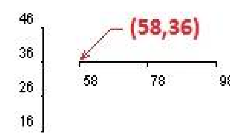
At right, the **Axis** command has been used to draw an **Axis** from the (0,0,0) origin in each of the x, y, and z *cardinal* directions.



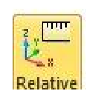
Select the endpoint of the **Axis** line with the mouse, keyboard, or **Object Snap**. Visual automatically ends the command and draws the **Axis**.

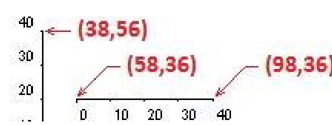


The **Global Axis** option restricts the Visual **Axis** to being parallel with one of the *Cartesian* axes. **Axis** labels are coincident with the X, Y, or Z-dimension related to that spot on the **Axis**.



The **Relative Axis** option allows for an **Axis** to be placed such that labels are based on zero being the ***Base Point*** of the **Axis** as specified and labelling is independent of global (X.Y.Z) *coordinates*. The **Axis** can be applied at any angle in the **Active** ***Plane***.

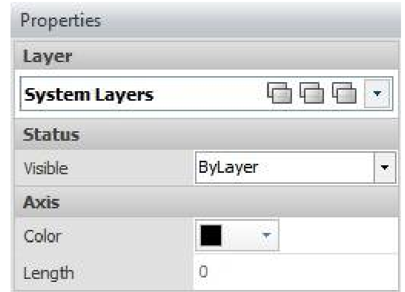




At right, the global *coordinates* are indicated for each Relative **Axis**, which then aligns with the **Global Axis** example above.

After creation, **Layer**, **Color**, and visibility [Properties] can be modified.

Label, line, and tick mark use the same **Color** for each **Axis**.

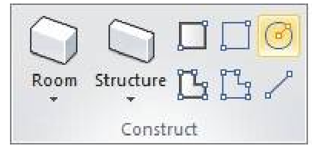


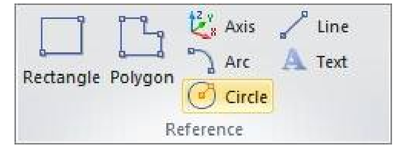
The most common use for an **Axis** would be in conjunction with the insertion of a **Luminaire Locations** table on a printed *page* to allow for the end-user to discern (x,y) *coordinates* of *pole* locations related to site lighting projects.

5.1.3 Circles

Background Circles can be drawn in Visual.

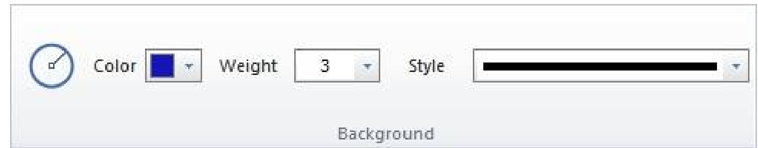
The buttons for **Background Circles** can be found in the **Construct** *panel* on the **Home** *tab* of the **Ribbonbar** or in the **Reference** *panel* on the **Construct** *tab*.



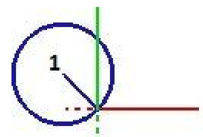


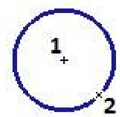
Color, **Weight**, and **Style** can be selected from the **Properties** *tab* in the **Ribbonbar** that will automatically be shown. See [Using the Color Dialog] for information on selecting **Color**. See [Lines and Polylines] for information on **Weight** and **Style.**

Examples shown here are drawn with a **Weight** of "3".



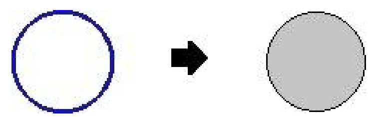
To construct a **Circle**, specify the *coordinates* of the first *vertex* (the center of the circle) using the mouse, keyboard, or **Object Snap**. In the command, moving the mouse causes Visual to draw the implied *radius vector* and the implied **Circle** showing what will be created when the command is completed. Specify the *radius*. To end the command, right-click the mouse or press *Enter*.





During any command, **Undo** will remove the last specified *coordinate* (*vertex*).

Background Circles can be converted to **Solids** if necessary. See [Converting Object Types]. (Note that in the example at right, the **Background** object has a **Line Width** of 3.)

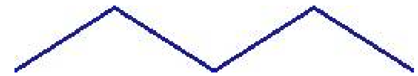


Remember that construction of any object can occur in different *planes* by pressing the *Tab* key.

5.1.4 Lines and Polylines

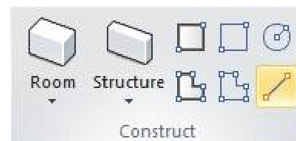
Lines and **Polylines** are constructed in an identical fashion and the separation of the two in Visual is purely semantics.

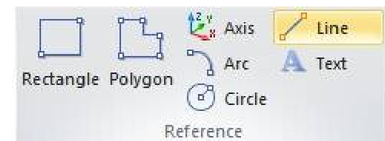
Polylines are a connected series of **Line** segments. A *vertex* is the connection of two segments.



Lines are single segments with a start and an end point.

To construct a **Line** or ***Polyline***, click the **Line** button in the **Construct** *panel* of the **Home** *tab* or in the **Reference** *panel* of the **Construct** *tab* in the **Ribbonbar.**



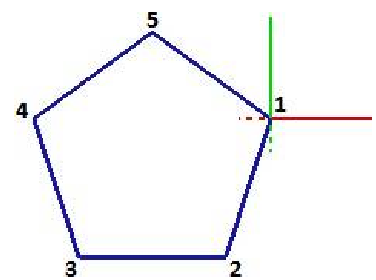


Specify the *coordinates* of the first *vertex* using the mouse, keyboard, or **Object Snap**.

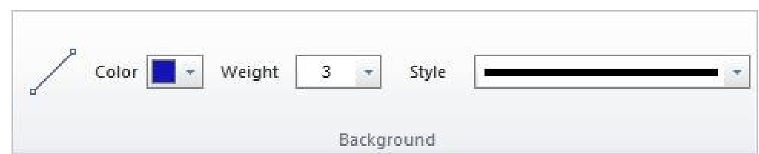
Specify additional *coordinates* as necessary.

Right-click the mouse or press *Enter* to end the command.

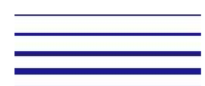
Even when **Polylines** appear to be closed (as at right), Visual does not consider them to be closed and therefore **Polygons**. The ***Polygon*** command must be used to make **Polygons**.



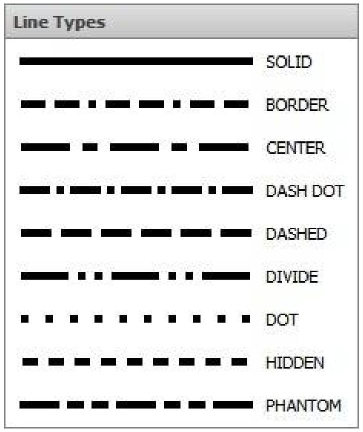
While executing the command, **Color**, **Weight**, and **Style** can be selected from the **Properties** *tab* in the **Ribbonbar** that will automatically be shown. See [Using the Color Dialog] for information on selecting **Color**.



Line Weight can be changed by selecting from one of the five values in the drop-down list. Values are the width in pixels the line will be drawn regardless of **Zoom** value.



The available **Styles** for **Lines** and **Polylines** are shown at right.

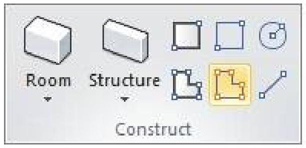


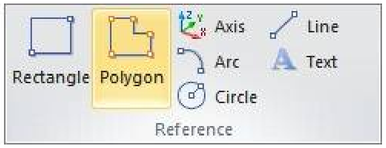
Remember that construction of any object can occur in different *planes* by pressing the *Tab* key.

5.1.5 Polygons

Background Polygons can be created in Visual.

The buttons for **Background Polygons** can be found in the **Construct** *panel* on the **Home** *tab* of the **Ribbonbar** or in the **Reference** *panel* on the **Construct** *tab*.

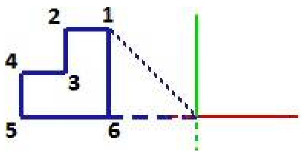


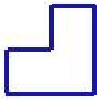


Color, **Weight**, and **Style** can be selected from the **Properties** *tab* in the **Ribbonbar** that will automatically be shown. See [Using the Color Dialog]() for information on selecting **Color**. See [Lines and Polylines]() for information on **Weight** and **Style.**

Examples shown here are drawn with a **Weight** of "3".

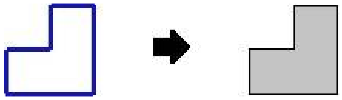
To construct a ***Polygon***, specify the *coordinates* of the *vertices* using the mouse, keyboard, or **Object Snap**. In the command, moving the mouse causes Visual to draw two types of implied lines: the small-dash line connects the cursor to the first *vertex* and the large-dash line connects the cursor to the last *vertex* specified. Visual also shows the implied connection between the first and last *vertices* to illustrate the result if the command is ended. To end the command, right-click the mouse or press *Enter*.





During any command, **Undo** will remove the last specified *coordinate* (*vertex*).

Background Polygons can be converted to **Solids** if necessary. See [Converting Object Types](). (Note that in the example at right, the **Background** object has a **Line Width** of 3.)

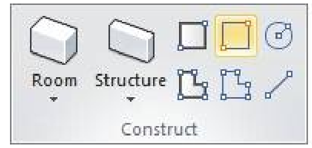


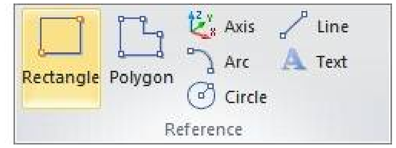
Remember that construction of any object can occur in different *planes* by pressing the *Tab* key.

5.1.6 Rectangles

Background Rectangles can be drawn in Visual.

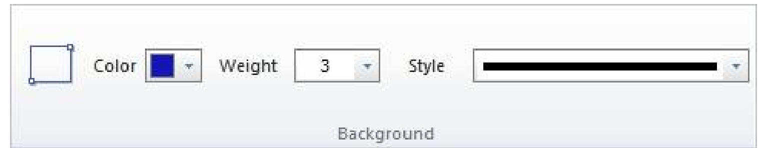
The buttons for **Background Rectangles** can be found in the **Construct** *panel* on the **Home** *tab* of the **Ribbonbar** or in the **Reference** *panel* on the **Construct** *tab*.



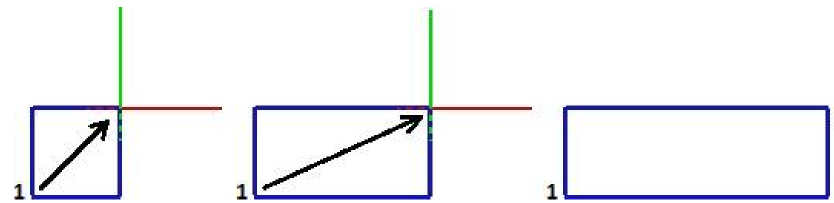


Color, **Weight**, and **Style** can be selected from the **Properties** *tab* in the **Ribbonbar** that will automatically be shown. See [Using the Color Dialog]() for information on selecting **Color**. See [Lines and Polylines]() for information on **Weight** and **Style.**

Examples shown here are drawn with a **Weight** of "3".

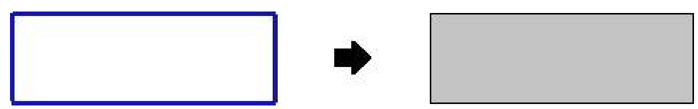


To construct a **Rectangle**, specify the *coordinates* of the first *vertex* using the mouse, keyboard, or **Object Snap**. In the command, moving the mouse causes Visual to draw the implied **Rectangle** showing what will be created when the command is completed. To end the command, right-click the mouse or press *Enter*.



During any command, **Undo** will remove the last specified *coordinate* (*vertex*).

Background Rectangles can be converted to **Solids** if necessary. See [Converting Object Types](). (Note that in the example at right, the **Background** object has a **Line Width** of 3.)

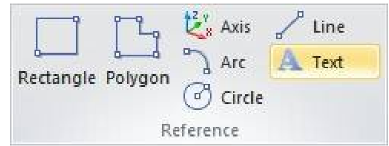


5.1.7 Text

Background Text is useful for annotating features of a lighting *model* or describing particular aspects of a lighting design.

To add **Background Text** to a design, select the **Text** command from the **Construct** menu.

The **Text Editor**, will appear.



Type the desired text into the editing area of the **Text Editor**.

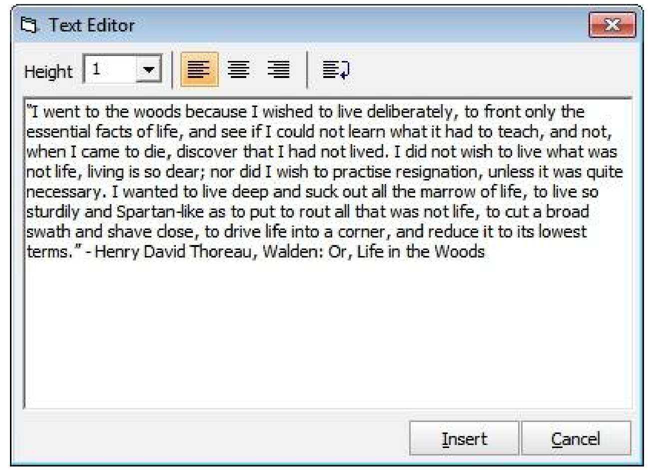
Height can be specified in the same units as used in the **Design Environment** for other elements; feet or meters. To select the **Height** , choose one of the options from the *drop-down menu* or enter a value (integer or decimal) with the keyboard. The **Height** of the "tall" letters will be drawn to that size; for example "l", "t", or "d".

Left, **Center**, or **Right Alignment** can be chosen. Examples of the output are shown below.

The **Wordwrap** button will cause **Text** to be placed on multiple lines. Without this button active (gold), Visual will place all **Text** on one line.

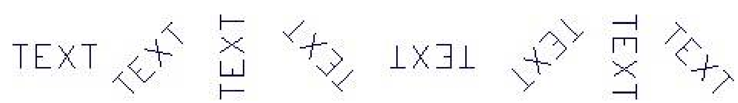
Pressing the *Enter* key inserts a carriage return, and unlike most other commands, does not end the command, for obvious reasons.

Click the **Insert** button to continue.

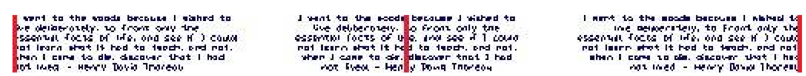


Visual requires the specification of a line to know where to place the **Text**. Specify the first and second points with the mouse, the keyboard, or with **Object Snap**. Visual places the **Text** along that line. The specification of the second point ends the command automatically and places the text. (Visual does not draw the line once the text is placed.) Alternately, right-clicking the mouse ends the command and uses the default (0 degrees) orientation.

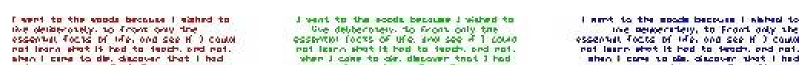
Visual will place **Text** at any angle specified by the implied line between the two points. For example, specifying the second point to the left of the first draws the **Text** inverted.



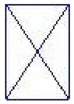
As mentioned above, **Wordwrap** can be set to **Left** (default), **Center**, or **Right Alignment** with respect to the two input points.



Text Color is set by the **Layer** on which it resides. Unlike other **Background** objects, **Text** does not have **Color** unto itself.



It is possible that characters entered into the **Text Editor** cannot be displayed by Visual. In that case, a substitute *symbol* is inserted instead. This is rare.



The "Visual font" is shown at right for reference.

ABCDEFGHIJKLMNOPQRSTUVWXYZ

abcdefghijklmnopqrstuvwxyz

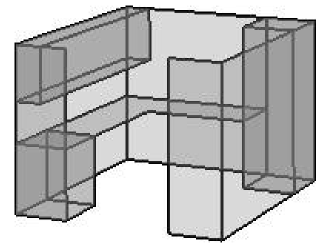
Note that when importing *CAD* information in *DWG* or *DXF* format, any **Text** in the file is converted to the Visual font.

To place formatted text using typical fonts, colors, and other augmentation, see [Text](#) for information on placing text in the **Print Editor**.

5.2 Constructing Solid Objects

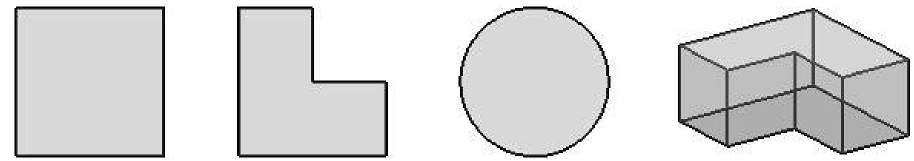
Solid Objects (**Solids**) are an important component of lighting system analysis.

Rooms, **Structures**, and **Walls** (or other more complex obstructions like modular furniture shown at right) can all have a dramatic impact on lighting system performance and it is frequently important to *model* these features to then take them into account in the calculation.



In Visual, such items are comprised of one or more **Solid Objects** in the form of **Rectangles**, **Polygons**, or **Circles**.

Solids can be constructed in a pre-grouped fashion as Rooms and Structures.

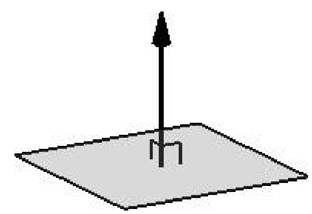


Visual creates **Solid Objects** with a coplanar front and back having the same properties. There is no need to create extra surfaces to have a correct *model*, as is the case in some other lighting software. A common wall can be created between two rooms without impacting the average noticeably in most cases if it is convenient. For example, a 60x40 room versus a 61x41 room will have 1% difference in average *illuminance* with the same lighting system, which is inside the 2% standard *photometric* test error. Imported *CAD* files almost always contain both sides of a given wall, and when an enclosed **Room** is created, Visual's algorithms calculate succinctly so the seeming duplication is not a detriment. See Rooms and Structures for more information.

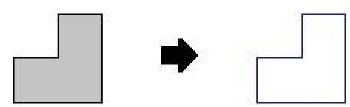
Solids are created with a **Surface Normal** to discern the front face from the back face. This is stored in the object **Properties** and accessed with the **Properties** command. The **Surface Normal** is a unit *vector* indicating direction. (0,0,1) indicates the positive-Z direction. (0,1,0) indicates the positive-Y direction. (1,0,0) indicates the positive-X direction.

The **Surface Normal** is important in that Visual uses that information (which side is the front side) when for example a **Calculation Zone** is placed on a **Solid**. See Placing Calculation Zones on Existing Solid Objects

The **Surface Normal** can be "**Flipped**" by modifying object **Properties**. See Solid Properties.



Solid Circles, **Rectangles**, and **Polygons** can be converted to **Background** objects if necessary. See Convert to Background. (Note that the resulting **Background** objects will have a **Line Width** of 1.)

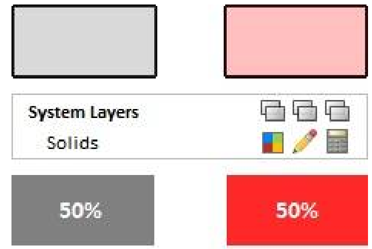


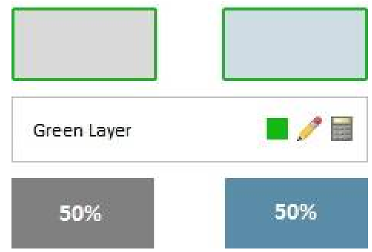
It is important to select **Color** and ***Reflectance*** to align with the properties of the materials in the actual project. For example, 80% ***Reflectance*** is valid for a ceiling composed of higher end acoustic tile, but is certainly not appropriate for raw materials used in most "open to deck" scenarios or sprayed-on insulation, especially when an indirect *luminaire* is used. The default is 50% ***Reflectance*** for all **Solids**.

The choice of a **Color** is only necessary if **Color Rendering** is a desired output from Visual. Grayscale choices yield the same numeric results as "colored" choices, assuming the ***Reflectance*** value is the same.

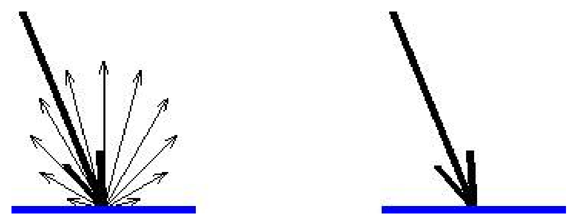
The **Color** and ***Reflectance*** chosen for **Solids** is independent of the **Layer Color**. The **Layer Color** is used to provide user feedback in the **Design Environment** and the **Color** and ***Reflectance*** is used for calculation.

On the right, the objects with a black border have different **Color** (and therefore ***Reflectance***) on the **Solids System Layer** (**Color** is **ByLayer**) and those with a green border are on a separate **Layer**, also with different **Color** (and ***Reflectance***). In **Shaded Display Mode** shown at the bottom, borders (drawn in the **Layer Color**) are not shown. The gray, red, and blue all yield the same calculational result because they are all 50% ***Reflectance*** .

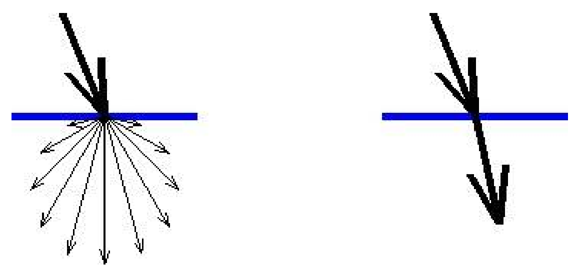




Solid Objects can be modeled to simply block the direct travel of light or reflect light diffusely. See [Solid Object Properties]() for more information.



Solids can be modified to transmit light diffusely or transparently. See [Solid Object Properties]() for more information.

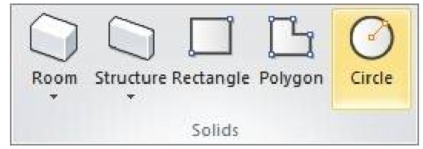


The following section will detail the various methods used to construct and assign properties to **Solid Objects** along with some useful techniques for rapidly developing both common and complex architectural geometry.

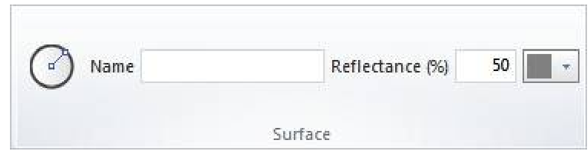
5.2.1 Circles

The most basic means of entering **Solid Objects** (**Solids** and/or **Surfaces**) is by *coordinate* selection, building one surface at a time. *Coordinates* are identified, either graphically or by text *coordinate* entry at the **Command Line**, to define the location and orientation of each **Solid Objects**.

The button for **Solid Circles** can be found in the **Solids** *panel* on the **Construct** *tab* of the **Ribbonbar.**



Solid Circles share a similar interface in the **Properties** *tab* of the **Ribbonbar** that is shown upon command execution.

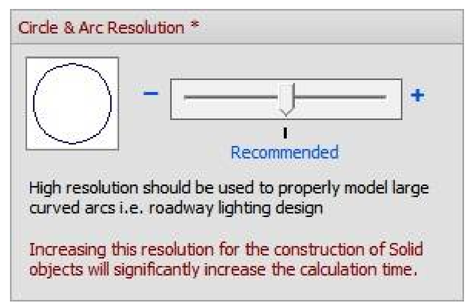


Solids can be named for later reference. If no name is user-defined, Visual will call all **Solid Objects** "Solid". Naming objects can be useful, but it is not required.

The **Color** and ***Reflectance*** of **Solids** are tied together in Visual. Specifying a numeric ***Reflectance*** will cause Visual to choose the analogous gray shade to match. Clicking the **Color** button will launch the **[Color Dialog]** to allow for more detailed **Color** selection.

To construct a **Solid Circle**, specify the *coordinates* of the first *vertex* (the center of the circle) using the mouse, keyboard, or **Object Snap**. In the command, moving the mouse causes Visual to draw the implied *radius vector* and the implied **Circle** showing what will be created when the command is completed. Specify the *radius*. To end the command, right-click the mouse or press *Enter*.

Note that Visual creates faceted **Circles** based on system parameters. If large **Circles** are being created, it may be necessary to modify the parameter to yield a smooth **Circle**. See Drawing Aids Settings for more information.

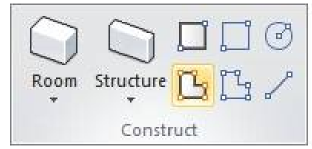


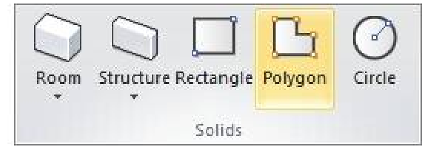
See Constructing Solid Objects for important information about various parameters and behavior of **Solid Objects**.

5.2.2 Polygons

The most basic means of entering **Solid Objects** (**Solids** and/or **Surfaces**) is by *coordinate* selection, building one surface at a time. *Coordinates* are identified, either graphically or by text *coordinate* entry at the **Command Line**, to define the location and orientation of each **Solid Objects**.

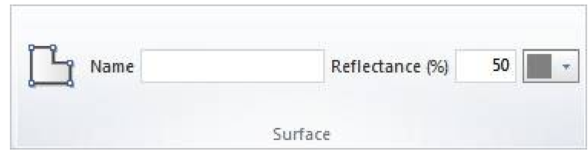
The buttons for **Solid Polygons** can be found in the **Construct** *panel* on the **Home** *tab* of the **Ribbonbar** and in the **Solids** *panel* on the **Construct** *tab*.



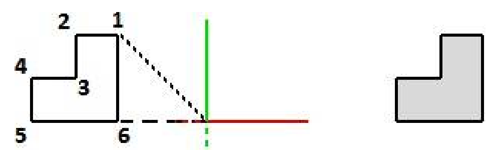


Solids can be named for later reference. If no name is user-defined, Visual will call all **Solid Objects** "Solid". Naming objects can be useful, but it is not required.

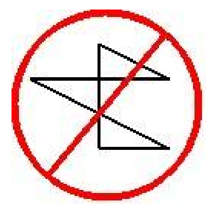
The **Color** and ***Reflectance*** of **Solids** are tied together in Visual. Specifying a numeric ***Reflectance*** will cause Visual to choose the analogous gray shade to match. Clicking the **Color** button will launch the **[Color Dialog]** to allow for more detailed **Color** selection.



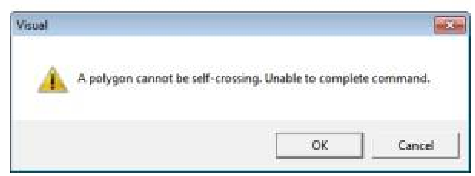
To construct a ***Polygon***, specify the *coordinates* of the *vertices* using the mouse, keyboard, or **Object Snap**. In the command, moving the mouse causes Visual to draw two types of implied lines: the small-dash line connects the cursor to the first *vertex* and the large-dash line connects the cursor to the last *vertex* specified. Visual also shows the implied connection between the first and last *vertices* to illustrate the result if the command is ended. To end the command, right-click the mouse or press *Enter*.



Solid Polygons cannot be self-crossing. Visual makes the determination at the completion of the command and provides a message box. All *coordinate* input during the command is lost; therefore careful selection of points should be made.



For example, the perimeter of a complex large parking lot is being traced with an **Imported** *CAD* file as reference. There can easily be an improper selection when **Object Snap** is used and the ***Polygon*** can be crossing without it being apparent.

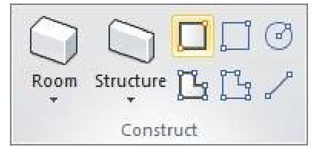


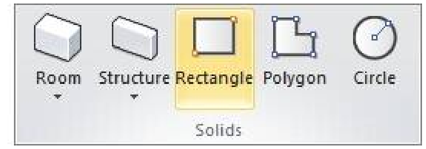
See [Constructing Solid Objects] for important information about various parameters and behavior of **Solid Objects**.

5.2.3 Rectangles

The most basic means of entering **Solid Objects** (**Solids** and/or **Surfaces**) is by *coordinate* selection, building one surface at a time. *Coordinates* are identified, either graphically or by text *coordinate* entry at the **Command Line**, to define the location and orientation of each **Solid Objects**.

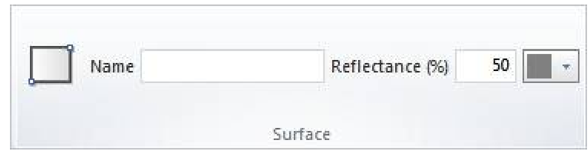
The buttons for **Solid Rectangles** can be found in the **Construct** *panel* on the **Home** *tab* of the **Ribbonbar** and in the **Solids** *panel* on the **Construct** *tab*. The **Solid Circles** button is only on the **Construct** *tab*.



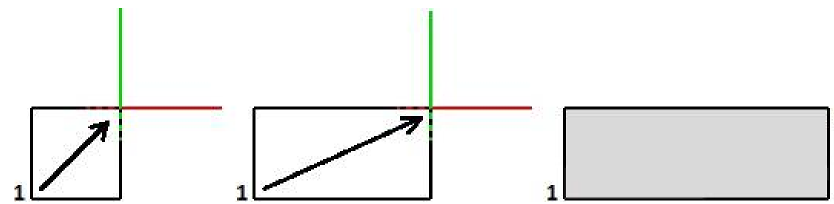


Solids can be named for later reference. If no name is user-defined, Visual will call all **Solid Objects** "Solid". Naming objects can be useful, but it is not required.

The **Color** and ***Reflectance*** of **Solids** are tied together in Visual. Specifying a numeric ***Reflectance*** will cause Visual to choose the analogous gray shade to match. Clicking the **Color** button will launch the **Color Dialog** to allow for more detailed **Color** selection.



To construct a **Rectangle**, specify the *coordinates* of the first *vertex* using the mouse, keyboard, or **Object Snap**. In the command, moving the mouse causes Visual to draw the implied **Rectangle** showing what will be created when the command is completed. To end the command, right-click the mouse or press *Enter*.



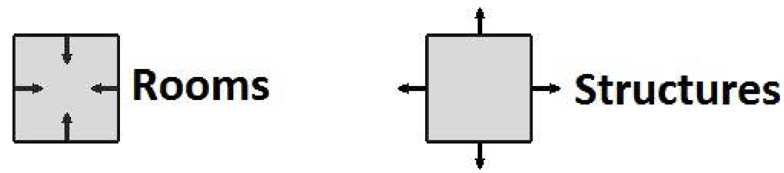
See Constructing Solid Objects for important information about various parameters and behavior of **Solid Objects**.

5.2.4 Rooms and Structures

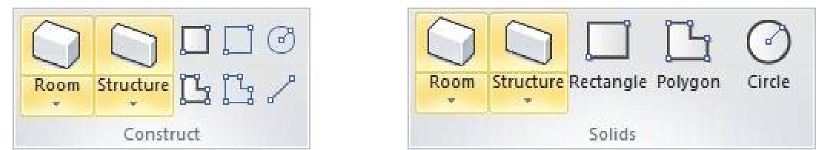
A large majority of projects will include **Rooms** and **Structures** that are ***Polygonal*** or **Rectangular** in plan view and will have flat ceilings and roofs. Visual includes the ability to quickly construct these **Rooms** and **Structures** that are a pre-Grouped collection of **Solid Objects** (**Solids** and/or **Surfaces**).

Rooms and **Structures** can be created in ***Polygonal*** or **Rectangular** form. The semantics of **Surface Normals** is the only difference: **Rooms** will have all normals pointed inward. **Structures** will have all normals pointed outward; this aids surface-based commands such as placing **Calculation Zones**.

Because of the orientation of normals, **Rooms** are normally used for Interior calculations and **Structures** used in **Exterior** calculations. **Structures** could be used to model details of an **Interior** project such as bookcases and desks.

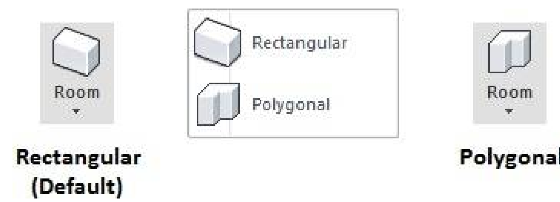


The **Room** and **Structure** buttons can be found in the **Construct** *panel* of the **Home** *tab* and the **Solids** *panel* of the **Construct** *tab* in the **Ribbonbar**.



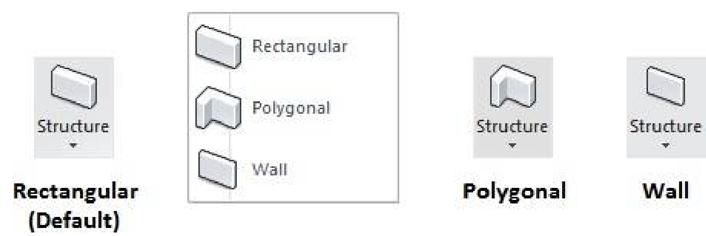
The **Room** button is dual function; the upper portion executes the command, the lower portion initiates a *drop-down menu*.

Once **Polygonal** has been chosen, the upper button portion will change to execute that command with the next press and the graphic is changed accordingly. Selecting **Rectangular** from the drop-down menu will revert the button to that mode.



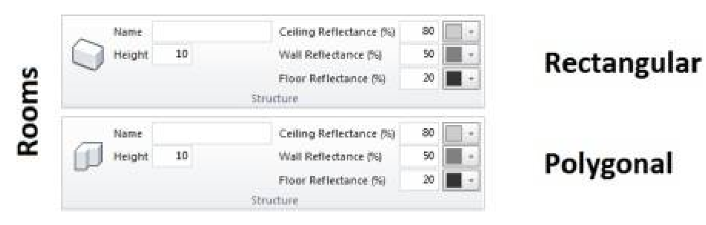
The **Structure** button is dual function; the upper portion executes the command, the lower portion initiates a *drop-down menu*.

Once **Polygonal** or **Wall** has been chosen, the upper button portion will change to execute that command with the next press and the graphic is changed accordingly. Selecting one of the other commands from the *drop-down menu* will revert the button to that mode.



Rooms or **Structures** share a similar interface in the **Properties** *tab* of the **Ribbonbar** that is shown upon command execution. Note the similarities to single **Solid** construction.

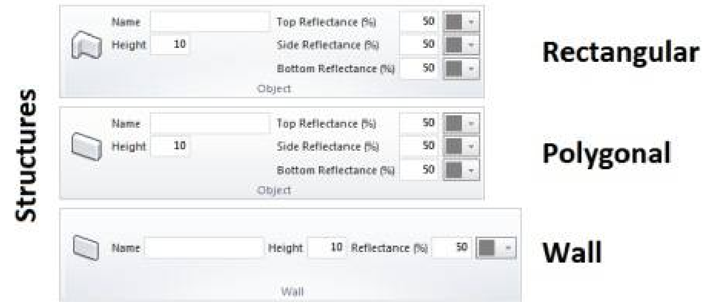
Rooms and **Structures** can be named for later reference. If no name is user-defined, Visual will call the **Grouped Solid Objects** "Solid". Individual **Surfaces** are named "Floor", "Ceiling", and Wall x" accordingly. Naming objects can be useful, but it is not required.



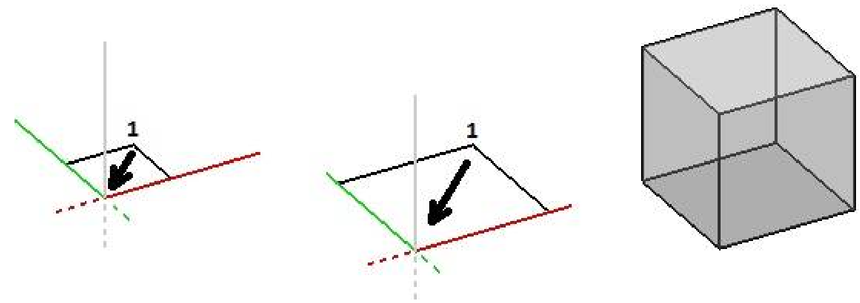
The **Height** of the **Room** or **Structure** must be specified. Note that the **Height** last specified as input for the command will be used as the default (which can of course be changed) upon the next execution of the command; the idea being that heights of **Rooms** and **Structures** will be the same in most cases for a given project.

Parameters specified for one type of **Room** or **Structure** do not carry over to other types.

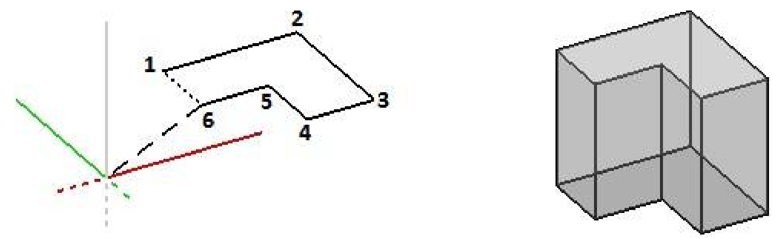
The **Color** and ***Reflectance*** of **Ceiling**, **Walls**, and **Floor** are chosen individually. Recall that **Color** and ***Reflectance*** and are tied together in Visual. Specifying a numeric ***Reflectance*** will cause Visual to choose the analogous gray shade to match. Clicking the **Color** button will launch the **Color Dialog** to allow for more detailed **Color** selection.



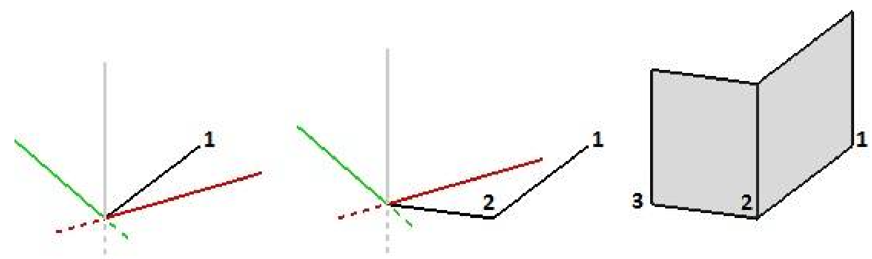
To construct a **Rectangular Room** or **Structure**, specify the coordinates of the first *vertex* using the mouse, keyboard, or **Object Snap**. In the command, moving the mouse causes Visual to draw the implied **Rectangle** showing what will be created when the command is completed. To end the command, right-click the mouse or press *Enter*.



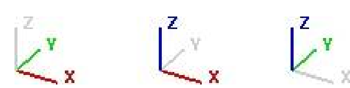
To construct a ***Polygonal*** **Room** or **Structure**, specify the coordinates of the *vertices* using the mouse, keyboard, or **Object Snap**. In the command, moving the mouse causes Visual to draw two types of implied lines: the small-dash line connects the first point to the last specified point to illustrate the result if the command is ended and the large-dash line connects the cursor to the last *vertex* specified. To end the command, right-click the mouse or press *Enter*.



To construct a **Wall**, specify the coordinates of the *vertices* using the mouse, keyboard, or **Object Snap**. Visual will extrude the specified *polyline* to the **Height** chosen in the **Properties** *tab*. In the command, Visual will connect the mouse cursor to the last point specified with a solid line. Right-click the mouse or press *Enter* to end the command.



Note that these commands can be used when the **Active Plane** is set to Y-Z or X-Z. Extrusion (the effective operation that gives **Rooms** and **Structures** their **Height**) occurs in the positive direction perpendicular to the **Active Plane**.

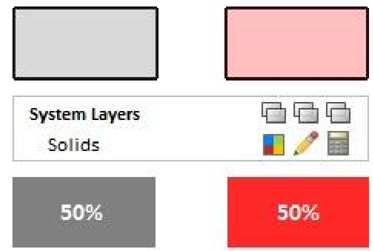


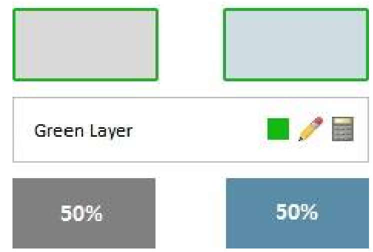
It is important to select **Color** and ***Reflectance*** to align with the properties of the materials in the actual project. For example, 80% ***Reflectance*** is valid for a ceiling composed of higher end acoustic tile, but is certainly not appropriate for raw materials used in most "open to deck" scenarios or sprayed-on insulation, especially when an indirect *luminaire* is used. The default values for **Rooms** are 80% ceiling, 50% wall, and 20% floor ***Reflectance*** (often referred to as "80/50/20"). **Structures** and **Walls** have 50% ***Reflectance*** for all **Solids**.

The choice of a **Color** is only necessary if **Color Rendering** is a desired output from Visual. Grayscale choices yield the same numeric results as "colored" choices, assuming the ***Reflectance*** value is the same.

The **Color** and ***Reflectance*** chosen for **Solids** is independent of the **Layer Color**. The **Layer Color** is used to provide user feedback in the **Design Environment** and the **Color** and ***Reflectance*** is used for calculation.

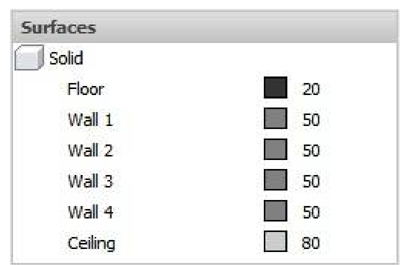
On the right, the objects with a black border have different **Color** (and therefore ***Reflectance***) on the **Solids System Layer** (**Color** is **ByLayer**) and those with a green border are on a separate **Layer**, also with different **Color** (and ***Reflectance***). In **Shaded Display Mode** shown at the bottom, borders (drawn in the **Layer Color**) are not shown. The gray, red, and blue all yield the same calculational result because they are all 50% ***Reflectance*** .





The **Solids** created by these commands are **Grouped**. See [Group] for more information. Note that **Solid Objects** are named "Floor", "Ceiling", and Wall x" accordingly.

Rooms and **Structures** can be modified with the **Properties** command just like single objects. When a **Room** or **Structure** is selected, Visual displays the associated **Solids** in the **Surfaces** section of the **Sidebar** (as shown at right). See Ribbonbar Properties Tab for information on object modification and how **Single Selection** and **Multiple Selection** impact selection of **Grouped** objects when editing **Properties**.

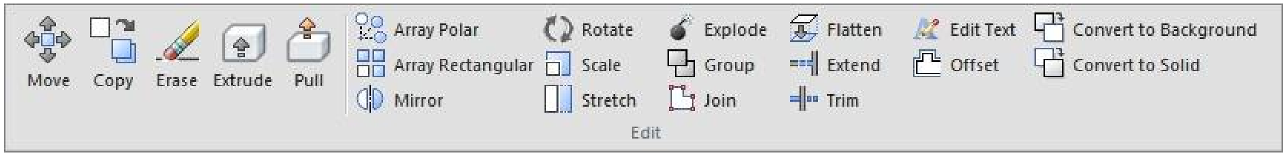


Note that **Rooms** and **Structures** can be created, **Exploded**, and modified as part of the process of *drawing* more complex models. For example, a **Structure** could be created mimicking a column then **Exploded**, the top and bottom (ceiling and floor) **Erased**, and then the objects re-**Grouped** for later ease of use. See Modify.

Chapter 6 - Modify

Ease of modification is a critical factor when modeling lighting systems. This is partly due to the complexity of the overall architectural design process (project phases and revisions for example) and the fact that lighting design is largely a matter of *iterative* process and analysis. The initially constructed *model* and the final design are rarely one and the same.

The **Modify** *tab* of the **Ribbonbar** contains commands to alter the current *model*.

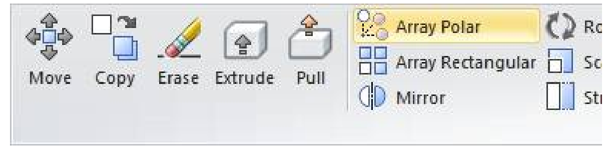


This chapter will introduce the concepts and commands used in Visual to permit modification of lighting designs. Discussion of the **Copy**, **Extrude**, **Pull**, **Array Polar**, **Array Rectangular**, **Mirror**, and **Offset** are commands can be found in Constructing by Reference.

6.1 Array Polar

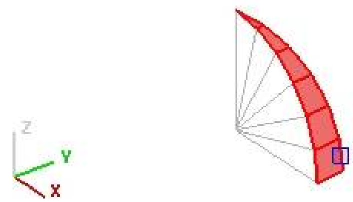
The **Array Polar** command applies to all object types and is used to create multiple copies of all selected objects in columns (x-direction), rows (y-direction), and/or levels (z-direction). The most common use of the **Array Polar** command is with **Solid Objects** since they are most often placed in such **Arrays** to *models* circular, spherical, and cylindrical objects.

The **Array Polar** command can be found on the **Modify** *tab* of the **Ribbonbar**.

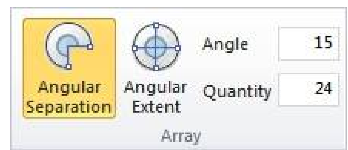


To **Array Polar** objects, left-click the object(s) to be used as the basis for the **Array** with the selection box or use a selection window to select a set of objects. Right-click to complete the selection process of base objects.

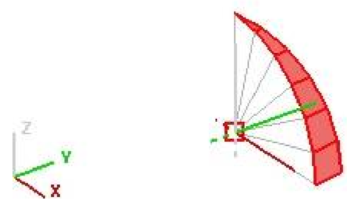
See [Selecting Objects](#) for information on object selection methods.



Spacing information for **Arrayed** objects must be provided in the **[Properties](#)** *tab*. **Angular Separation** spaces newly created objects at the angle specified and creates a total quantity (including the original object) also as specified. Positive angles yield clockwise arrays; negative angles yields counterclockwise arrays. See below for information on **Angular Extent**.

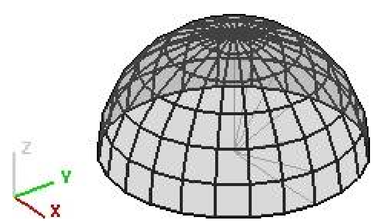


Specify a ***Base Point*** with the mouse, keyboard, or **Object Snap**.

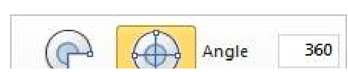


After selecting the ***Base Point*** for the **Array**, Visual automatically completes the command.

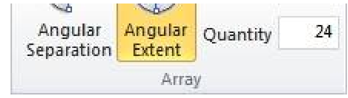
At right, 24 objects are arrayed in a polar fashion 15° apart as is shown in the **[Properties](#)** *tab* input boxes above.



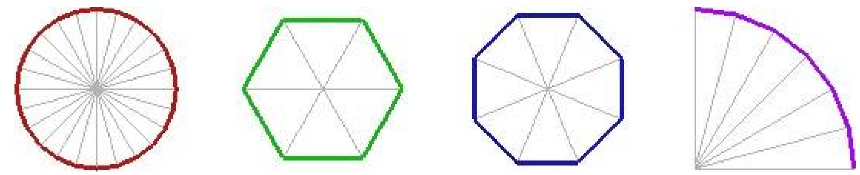
Angular Extent allows the user to define how many objects are created (including the original object) and then specify the total angular extent to fill with objects. The



process is the same as before: select objects, specify a ***Base Point***, and Visual automatically completes the command.



Two examples that create a full faceted circle (*polygon*) are warranted to illustrate the difference between the angular options. Once the radial lines are arrayed, the faceted circle is drawn with the **Polyline** command:



Angular Extent option: an angle of 360 is specified, and the number of objects to use to fill that angle is chosen. A quantity of 24 yields 15° wedges that might be the base of the hemisphere shown above, 6 yields a hexagon, and 8 yields an octagon.

Angular Separation option : the inputs left to right in the examples are 15° angle and quantity of 24. 60° angle and quantity of 6, or 45° of angle and quantity of 8. At far right, 15° and quantity of 7 yields 90° of arc.

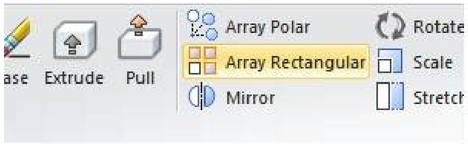
[Angular Separation] X [Quantity] = [Angular Extent] e.g. 15 X 24 = 360 as above.

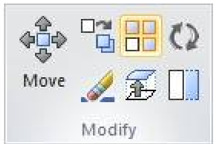
Like many commands, **Array Polar** can be used on ***Luminaires***, **Background Objects**, **Solid Objects**, and **Calculation Zones**.

6.2 Array Rectangular

The **Array Rectangular** command applies to all object types and is used to create multiple copies of all selected objects in columns (x-direction), rows (y-direction), and/or levels (z-direction). The most common use of the **Array Rectangular** command is with ***Luminaire*** **Objects** since they are most often placed in such **Arrays** in reality.

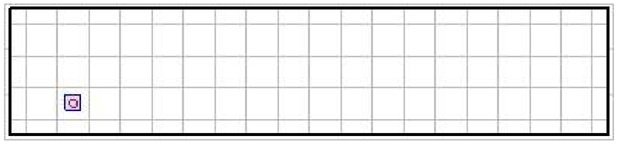
The **Array Rectangular** command can be found on the **Modify** *tab* and the **Home** *tab* of the **Ribbonbar**.



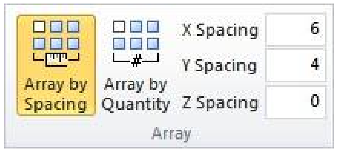


To **Array Rectangular** objects, left-click the object(s) to be used as the basis for the **Array** with the selection box or use a selection window to select a set of objects. Right-click to complete the selection process of base objects.

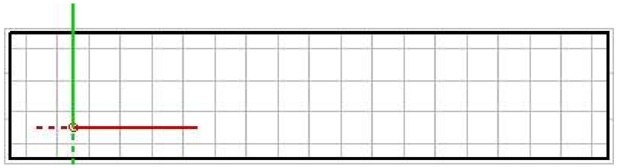
See Selecting Objects for information on object selection methods.



Spacing information for **Arrayed** objects must be provided in the **Properties** *tab*. **Array By Spacing** spaces newly created objects at the distance specified. The limits of the Array are specified with the mouse; defined by the ***Base Point*** and ***Destination Point***. See below for information on **Array By Quantity**.

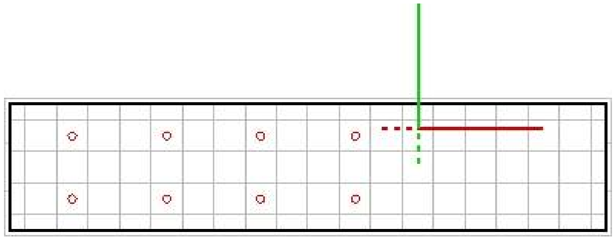


Specify a ***Base Point*** with the mouse, keyboard, or **Object Snap**.

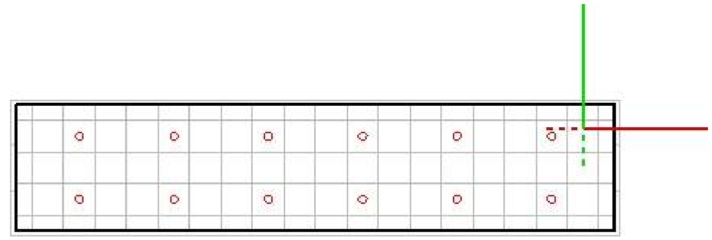


After selection of a ***Base Point***, movement of the mouse *crosshairs* within the **Design Environment** will display a graphical representation of the selected objects as they will be arrayed with the specified spacing to aid in the proper selection of a ***Destination Point***.

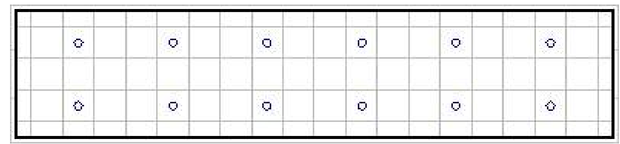
In the example at right, ***Luminaire*** **Objects** are pre-spaced at 6ft in the x-direction and 4ft in the y-direction. The *crosshairs* indicate the current extent of the **Array**.



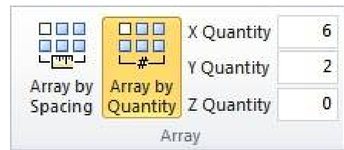
Select a ***Destination Point*** with the mouse, keyboard, or **Object Snap**.



After selecting the ***Destination Point***, Visual automatically completes the command.

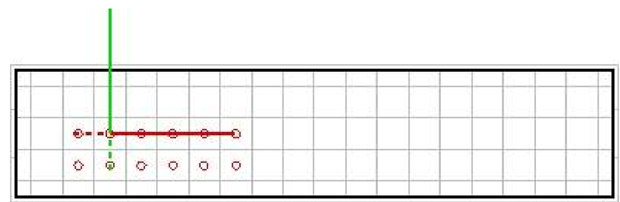


Array By Quantity allows the user to define how many objects are created and then specify the X, Y, and/or Z-spacing with the mouse, keyboard or **Object Snap**.

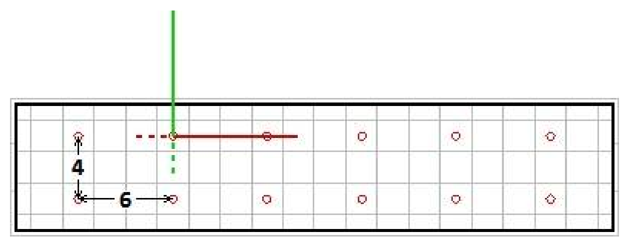


As before, moving the mouse in the **Array By Quantity** mode illustrates how the columns and rows would be placed if the mouse was clicked in that location with the quantity fixed and the spacing variable with mouse movement.

For example, at right, the mouse has been moved 2x2 and the 6 columns and 2 rows are shown more compact than is likely desired.



Select a ***Destination Point*** that defines the X, Y, and/or Z-spacing with the mouse, keyboard or **Object Snap.** For example, specifying a quantity of X=6 and Y=2 and then using the mouse to specify **Base Point** and ***Destination Point*** 6x4 apart yields the same **Array** as was shown above.



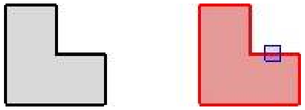
Like many commands, **Array Rectangular** can be used on ***Luminaires***, **Background Objects**, **Solid Objects**, and **Calculation Zones**.

6.3 Convert To Background

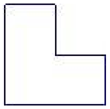
Solid Objects can be converted to **Background Objects.**

The **Convert To Background** command can be found on the **Modify** *tab* of the **Ribbonbar**.

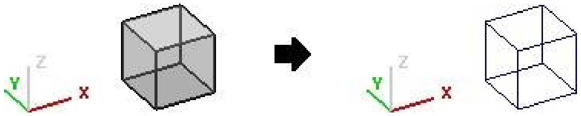
To **Convert To Background**, select the **Solid Object** to be converted by left-clicking the object or using a window selection method.



Right-click the mouse or press *Enter* to end the command and make the conversion. The new **Background Object(s)** will reside on the same **Layer** as the original **Solid Object(s)**.



Grouped Solid Objects (**Rooms**, **Structures**, etc) can be converted in bulk by clicking the **Group**. Individual **Polygons** will be created since there is not an analog to "group" **Background Objects**.



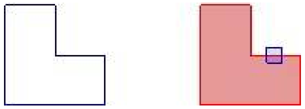
See **[Convert To Solid]** for the opposite functionality.

6.4 Convert To Solid

Background Objects can be converted to **Solid Objects.**

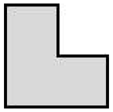
The **Convert To Solid** command can be found on the **Modify** *tab* of the **Ribbonbar**.

To **Convert To Solid** , select the **Background Object** to be converted by left-clicking the object or using a window selection method.

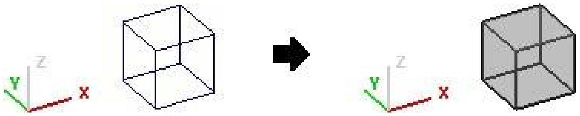


Before or after object selection, a **Name** can be assigned in the **Properties** *tab*. Additionally, a **Color** and ***Reflectance*** can be chosen (see [Using the Color Dialog]) just as would be the case when using the Individual Construction methods.

Right-click the mouse or press *Enter* to end the command and make the conversion. The new **Solid Object(s)** will reside on the same **Layer** as the original **Background Object(s)**.

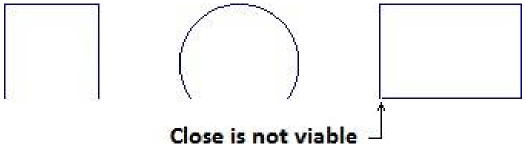


Grouped Background Objects can be converted in bulk. All converted objects will be assigned the same **Name**, **Color**, and ***Reflectance*** as chosen in the **Properties** *tab*. Individual **Solid Objects** will be created and will not be made a **Group**.



It should be clear that only closed *planar* polygons can be converted to **Solid Objects**. Visual will validate the selection by effectively ignoring the object selection if it cannot be converted.

It is routinely the case that objects appear to be a closed *polygon*. If they are closed, they will be converted. If they are not converted, they are simply not closed regardless of the appearance. The user must apply Trim and Extend to provide a single *vertex* for Visual to use.

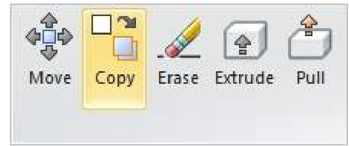


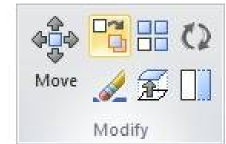
See **Convert To Background** for the opposite functionality.

6.5 Copy

The **Copy** command applies to all object types and is used to create single or multiple copies of all selected objects.

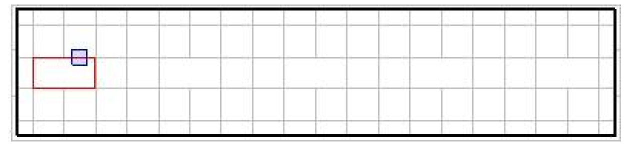
The **Copy** command can be found on the **Modify** *tab* and the **Home** *tab* of the **Ribbonbar**.



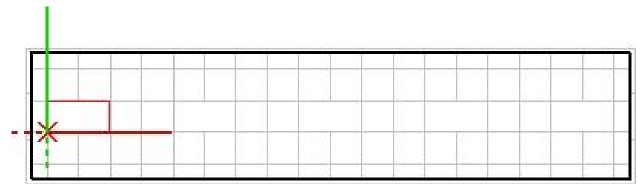


To **Copy** objects, left-click the object(s) you want to **Copy** with the selection box or use a selection window to select a set of objects. Right-click to complete the selection process of base objects.

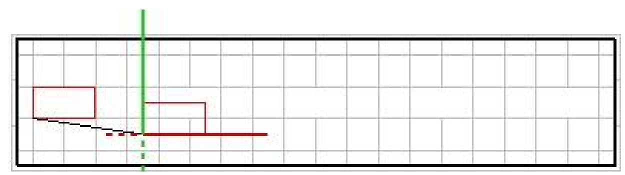
See [Selecting Objects](#) for information on object selection methods.



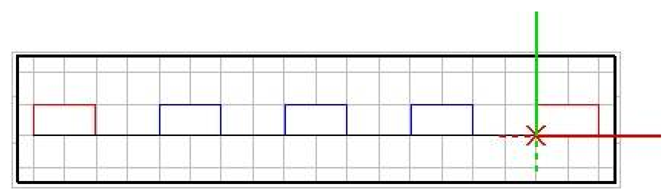
Specify a ***Base Point*** with the mouse, keyboard, or **Object Snap**.



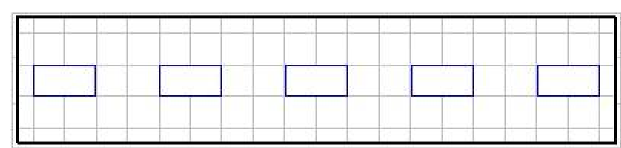
After selection of a ***Base Point***, movement of the mouse *crosshairs* within the **Design Environment** will display a graphical representation of the selected objects as they are being translated to aid in the proper selection of a ***Destination Point***.



Select a ***Destination Point*** with the mouse, keyboard, or **Object Snap**. Select additional **Destination Points** for each additional **Copy** you want to create. At right, note that the base object is highlighted in red (the system **Selection Color**) and newly created *luminaires* are shown in the **Color** assigned to them.



To complete the **Copy** command right-click the mouse or press *Enter*.

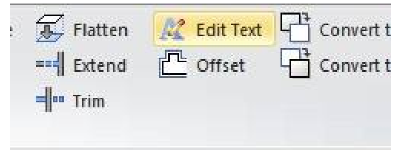


Copy can be used on ***Luminaires***, **Background Objects**, **Solid Objects**, and **Calculation Zones**.

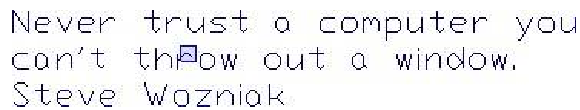
6.6 Edit Text

Text placed in Visual (created natively or by **Import**) can be edited with the **Text Editor**.

The **Edit Text** command can be found on the **Modify** *tab* of the **Ribbonbar**.



To **Edit Text**, left-click to select the **Text** to be edited.

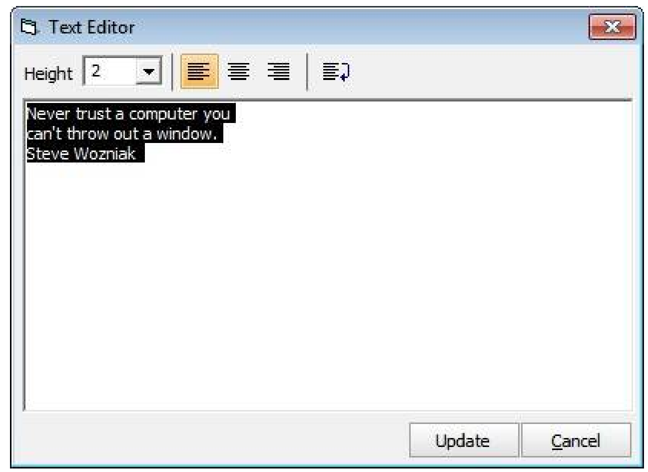


The **Text Editor** is immediately initiated. Unlike other **Modify** commands, the object will not be highlighted in the **Design Environment**.

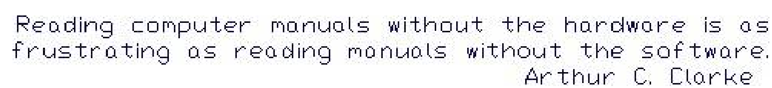
The selected **Text** is shown in the **Text Editor** and changes to **Height**, **Alignment**, and **Wrapping** can be made just as when the **Text** was originally created.

The orientation of the **Text** cannot be modified after the **Text Editor** is closed. See [Rotate] for information on changing the angle of the **Text**.

The **Color** of **Text** is modified with [Properties] based on **Layer** selection and object parameters as was the case during **Text** creation.



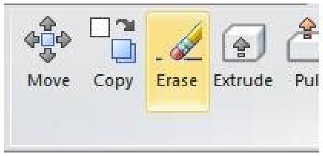
Click **Update** to apply the changes and exit the **Text Editor**. Clicking **Cancel** ignores changes and closes the *dialog*.

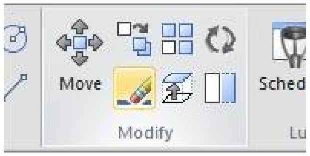


6.7 Erase

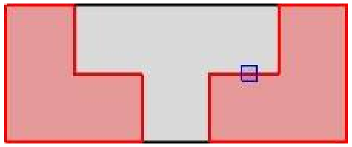
The **Erase** command removes objects from the lighting *model*.

The **Erase** command can be found on the **Modify** *tab* and the **Home** *tab* of the **Ribbonbar**.

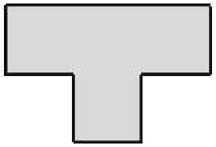




To **Erase** one or more objects, select the objects by left-clicking or selecting multiple objects with a window selection method.



Right-click or press *Enter* to end the command.

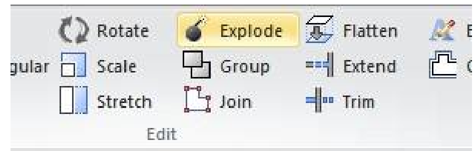


Erase applies to all object types.

6.8 Explode

The **Explode** command allows connected objects to be un-**Grouped** (for **Solid Objects**) or un-**Joined** (for **Background Objects**). Objects like **Rooms**, **Structures**, and **Polygons** are pre-connected upon construction. It may be desirable to break this connection to **Erase** or otherwise modify one of the sub-objects.

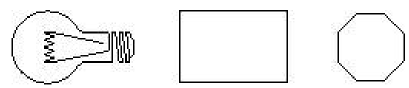
The **Explode** command can be found on the **Modify** tab of the **Ribbonbar**.



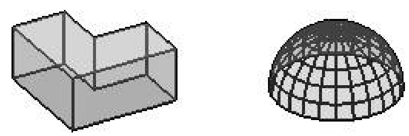
To **Explode** an object, select the object(s) to be **Exploded** by left-clicking or using a window selection method.

Right-click to end object selection and **Explode** the objects. In most cases, the explosion will not be immediately obvious. At right, note that a single surface of the **Solid Object Room** and the long sides of a **Background Rectangle** can be individually selected, whereas above, prior to the explosion, the entire **Room** and **Rectangle** where selected with a single left-click on each.

The **Background Objects**: **Polylines**, **Rectangles**, and **Polygons** can be **Exploded**.



The **Solid Objects**: **Room**, **Structure**, and **Grouped** objects can be **Exploded.**



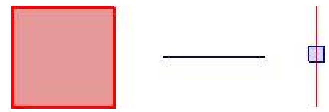
See Group and Join for methods of connecting objects.

6.9 Extend

The **Extend** command increases the length of a **Line** or ***Polyline*** (not **Arcs**) to meet or touch the selected **Base Object**.

The **Extend** command can be found on the **Modify** *tab* of the **Ribbonbar**.

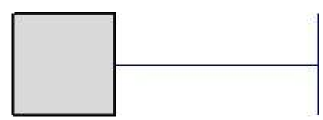
To **Extend** one or more **Base Objects**, left-click or use a window selection method to choose the **Boundary Edges** or object(s) to extend to. Right-click or press *Enter* to end object selection. Two **Boundary Edges** are selected at right; a **Solid Object** square and a **Background Line**.



Left-click each object to be **Extended** to the **Boundary Edge(s)**. It is necessary to left-click on the half of the object nearest the **Boundary Edge**.

After each click, Visual **Extends** the object.

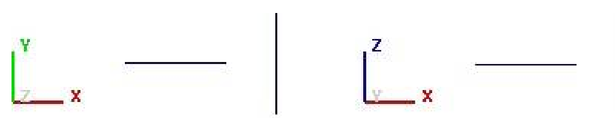
Right-click or press *Enter* to end the command.

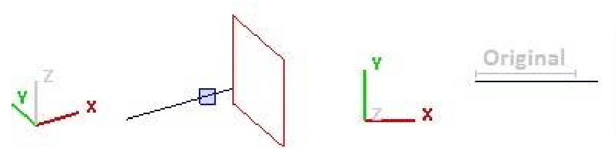


Extend operates on objects based on the current view. i.e. an object at Z=0 can be **Extended** to an object at Z+1 when viewed in the **Plan View**, even if the objects don't mathematically intersect. This functionality can be an advantage when constructing advanced geometries when used in N, S, E, or W views. At right, a line is extended to a vertical **Solid Object**.

Important Note:

Extending in isometric views can yield unsatisfactory results if **Boundary Edges** objects are not in the same *plane* as the **Extended** object. At top right, the **Plan View** and **South** view of two objects are shown; a line and a square. The common assumption is that the **Line** will be **Extended** to the center of the square when in an isometric view. This is not the way the command functions. At bottom, the **Line** is **Extended** in **SW View**, and when viewed in **Plan View**, the results are not likely what was intended.



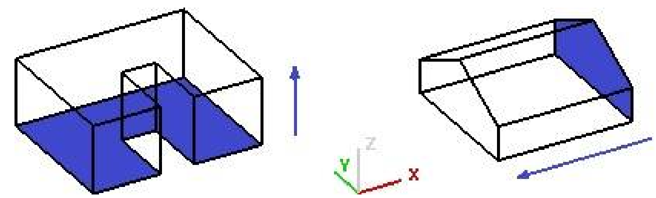


Extend operates only on **Background Objects**. **Arcs** cannot be **Extended**. **Solid Objects** can be used as **Boundary Edges**.

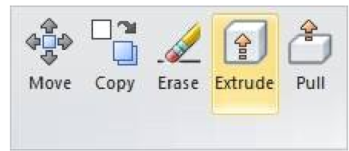
6.10 Extrude

Extrude is a term that describes the process of "stretching" a *linear* or *planar* object linearly into a (in most cases) third dimension to create a 3-D **Solid Object** from it. See the **Pull** command for a more graphical and WYSIWYG method of extruding.

Extrude is a powerful tool for modeling **Solid Objects** because extruded shapes are commonly found in modern architecture. At right, some examples of extruded shapes are shown. The original *planar* object is shaded and the arrows indicate the direction of extrusion.

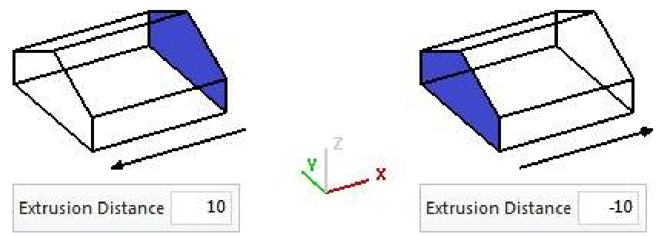


Any existing **Solid Object** may be **Extruded**. Select the **Extrude** command from the **Modify** *tab* of the **Ribbonbar**. The **Properties** *tab* will appear allowing for entry of command parameters.

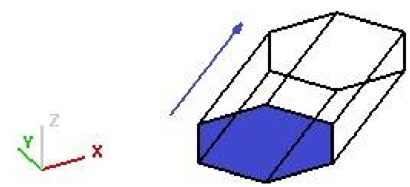


An **Extrusion Distance** must be entered. The default direction of **Extrusion** is perpendicular to the *plane* of the **Solid Object**, in the direction nearest the point of view.

To extrude in the opposite direction, specify a negative **Extrusion Distance**.



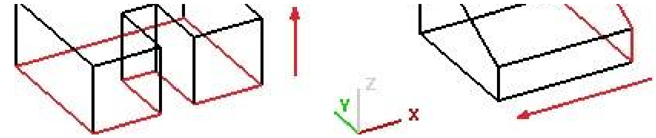
When **Directional Extrusion** is chosen, the **Command Line** will prompt for the base and destination points of a *vector* to establish the direction of **Extrusion**. In terms of the graphics above and at right, the base would correspond to the tail of the arrow and the destination would correspond to the head. The exact location of the chosen base and destination points is irrelevant as they only serve to indicate a direction. The base and destination points may be entered manually as well. For example, a *base point* of (0,0,0) combined with a *destination point* of (1,0,1) would result in the extrusion at right, which is in the X-Z *plane* at an angle of 45°.



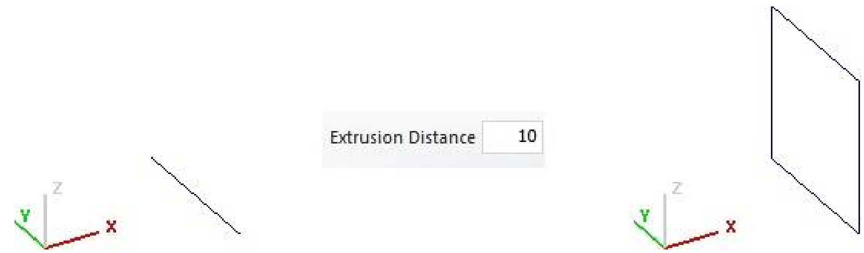
The result of **Extrusion** is a single **Solid Object** having the same ***Reflectance*** value (taken from the original *planar* object) on all surfaces. Should varying ***Reflectance*** values need to be assigned, this can be accomplished by editing the ***Reflectance*** values by using the Properties command. The **Grouped Solid Object** can also be Exploded into its component **Solids**.

Extruding Background Objects follows a similar methodology as **Solid Objects**. Select the object to be **Extruded**, specify the extrusion distance in the

[Properties](#) *tab*, and right-click or press *Enter* to end the command.



Lines can be **Extruded** to make **Rectangles**.



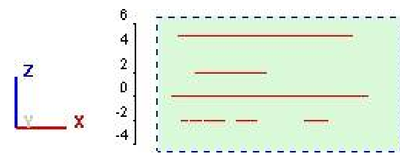
Note that the **Extrusion** process is the core of the behavior when executing the **Room** and **Structure** commands. Review [Rooms and Structures](#) before deciding to construct a **Solid Object** and **Extrude** it; i.e. constructing a **Room** or **Structure** may be a quicker process.

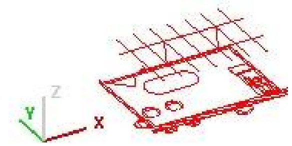
6.11 Flatten

The **Flatten** command changes the Z-*coordinate* of selected **Background Objects** to zero. This is very useful when importing *CAD* files to use as reference for a design since various heights of objects that are not germane to the project can exist.

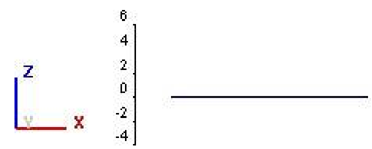
The **Flatten** command can be found on the **Modify** *tab* of the **Ribbonbar**.

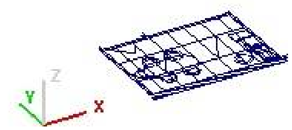
To **Flatten** objects, select the desired objects by left-clicking or with a window selection method. "All" is useful in this case; see Selecting Objects. Note the first graphic at right is an elevation view of the X-Z *plane*.





Right-click or press *Enter* to end the command and the objects are changed to have Z = 0. Note the first graphic at right is an elevation view of the X-Z *plane* and that all objects now have a Z-*coordinate* of "0".



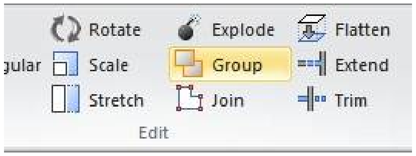


Flatten only operates on **Background Objects**.

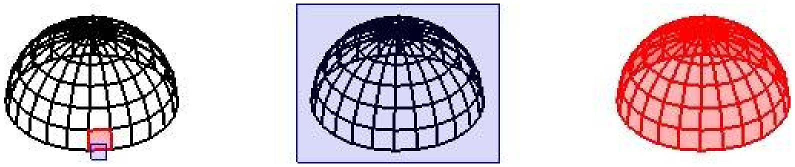
6.12 Group

The **Group** command allows **Solid Objects** to be connected. This can allow for collective editing of **Properties**, use of **Modify** commands, or in complex projects, a cleaner *model*.

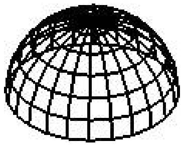
The **Group** command can be found on the **Modify** *tab* of the **Ribbonbar**.



To **Group** objects, select the desired objects by left-clicking or using a window selection method.



Right-click the mouse or press *Enter* to end object selection and automatically complete the command.



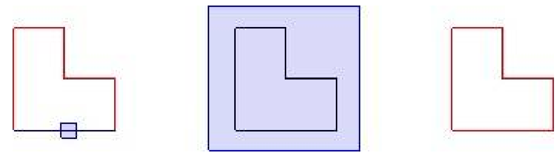
The **Group** command only applies to **Solid Objects**. See Join for the analog command for **Background Objects**.

6.13 Join

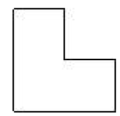
The **Join** command allows **Background Line** and **Polylines** to be connected. This can allow for collective editing of **Properties**, use of **Modify** commands, or in complex projects, a cleaner *model*.

The **Join** command can be found on the **Modify** *tab* of the **Ribbonbar**.

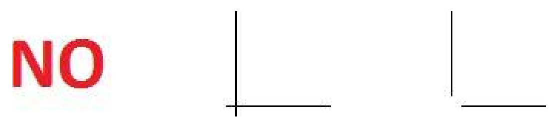
To **Join** objects, select the desired objects by left-clicking or using a window selection method.



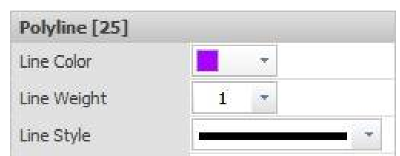
Right-click the mouse or press *Enter* to end object selection and automatically complete the command.



Lines or **Polylines** must touch and cannot cross at *vertices*. The level of **Zoom** may indicate a viable *vertex* when one does not actually exist. The command will not change the length of base objects; **Extend** and **Trim** must be used to "clean up" the base objects.



Objects of different **Color** and **Line Width** will be made the **Color** and **Line Width** of the object with the highest ***Polyline*** **Number**. The number of any ***Polyline*** can be found with the Properties command. After **Joining**, the resultant ***Polyline*** can be modified with Properties if desired.



The **Join** command only applies to **Background Objects**. See Group for the analog command for **Solid Objects**.

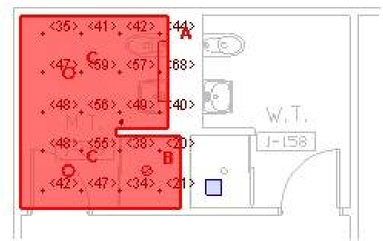
6.14 Mirror

The **Mirror** command applies to all object types and is used to produce a **Mirror** image of selected items.

The **Mirror** command can be found on the **Modify** tab of the **Ribbonbar**.

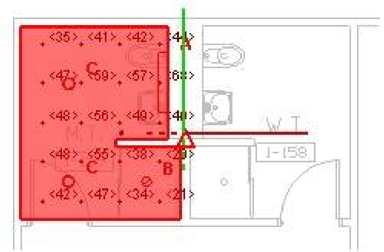
Select the objects to be **Mirrored** by left-clicking or with a window selection. Right-click or press *Enter* to complete the selection process.

See Selecting Objects for information on object selection methods.

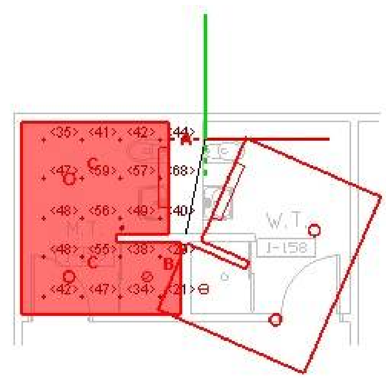


Mirroring occurs about a **Mirror Line** that must be user-specified. The mouse is normally used for this, but keyboard and **Object Snap** input are also accepted. Left-click to establish the first coordinate about which mirroring will occur.

In the example at right, it is known that the restrooms are symmetric and then the midpoint of a line between walls can be used as the ***Base Point*** to mirror the **Luminaires**, **Solid Objects**, and **Calculation Zones**.

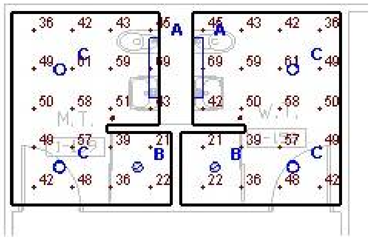


As the mouse crosshairs are moved, an implied **Mirror Line** will be drawn from the **Base Point** to the mouse cursor, and the **Mirrored** objects are temporarily shown to assist in proper **Mirror Line** input.



Specify the second point of the **Mirror Line** with the mouse, keyboard, or **Object Snap**. Visual completes the command after the complete specification of the **Mirror Line**.

Use of **Orthogonal Mode** is often an advantage since architecture is often parallel to the *Cartesian* axes. Similarly, using the keyboard to specify "@1<90" also yields the result at right.

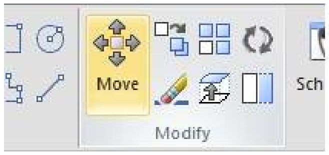


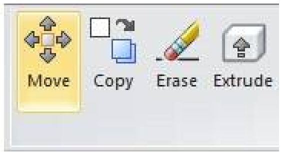
Mirror can be used on **Luminaires**, **Background Objects**, **Solid Objects**, and **Calculation Zones**.

6.15 Move

The **Move** command is used to uniformly translate selected objects in the **Design Environment**.

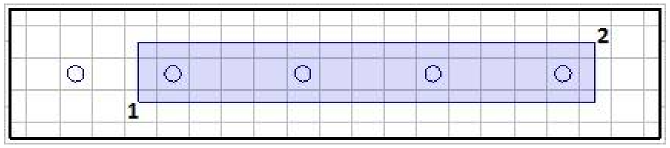
The **Move** command can be found on the **Modify** *tab* and the **Home** *tab* of the **Ribbonbar**.



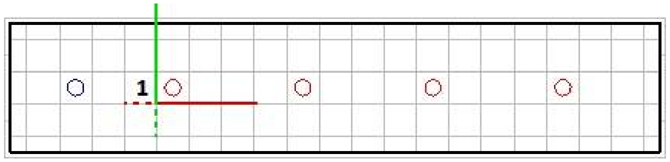


To **Move** one or more objects, Left-click on the object you want to **Move** with the selection box or use a selection window to select a set of objects.

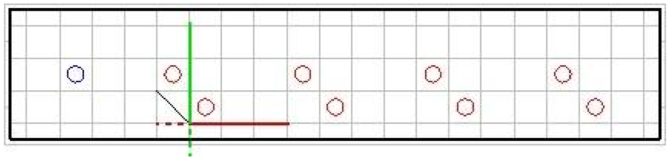
Right-click or press *Enter* to end object selection.



Select a ***Base Point*** with the mouse, keyboard, or **Object Snap**.

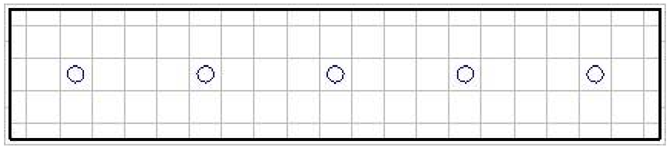


After selection of a ***Base Point***, movement of the mouse within the **Design Environment** will display a graphical representation of the selected objects as they are being translated to aid in the proper selection of a ***Destination Point***.



Select a ***Destination Point*** with the mouse, keyboard, or **Object Snap**.

Visual automatically ends the command and **Moves** the object(s).

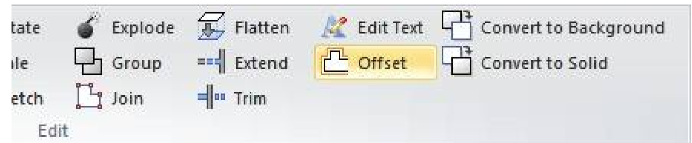


The **Move** command applies to all object types.

6.16 Offset

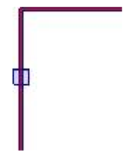
The **Offset** command creates a **Background Object** similar to the base **Background Object** but applies non-*linear* scaling to change the shape accordingly.

The **Offset** command can be found on the **Modify** *tab* of the **Ribbonbar**.



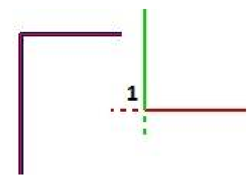
To **Offset** an object, select the base object by left-clicking with the mouse. Right-click the mouse or press *Enter* to end object selection.

Offset operates on multiple objects but because results can be confusing, it is recommended that **Offsets** be applied to one object at a time.



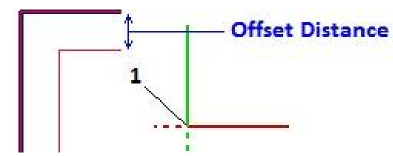
Select the ***Base Point*** with the mouse, keyboard, or **Object Snap**.

The ***Base Point*** can be positioned anywhere related to where the **Offset** is desired; it does not have to be on the side of the object where the new object will be created. The **Base Point** defines the first end of a direction *vector* that tells Visual how to make the **Offset**.



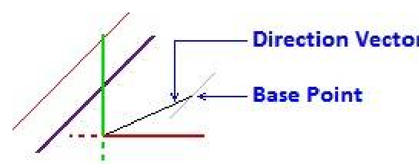
The **Offset Distance** must be specified in the **[Properties](#)** *tab* of the **Ribbonbar**.

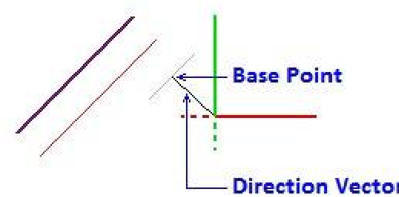
The **Offset** of the object is made parallel to the base object.



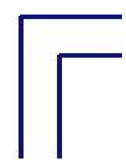
Moving the mouse after selection of the ***Base Point*** shows the implied **Offset** in red. The direction of the offset is based on an imaginary line (shown in gray at right) drawn parallel to the base object. This imaginary line is not drawn in Visual.

Moving to one side or the other of the imaginary line changes the directional *vector* and causes Visual to move the **Offset** object from one side to the other of the base object.

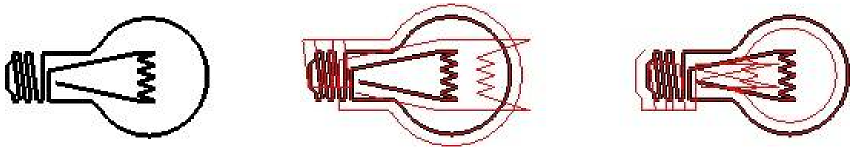




Select the second point of the direction *vector*. Visual automatically ends the command, creating the new object(s). The new **Background Object** is created with the same properties as the base object; **Color** and **Width** are preserved. [Properties](#) can be modified if necessary.



For multi-segment **Background Objects**, the behavior of the direction *vector* is often non-*linear* and complex as can be seen at right. It is recommended that the implied *drawing* feature inherent to the command be used to determine if the **Offset** is desirable and/or where the **Offset** object will be created.



Polylines may need to be Exploded and/or Joined prior to **Offsetting** to create the desired result.

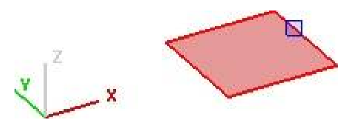
Offset only applies to **Background** objects.

6.17 Pull

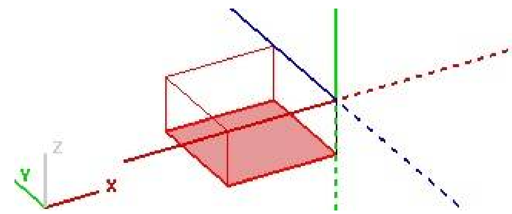
The **Pull** command is effectively the same as the **[Extrude]** command with the exception that the **Extrusion**/**Pull** distance is specified with the mouse, the keyboard or **Object Snap**. **Pull** only operates on **Solid Objects**.

The **Pull** command is found on the **Modify** *tab* of the **Ribbonbar**.

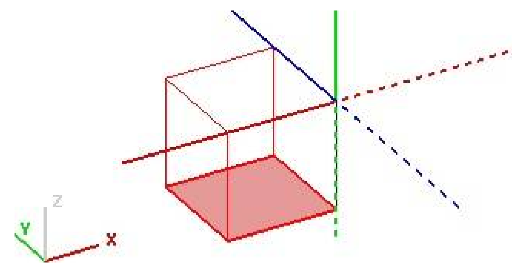
To use the **Pull** command, select the objects to be manipulated by left-clicking. Right-click or press *Enter* to proceed.

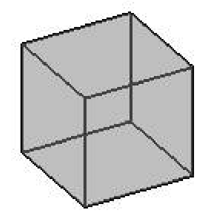


Visual will automatically begin **Pulling** the object by attaching the farthest extent to the mouse *crosshairs*. Note that **Pulling** only occurs perpendicular to the *plane* of the **Solid Object** chosen, with the positive direction of **Pull** being in the direction of the **Surface Normal**. Moving the mouse shows the implied **Pulled** shape.



Left-click the mouse to choose the desired distance. Note that keyboard input is valid in that a distance can be input; to **Pull** 10 units, enter "10" at the command line. Input of direction information via the "<*angle*" method is not valid.



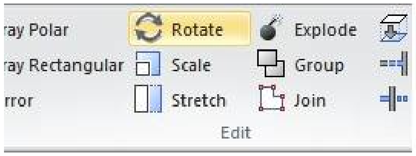


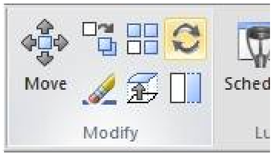
Pull only applies to **Background Objects** and **Solid Objects**.

6.18 Rotate

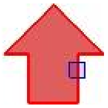
The **Rotate** command imparts an angular displacement to objects parallel to one of the *Cartesian planes*. Rotation occurs only in the ***Active Plane***.

The **Rotate** command can be found on the **Modify** *tab* and the **Home** *tab* of the **Ribbonbar**.

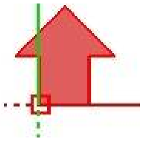




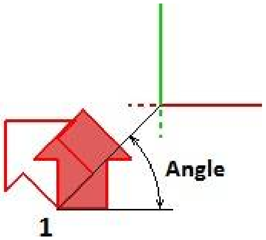
To **Rotate** one or more objects, select the objects by left-clicking or selecting multiple objects with a window selection method.



Select the ***Base Point*** for rotation with the mouse, keyboard, or **Object Snap**. Right-click or press *Enter* to end object selection.

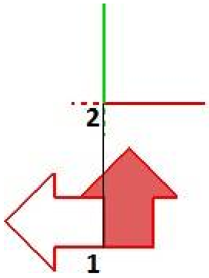


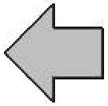
Movement of the mouse in the command shows the implied rotation of the selected objects. 0° is the X-axis if rotated in the X-Y or X-Z *planes* and the Y-axis if rotated in the Y-Z *plane*.



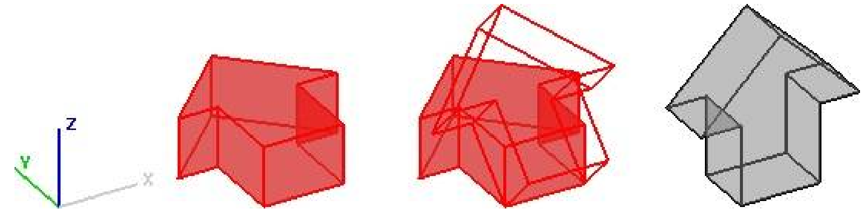
Specify the angle to **Rotate** with the mouse, keyboard, or **Object Snap**. The command will be automatically completed after the angle is specified with a left-click. Specification with the keyboard at the **Command Line** requires a right-click or pressing *Enter* to end the command.

Using **Orthogonal Mode** and the mouse, 90° rotations can be ensured without having to rationalize clockwise or counterclockwise when viewed in 3-D.

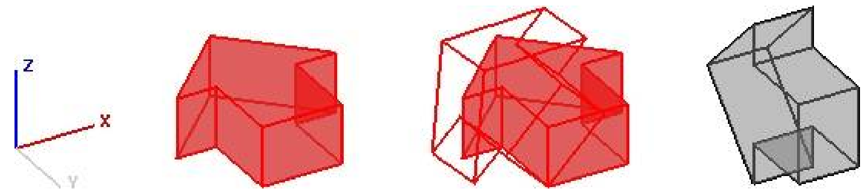




To **Rotate** an object vertically, simply choose the desired **Active *Plane***, and repeat the steps above. Since rotation can only be applied parallel to a *Cartesian plane*, the exact (X,Y,Z) location of the ***Active Plane*** is not important. At right, rotation occurs in the Y-Z *plane*, or in other words, the rotation occurs about the X-axis.



As an additional example, the same 3-D arrow is rotated at right in the X-Z *plane*, or in other words, the rotation occurs about the Y-axis.

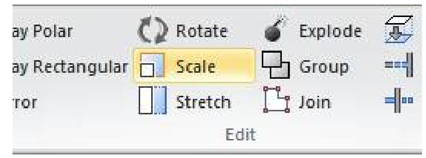


Rotate applies to all object types.

6.19 Scale

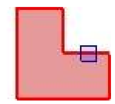
The **Scale** command changes the size of objects based on the application of one or more factors to the (X,Y,Z) *coordinates*.

The **Scale** command can be found on the **Modify** *tab* of the **Ribbonbar**.



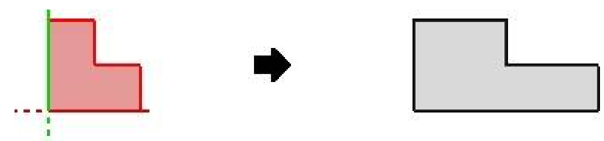
To **Scale** one or more objects, left-click or select objects with a window selection method.

Right-click or press *Enter* to end object selection.



Select a ***Base Point*** with the mouse, keyboard, or **Object Snap**. See below for detailed information and examples.

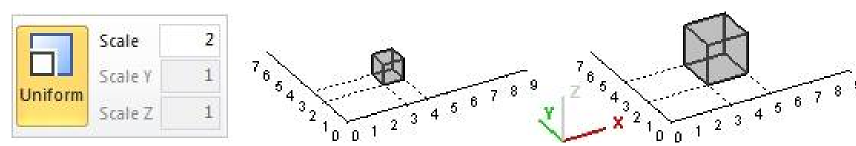
Selection of the ***Base Point*** automatically completes the command.



A **Scale Factor** must be specified in the **Properties** *tab*. The factor can be any decimal value and is applied as would be expected; e.g. a **Scale Factor** of 2 would make objects twice their original size and 0.5 would result in half size.

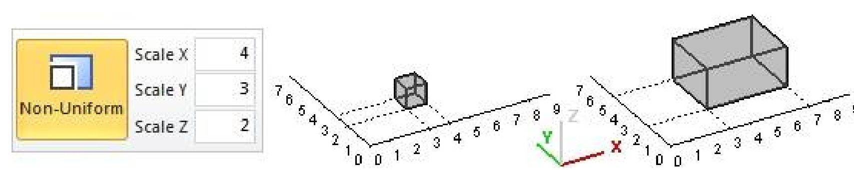
The **Uniform** option (the default) for **Scale Factor** applies a single factor to the X, Y, and Z dimensions.

For example, at right a 1x1x1 cube becomes 2x2x2.



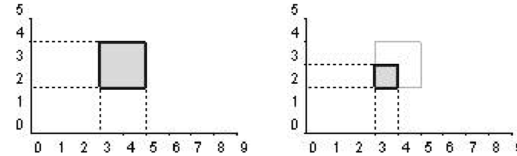
The **Non-Uniform** option for **Scale Factor** applies a separate factor to each of the X, Y, and Z dimensions as specified in the individual **Properties** tab fields.

For example, at right, a 1x1x1 cube becomes 4x3x2.

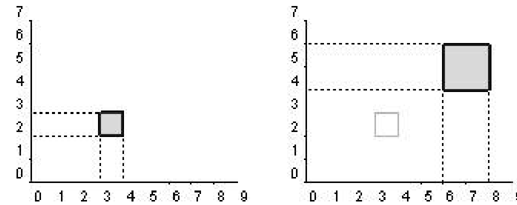


Selection of the ***Base Point*** may cause a translation of the source object(s) with an increase or decrease in size:

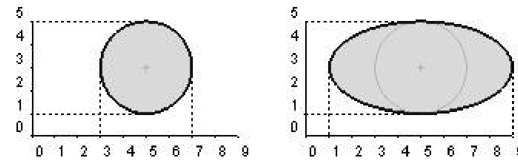
1. Selecting a ***Base Point*** at the corner of an object changes the size but doesn't cause a translation (a movement in the X, Y, and/or Z-direction). For example, with a **Uniform Scale Factor** of 0.5, a 2x2 square is reduced to a 1x1 square and the lower-left corner (being the ***Base Point***) remains in the same location.



2. Selecting a ***Base Point*** at (0,0,0) changes the size and translates the object by the same factor(s). For example, with a **Uniform Scale Factor** of 2, a 1x1 square located at (3,2,0) would be moved to (6,4,0) and would become 2x2 in dimension.



3. **Non-Uniform Scaling** of a **Solid** or **Background Circle** yields an ellipse. For example, a 2x2 **Circle** with **Scale Factors** of 2, 1, and 1 respectively yields an ellipse with a major axis of 4 and a minor axis of 2. The ***Base Point*** here is the center of the **Circle**.



Mathematically, the equations applied when scaling are shown at right.

$$x_{new} = [Scale\ Factor]_x \times (x_{old} - x_{BasePoint}) + x_{BasePoint}$$

$$y_{new} = [Scale\ Factor]_y \times (y_{old} - y_{BasePoint}) + y_{BasePoint}$$

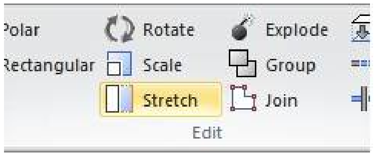
$$z_{new} = [Scale\ Factor]_z \times (z_{old} - z_{BasePoint}) + z_{BasePoint}$$

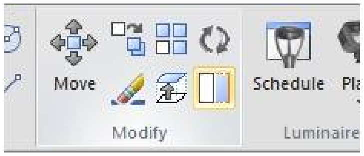
The **Scale** command applies to **Background Objects**, **Solid Objects**, and **Calculation Zones**. ***Luminaires*** cannot be scaled but their location can be scaled if, for instance, a *CAD* **Import** file was misjudged to be drawn in feet and it was really inches, a 1/12 **Scale Factor** could be applied to the entire lighting model to correct the error.

6.20 Stretch

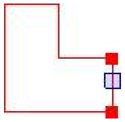
The **Stretch** command changes the size or shape of objects non-proportionally. **Stretch** will effectively move the selected objects and then alter the adjoining objects.

The **Stretch** command can be found on the **Modify** *tab* and the **Home** *tab* of the **Ribbonbar**.

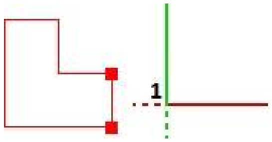




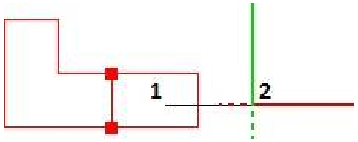
To **Stretch** an object, left-click the object(s). A selection should be made to fully select the object(s) that will remain the same shape. The process could be thought of as "stretching the connectors to keep the base objects attached as they are moved."



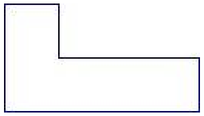
Select a ***Base Point*** with the mouse, keyboard, or **Object Snap**. This is the first end of a direction *vector* that will define the amount and direction of **Stretch**. Normally, a selection would be made on the object with the mouse. Once an object is selected, the *vertices* will be highlighted. Multiple left-clicks will select multiple objects. Right-click the mouse or press Enter to end object selection.



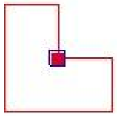
Moving the mouse in the command shows the implied change to the base objects, so the result can be verified before ending the command.

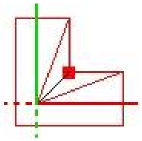


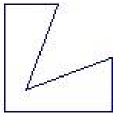
Select the end of the direction *vector* (**Destination Point**) with the mouse, keyboard, or **Object Snap** and the command is automatically completed.



If the initial object selection is made at a *vertex*, behavior changes slightly. The *vertex* will be moved and the abutting edges will be changed to suit that selection. Note that only one *vertex* is highlighted. (This is the same methodology as before except the base object is a zero-length line.)

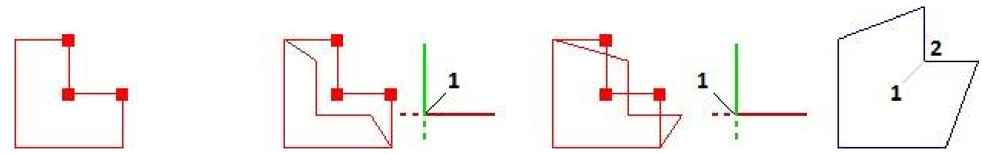




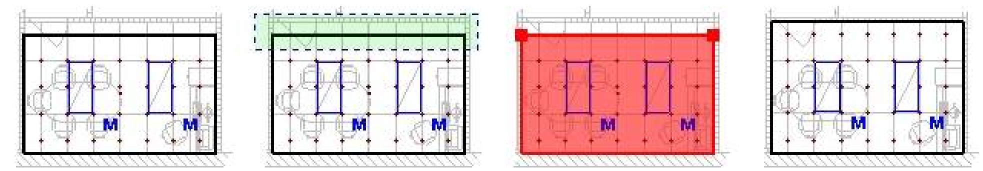


Two examples illustrating behavior and usefulness:

1. Multiple edges are selected, the mouse is moved to two positions, and the final selection is made. Note that the selected objects do not change. The objects adjacent to the selected objects morph to make the new shape.



2. A change has been made to a small office to increase the size by one foot in width and a new *CAD* file has been **Imported**. (This can be seen at right in the **Background** objects that are uneditable.) The appropriate edges are selected with a crossing window method; including the **Calculation Zone**. Finally, the new design is ready to be calculated after the changes have been applied.

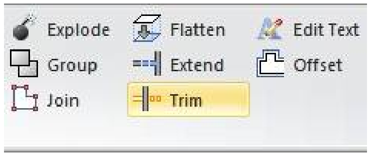


The **Stretch** command applies to all objects except ***Luminaires***.

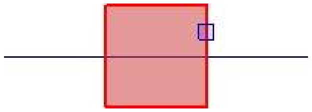
6.21 Trim

The **Trim** command decreases the length of any **Background Object** (**Lines**, **Polylines**, **Circles**, and **Arcs**) to meet the selected **Base Object** or **Boundary Edge**.

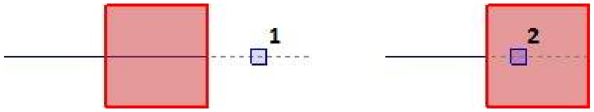
The **Trim** command can be found on the **Modify** *tab* of the **Ribbonbar**.



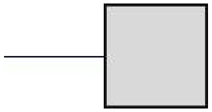
To **Trim** one or more **Base Objects**, left-click or use a window selection method to choose the **Boundary Edges** or object(s) to extend to. Right-click or press *Enter* to end object selection.



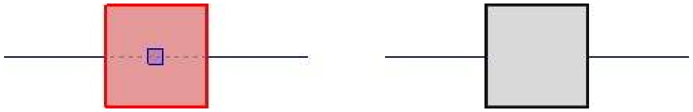
Left-click each object to be **Trimmed** to the **Boundary Edge(s)**. It is necessary to left-click on the half of the object nearest the **Boundary Edge**. After each click, Visual **Trims** the object. At right, the previous **Line** is shown dashed along with the clicked location.



Right-click or press *Enter* to end the command.



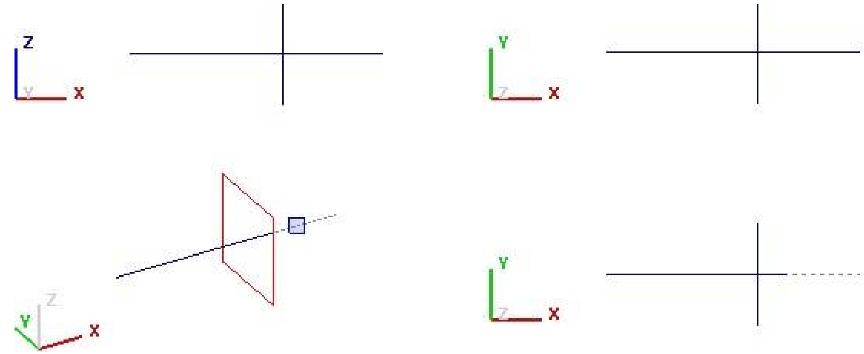
Trim can also remove the included portion of the **Trimmed** object. The segment bounded by the **Boundary Edges** will be removed wherever it may be. At right, the previous **Line** is shown dashed along with the clicked location.



Trim operates on objects based on the current view. i.e. an object at Z=0 can be **Trimmed** to an object at Z+1 when viewed in the **Plan View**, even if the objects don't mathematically intersect. This functionality can be an advantage when constructing advanced geometries when used in N, S, E, or W views.

Important Note:

Trimming in isometric views can yield unsatisfactory results if **Boundary Edge** objects are not in the same *plane* as the **Trimmed** object. At top right, the **Plan View** and **South** view of two objects are shown. The common assumption is that the **Line** will be **Trimmed** to the center of the square. This is not the way the command functions. At bottom, the **Line** is **Trimmed** in **SW View**, and when viewed in **Plan View**, the results are not likely what was intended.



Trim operates only on **Background Objects**. **Solid Objects** can be used as **Boundary Edges**.

Chapter 7 - Luminaire

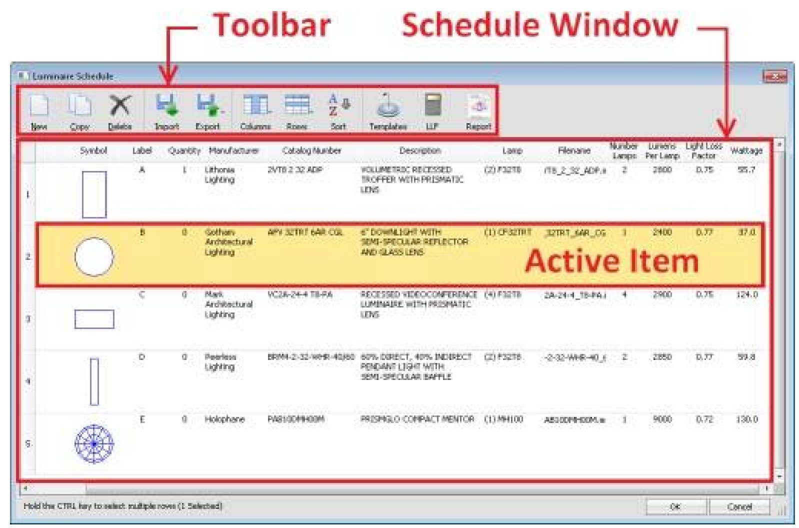
In Visual, each ***Luminaire*** has certain fundamental properties (*photometric* information, graphical representation, and descriptive information) that are common to all *luminaires* of that ***Luminaire Type***. Before *luminaires* can be placed and manipulated in the **Design Environment**, these properties must be defined in the **Luminaire Schedule**. This is accomplished in the **Luminaire Schedule Editor**.

7.1 Luminaire Schedule

The **Luminaire Schedule Editor** allows for the creation and manipulation of the definitions of **Luminaire Types** to be placed in the **Design Environment**. The schedule is a spreadsheet format that allows for manipulation of text fields, symbols, and other parameters.

The **Luminaire Schedule Editor** is accessed from the **Luminaire** *tab*. Alternately, the **Schedule** button can be found in the **Luminaire** *panel* of the **Home** *tab*.

All necessary commands are included in the **Toolbar** located at the top of the **Luminaire Schedule Editor.** Some commands can be executed with multiple *luminaires* selected.



Left-clicking an entry in the **Schedule Window** will highlight it in yellow indicating it is the **Active Item** with respect to command buttons. Holding the *Ctrl* key while left-clicking additional entries will select multiple *luminaires*.

The window can be sized like any other Windows-based application with click-drag operations on corners and window edges. Scroll bars allow for all *luminaires* and their data to be shown.

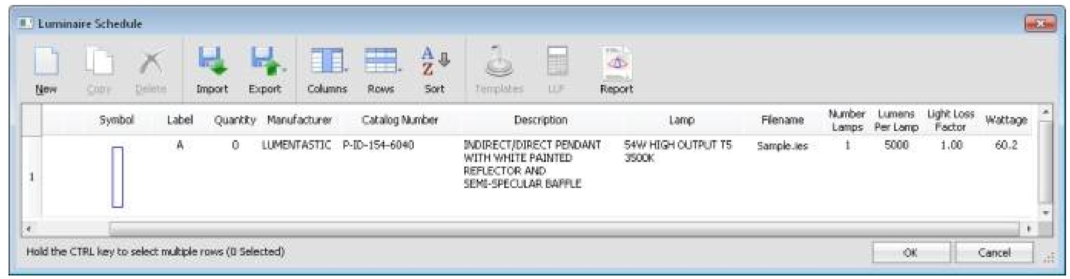
Specific usage and commands are discussed in this chapter. Content changes are passed to the **Print Editor** so **Luminaire Types** are defined identically in both places and the schedule is the same.

7.1.1 Creating a Schedule Entry

In order to place *luminaires* in the **Design Environment**, they must be defined in the **Luminaire Schedule**.

To define a new ***Luminaire Type***, left-click on the **New** button in the **Toolbar**. The ***Photometric* File *Dialog*** will appear, prompting for the selection of a *photometric file*. For information on how to use the ***Photometric* File *Dialog***, reference section Selecting a Photometric File.

After a file is selected, a new **Luminaire Schedule** entry will be created in the first available row in the **Schedule Window**. All available information from the *photometric file* will be placed in the appropriate fields of the new **Luminaire Schedule** item. If a field is left blank, the *photometric file* did not contain that particular information.



A default ***Symbol*** will be created for the new item based on the luminous opening dimensions included in the *photometric file* and not the physical dimensions of the entire *luminaire*. The *symbol* dimensions can be modified if necessary; see The Symbol Editor.

A ***Label*** will be assigned to the new ***Luminaire Type*** using the first available letter in the alphabet. For example, if **Luminaire Types** A,B, and F are defined, Visual will assign the newly created type the letter "C".

Clicking the **OK** command button saves changes and will exit the editor. Clicking the **Cancel** button exits without saving changes.

7.1.2 Modifying a Schedule Entry

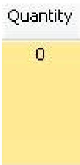
All fields defining a ***Luminaire Type*** can be edited in the **Luminaire Schedule Editor** to accommodate all scenarios of both text changes and performance modification.

Left-click on any part of a row in the **Schedule Window** to make that ***Luminaire* Type** the **Active Item**.

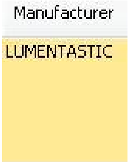
To edit the **Luminaire Symbol**, move the mouse pointer over the **Symbol** field. The **Symbol** field will become a button. Left-click on the button to launch the **Symbol Editor** . See The Symbol Editor for more information.

The ***Label*** can be thought of as the “name” of the ***Luminaire Type***. The ***Label*** may be any combination of alphanumeric characters.

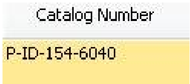
The **Quantity** cannot be modified and will change as *luminaires* are added in the **Design Environment**.



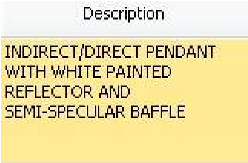
The **Manufacturer** can be any combination of alphanumeric characters, with a maximum length of 255 characters.



The **Catalog Number** is generally the specific product tested but changes to this field are frequent to indicate *luminaire* properties specific to the project at hand. This field can be any combination of alphanumeric characters, with a maximum length of 255 characters.



The **Description** can be modified to describe all *luminaire* properties as they relate to the performance of the *luminaire* or perhaps related to the project. For example, it could be indicated that the *pendant* indirect-direct at right was suspended 24" from the ceiling if that dimension was consistent for all instances of the *luminaire*. This field is 255 characters maximum.



The **Filename** field displays the currently associated *photometric file*. Moving the mouse pointer over the field causes it to become a button. Left-clicking this button launches the ***Photometric* File *Dialog***. Choosing a new file from the *dialog* will overwrite the current ***Luminaire Type*** with the new file information.

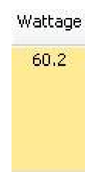
The **Number Lamps** field can be modified to provide a *linear* change to the output of the *luminaire* in Visual. For example, changing 2 lamps to 3 lamps would increase the luminous intensity by a factor of 1.5 (3/2 = 1.5) at all angles.

Note: Any change to the number of lamps in a *luminaire* has a non-*linear* impact on the shape of the distribution in reality, so changes to this field must be done very carefully and with direct knowledge of the validity of the change for a particular scenario.

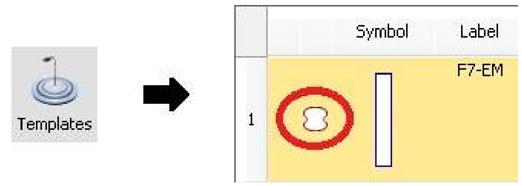
The **Lumens Per Lamp** field will initially show the value that was contained in the *photometric file*, but it is most often changed to reflect the specific *lamp* that will be used in the design.

The **Light Loss Factor** (LLF) field is auto-populated with a value of 1.00 that is often used for "initial" conditions but should be changed to match equipment and installation conditions as appropriate.

The **Wattage** field displays the input power for the *luminaire* when it was tested. This value is initially read from the *photometric file*, but may be changed as necessary to account for ballast loads or different *lamp* types. Modification of this value does not change *photometric* output but it is critical to obtain proper lighting power density when **Power Zones** are created. See [Power Zones] for more information.



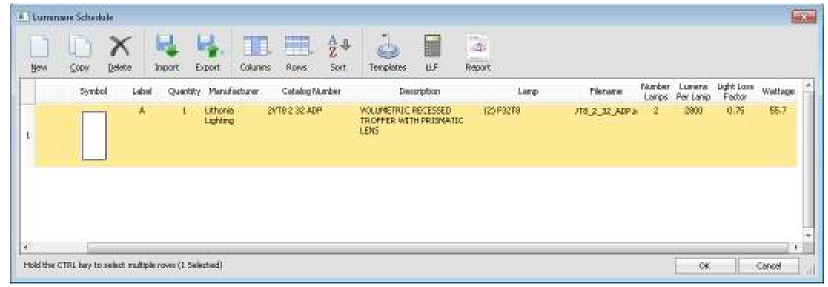
A **Template** is a set of iso-*illuminance* contour lines that are associated with the current ***Luminaire Type***. To assign a **Template** to a ***Luminaire Type***, make the desired ***Luminaire Type*** the **Active Item** and click the **Template** button in the toolbar. The **Luminaire Template Editor** will launch and **Template** values and colors can be assigned. For information on using the ***Luminaire* Template Editor**, reference section [Luminaire Templates]. Multiple *luminaires* can be selected by holding the *Ctrl* key while left-clicking in order to assign the same **Template** to those selected *luminaires*.



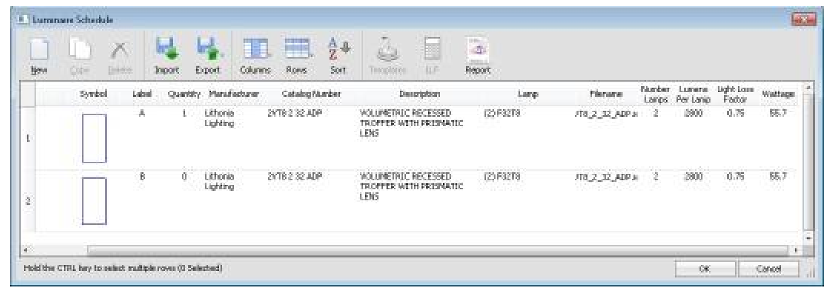
7.1.3 Copying a Schedule Entry

Luminaire Types can be copied. A common use for this feature is *luminaires* with emergency batteries or wiring. The base *photometric file* is the same for both types, but modifications to **Catalog Number**, **Description**, and **Wattage** would be appropriate to indicate the difference in the product to be used.

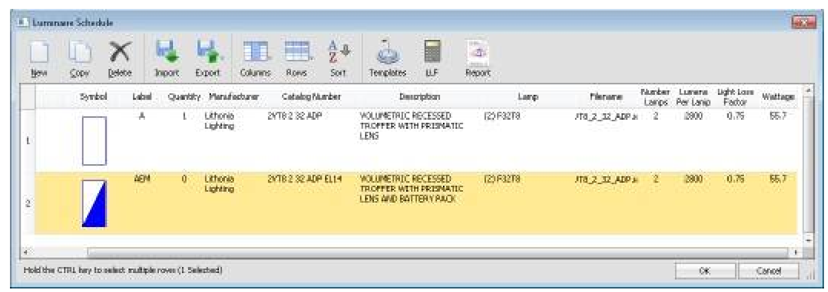
To **Copy** an existing ***Luminaire Type***, select the entry to be copied by left-clicking on the appropriate row in the **Schedule Window** to make it the **Active Item**.



Left-click the **Copy** button on the **Toolbar**. The selected entry will be appended to the bottom of the list of **Luminaire Types**. The ***Label*** will be assigned based on the earliest unused character in the alphabet.



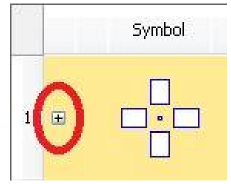
The copied ***Luminaire Type*** can then be edited as necessary. See [Modifying a Schedule Entry](#) for more information.



7.1.4 Expanding a Schedule Entry

When a ***Luminaire Type*** has been defined with multiple **Heads**, the properties of each **Head** can be modified. Multiple **Heads** are most common in area lighting projects, but there are also some interior applications with track and retail lighting products. For information on how to create multi-headed **Luminaire Types**, reference Multi-head Luminaires.

When a ***Luminaire Type*** can be expanded, a plus-sign graphic will appear at the left side of the entry in the **Luminaire Schedule.** To expand the item, left-click the *symbol*.

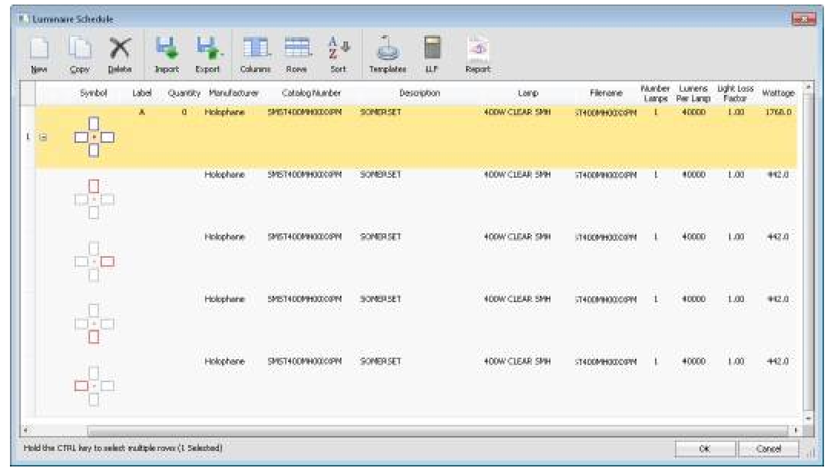


With the exception of ***Label*** and **Quantity**, all fields can be modified on a per-**Head** basis. The **Head** to which the entry applies is shown in red in the sub-***Symbol***.

Most often, the need for a different *photometric file* would be the impetus for this process. Select a new *photometric file* as appropriate for each head and modify the other fields as necessary.

To modify a field, simple left-click the entry and Visual will highlight the entire text field to indicate it is selected and allow for editing.

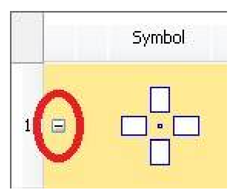
Note: The yellow **Active Item** *panel* will not shift to the sub-entries.



Modification of any fields on the **Head** level proceeds in the same manner as discussed in section Modifying a Schedule Entry.

Modifications to fields on the ***Luminaire*** level (i.e., in the yellow **Active Item** area) are applied to all **Heads** in the currently selected ***Luminaire Type***.

To collapse (i.e. un-expand or close) a **Luminaire Type**, left-click the minus-sign *symbol* on the left side of the entry.



7.1.5 Modifying Columns

In the **Luminaire Schedule Editor**, **Columns** can be modified to provide configuration specific to user preference and needs.

To change which **Columns** Visual displays, click the **Columns** button in the **Toolbar**.

Clicking the **Columns** button will pull down the sub-menu that includes the list of available **Columns** that can be shown or hidden.

The currently visible **Columns** are indicated with check marks. The list is ordered alphabetically in this sub-menu and is independent of how the **Columns** are displayed in the ***Luminaire*** **Schedule**. Columns can be moved as discussed below.

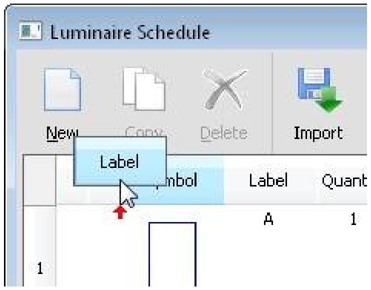
Clicking any **Column** name selects/deselects that column, and changes will be made immediately in the **Schedule Window**.

The **Reset Columns** command returns the columns to the default state shipped with Visual (shown at right).

Save as Default saves the column configuration as the default that Visual will display in new *Luminaire* Schedules in future projects.

The sub-menu will stay visible until the mouse is clicked elsewhere in the **Luminaire Schedule Editor**.

Columns can be moved by left-click-dragging (left-click and hold, and then drag) the **Column** header (name) to the desired position. A red arrow will indicate where the **Column** header will be placed when the mouse button is released. In the example at right, the ***Label*** column is being moved to the left of the ***Symbol*** column.



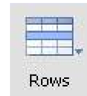
To re-size **Columns** , place the mouse cursor over the vertical boundary between two **Columns** . The cursor will change to a double-arrow. Left-click (and hold) and drag the mouse to the left or right to the desired width. Note: the **Column** for which the width will be changed is to the left of the cursor. Visual will highlight one **Column** or the other depending on the specific *coordinates* of the cursor but that has nothing to do with the re-sizing process.

Changes made to which **Columns** are displayed and the order they appear in the **Luminaire Schedule Editor** are independent of those made to the **Luminaire Schedule** in the **Print Editor.**

7.1.6 Modifying Rows

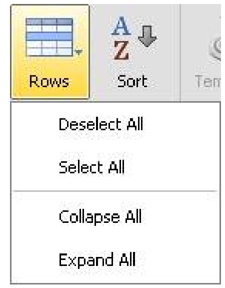
In the **Luminaire Schedule Editor**, **Rows** can be manipulated in a few ways.

The **Rows** button in the **Toolbar** provides quick selection and expansion of **Rows**.



Clicking the **Rows** button will pull down the sub-menu that includes commands to select/deselect all **Rows** (for use with other command buttons) as well as expand/collapse all **Rows** if the *luminaire* definitions allow. See Expanding a Schedule Entry for more information.

The sub-menu will stay visible until the mouse is clicked elsewhere in the ***Luminaire*** **Schedule Editor**.



Rows can also be sorted alphabetically based on the content of the various ***Label*** fields in each ***Luminaire Type*** by clicking the **Sort** button. It is not necessary to select all of the **Rows** .

The **Sort** order of **Rows** will pass through to the **Luminaire Schedule** in the **Print Editor.**

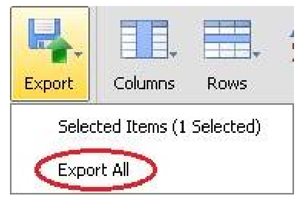
7.1.7 Importing and Exporting Schedules

Luminaire Types can be imported and exported singly, in groups, or as complete schedules.

To export **Luminaire Types**, select those to be exported from the **Schedule Window**. Hold the *Ctrl* key to select multiple types. Once the desired entries are selected, click the **Export** button in the **Toolbar**.

Clicking the **Export** button will pull down the sub-menu. Click **Selected Items** and a standard file *dialog* will appear. Choose a filename and location; be sure to note where you have saved the file.

If the entire schedule is to be saved, there is no need to select items prior to clicking the **Export** button. Simply click the **Export** button and then click **Export All**. A standard file *dialog* will appear. Choose a filename and location; be sure to note where you have saved the file. Visual saves exported schedules with a *.VSC extension.



The **Luminaire Schedule** can also be exported as a Comma Separated Value (*.CSV) file for use with spreadsheet software. If desired, select that format from the "Save as type:" *combo box* at the bottom of the file *dialog* prior to clicking **Save**.

Note: If ***Luminaire Type*** fields (**Description**, ***Lamp***, etc) contain commas, those commas are inherently interpreted as part of the separation construct of the *.CSV file format. Extensive formatting may be necessary to use the *.CSV file in other software related to this idiosyncrasy.

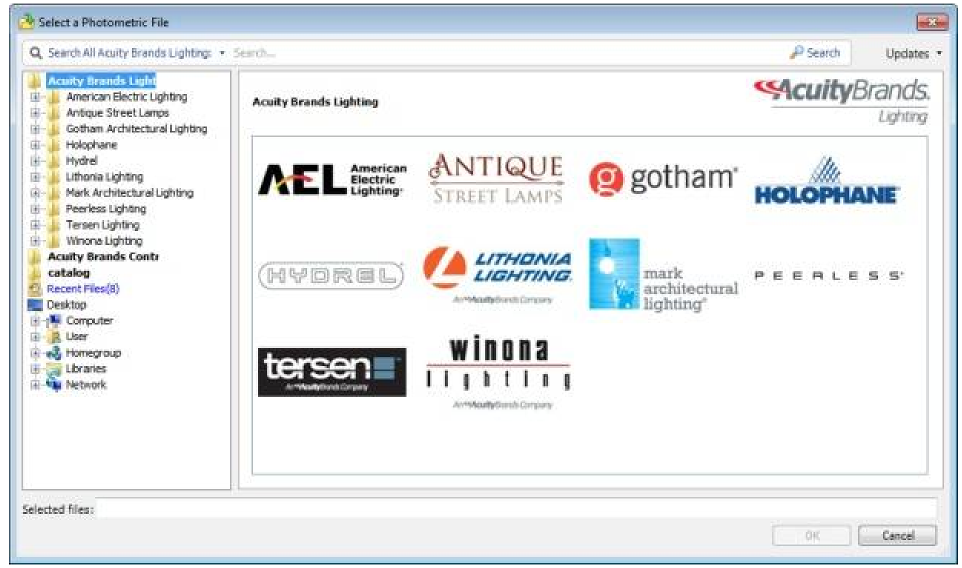
To import saved **Luminaire Types** into the current list, click the **Import** button. Select the desired *.VSC file using the *dialog* (only *.VSC files can be imported). Visual will sort the list by ***Label*** as the last step of importing. Note that Visual cannot resolve duplicate ***Label*** names so there may be multiple **Luminaire Types** with the same ***Label*** after **Import**.

Exported files could be given to other Visual users to maintain continuity in a project or as a "*boilerplate*". Imported files are appended to previously defined **Luminaire Types** in the **Schedule**.

7.1.8 Selecting a Photometric File

Selecting a *photometric file* is a necessary part of defining a ***Luminaire Type*** in the **Luminaire Schedule Editor**. The ***Photometric File Dialog*** is the tool used to select *photometric* files. This *dialog* is similar to dialogs found in other Windows-based applications with the addition of functionality to aid in the selection of the appropriate file based on physical and performance characteristics.

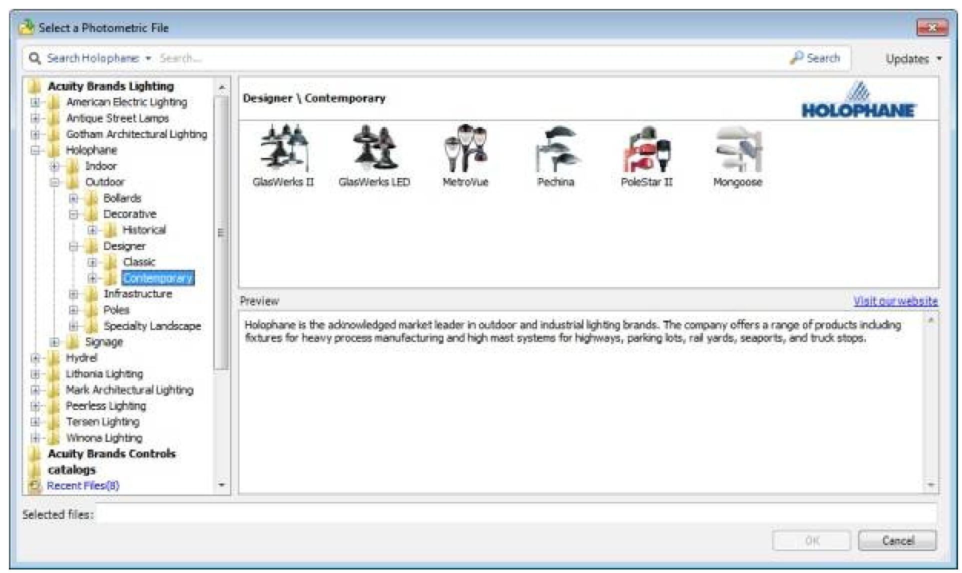
To define a new ***Luminaire Type***, select **New** from the toolbar in the **Luminaire Schedule Editor**. A file selection *dialog* customized to *photometric* files will appear.



Acuity Brands products can be selected from the database included with Visual. This database is comprised of all publicly available data and is updated regularly.

For non-Acuity Brands products, navigation is done in the lower half of the directory structure on the left, just as in other Windows-based applications.

The left side of the *dialog* houses a directory structure that is similar to that used in other Windows-based applications.



Left-clicking a "+" will expand the sub-directories. Alternately, the sub-directory name can be double-clicked to navigate into the structure.

Left-clicking a product category name will show images for all products in the sub-directories.

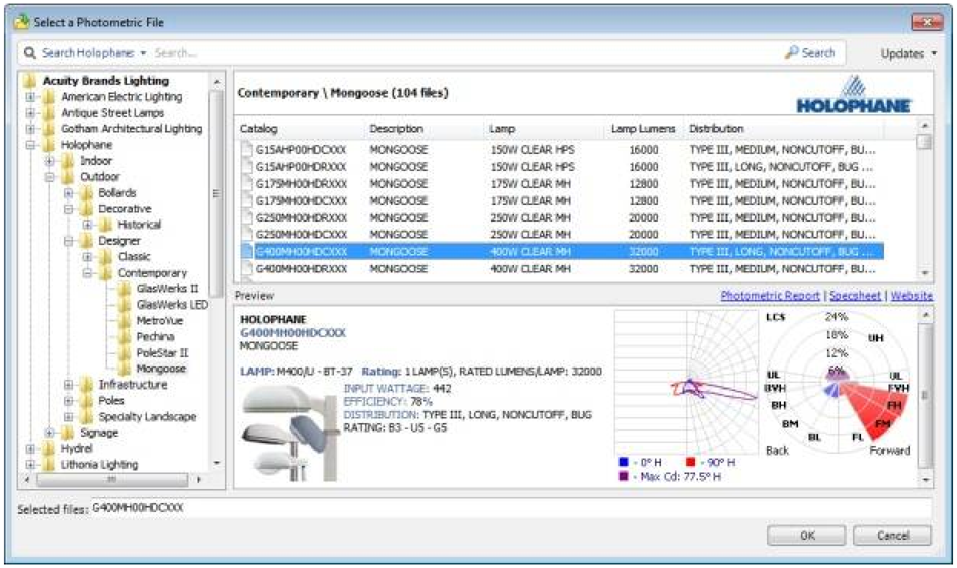
Left-clicking a product family directory name in the left pane will display all available *photometric* files in the upper portion of the right pane. All files in the directory are read by Visual and the most common header information is displayed for each available file.

If information is missing from the header of a particular *photometric file*, the entry for that file in one or more columns may be blank.

The lower portion of the right pane is a preview of the selected file above. An image (if available) is shown, along with basic header information, a polar *candlepower* curve plot, and the *Luminaire* Classification System BUG plot related to IESNA publication TM-15.

Between the upper and lower right panes, Visual displays helpful links to additional information. All files will have links to a complete *photometric* report, a PDF specification sheet, and the product or family website; all requiring internet access.

Some files will additionally have links to solid *model* information. "*Model*" will be displayed if the information is available.



Visual can search (in the Acuity Brands database only) for files with keywords as defined by the user in the Search box at the top of the *dialog*. If the name of a product is known but the location of that product is not, this is a simple way to quickly get to that product.

When selecting outside the Acuity Brands database, the *dialog* will list any files with an IES, LDT, CIB, TMS, or CB1 extension. Visual can read any *photometric file* that is formatted in accordance with the IESNA LM-63, EULUMDAT, or CIBSE-TM14 specifications.

7.2 Luminaire Editor

The ***Luminaire Symbol*** is a graphical *model* used to communicate the physical properties of the ***Luminaire*** and the associated components.

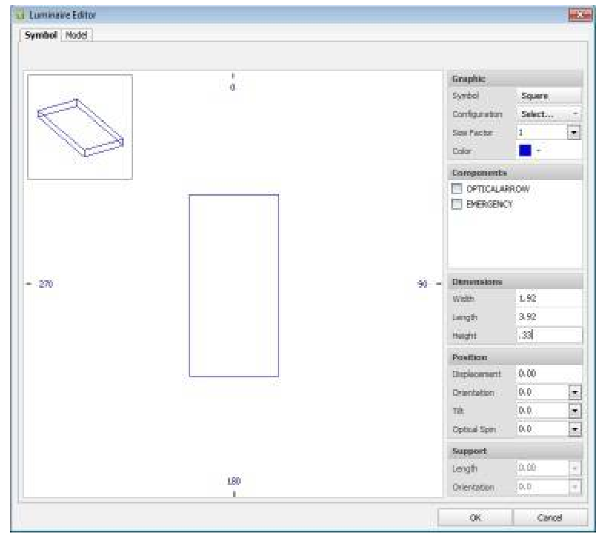
To open the **Luminaire Editor**, move the mouse pointer over the ***Symbol*** field of a ***Luminaire Type*** in the **Luminaire Schedule Editor**. The ***Symbol*** field will become a button. Left-click on the button to launch the **Luminaire Editor**.

The **Luminaire Editor** provides flexibility in constructing and modifying a ***Symbol*** to allow for multiple colors and configurations.

The ***Luminaire*** **Editor** contains two *tabs*, both of which contain a view pane and multiple *panels* for parameter definition:

- The ***Symbol Tab*** configures what is displayed in the **Wireframe Display Mode**.

- The ***Model Tab*** configures what is displayed when **Shaded** and **Rendered** modes are important and may therefore not be necessary for certain projects or certain users. See Display Modes for more information.



Visual populates the **Luminaire Editor** with information relevant to the data in the *photometric file*. A ***Symbol*** of appropriate size and shape will be chosen by Visual based on the luminous dimensions (in feet) recorded in the *photometric* test. For example, a 2ft x 4ft *troffer* might be 1.92ft x 3.92ft. Note: Visual cannot account for poor *photometric* tests that have incorrect dimensions, incorrect shape indicators, or other issues. See the IESNA publication LM-63 for information about dimensions in *.IES files.

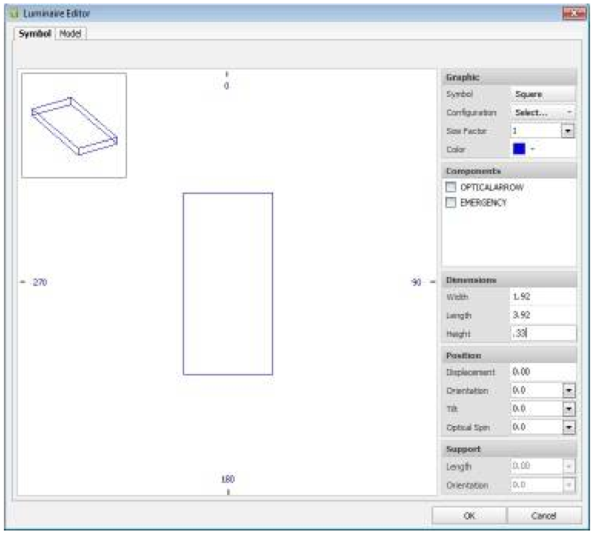
The ***Symbol*** chosen is an indicator only. Visual performs calculations based on the luminous dimensions in the files associated with each ***Luminaire Type***.

7.2.1 Symbol Tab

The ***Symbol*** *tab* configures what is displayed in the **Wireframe** **[Display Mode](#)**.

The **Preview Pane** is the main portion of the *tab* and shows the ***Symbol*** in a plan view.

Angular markers are provided at the edges of the **Preview Pane** for reference when specifying angular parameters in the *panels*. Note: 0 degrees when referencing *luminaires* is the Y-Axis due to *photometric* reporting conventions, unlike the *Cartesian* convention where 0 degrees is the X-Axis when *drawing* objects



The multiple *panels* on the right side of the *tab* allow for parameter definition and ***Symbol*** manipulation. The *panels* are discussed in more detail in subsequent sections of this manual.

Changes made to the parameters will modify all heads of a multi-head ***Symbol*** equally. See [Multi-head Luminaires](#) for more information.

The thumbnail view in the upper left corner of the **Preview Pane** shows the ***Symbol*** in an isometric view to provide further feedback of the effect of parameter changes.

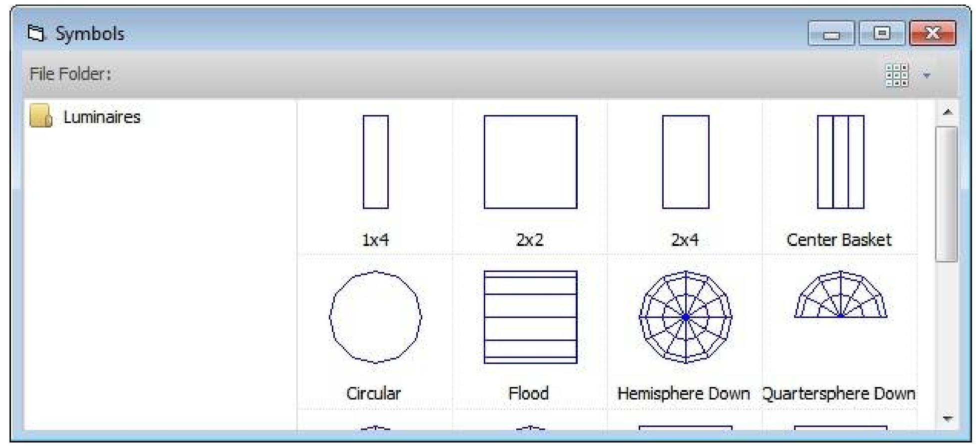
The various components and their use are described in the following topics.

7.2.1.1 Symbol Tab Graphic Panel

The **Graphic** *panel* is part of the ***Symbol Tab*** in the **Luminaire Editor**.

To change the basic ***Symbol*** shape, click the ***Symbol*** button in the **Graphic** *panel* to open the **Symbols** *dialog*.

The **Symbols** *dialog* contains several common shapes that can be associated to the ***Luminaire Type***. These are 3-D wireframe representations that have depth/height.

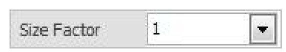


Left-clicking the desired ***Symbol*** will close the *dialog* and place that information in the **Luminaire Editor**. Note that all **Symbols** are shown in blue in this *dialog* regardless of the ***Symbol*** color chosen in the **Luminaire Editor**.

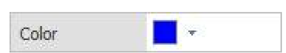
To close the ***Symbol*** *dialog* without making a choice, click the red X at the upper right of the form.

Configurations are multiple *luminaires* that are arranged in commonly used groups. To create a **Configuration**, click the **Configuration Select…** button to open the flyout *dialog*. See [Multi-head Luminaires](#) for more information.

Size Factor increases the size of the ***Symbol*** in the **Design Environment** and **Print Editor** to allow for ease of viewing for large projects. The default **Size Factor** of 1 is most common for **Interior** designs, whereas a larger **Size Factor** would be appropriate for **Exterior** (site) applications. Note: Visual does not alter calculations based on this value.



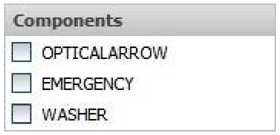
The **Color** button shows the currently assigned color. Left-clicking the **Color** button launches the **Color** *dialog*, which can be used to change the color of the ***Luminaire Symbol***. This does not impact the color of the ***Model*** associated to the *Luminaire Type*. See [Using the Color Dialog](#) for more information.



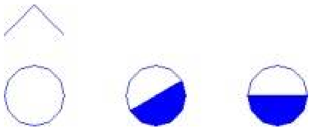
7.2.1.2 Symbol Tab Components Panel

The **Components** *panel* is part of the ***Symbol Tab*** in the **Luminaire Editor**.

The **Components** *panel* contains checkboxes that allow the available **Components** defined in the ***Symbol*** to be chosen such that additional detail or variation can be shown in the **Design Environment** and **Print Editor**. The **Components** shown will vary based on the base ***Symbol*** chosen. Multiple **Components** can be selected by placing a check in the desired box(es)



Typical **Components** are: **Optical Arrow**, **Emergency**, and **Washer**. These three **Components** are shown at right for the **Circular** ***Symbol*** as an example.



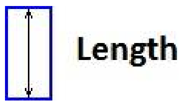
7.2.1.3 Symbol Tab Dimensions Panel

The **Dimensions** *panel* is part of the ***Symbol Tab*** in the **Luminaire Editor** and allows for the modification of ***Symbol*** size.

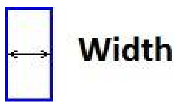
Visual populates these cells with the luminous dimensions in the *photometric file*, which are not always the same as the physical dimensions. Note: 0 degrees when referencing *luminaires* is the Y-Axis due to *photometric* reporting conventions, unlike the *Cartesian* convention where 0 degrees is the X-Axis when *drawing* objects

Dimensions	
Width	1.92
Length	3.92
Height	0.00

Length is defined as being along the 0-degree axis of the *luminaire*. Again, 0 degrees is at the top of the screen and therefore **Length** is generally top-bottom on the screen.

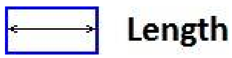


Width is defined as being perpendicular to the 0-degree axis of the *luminaire* in the most basic case. **Width** is always initially left-right on the screen.



Photometric file data for directional *luminaires* (e.g. wallwash and/or asymmetric reflectors) are likely oriented so the "throw" is in the 0-degree direction. Therefore **Width** and **Length** may not be as intuitive as it is in the definition graphics above. In the example at right the long axis is the **Width** whereas it might at first seem to be the **Length**.

When an **Orientation** angle is applied, the "length axis" rotates with the ***Symbol***. For example, with the 2x4 ***Symbol*** and a 90 degree **Orientation**, changes to **Length** would apply left-right on the screen as seen at right. See Position Panel for more information on **Orientation**.

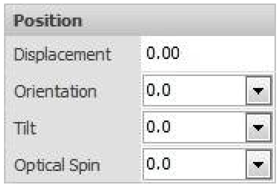


The resultant size of the ***Symbol*** is for display only; Visual calculates the lighting *model* based on the dimensions in the related *photometric file*. The Audit may report issues related to dimensions if user-specified values are used.

7.2.1.4 Symbol Tab Position Panel

The **Position** *panel* is part of the ***Symbol Tab*** in the ***Luminaire*** **Editor**.

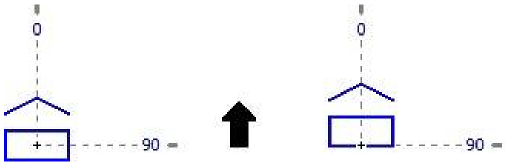
Parameters editable in the *panel* allow for movement of the ***Symbol*** with respect to the insertion point. Common angles are included in the lists accessed by clicking the arrows to the right of the various fields. Custom values can also be entered with the keyboard by simply clicking in the text field and typing.



Displacement allows the ***Symbol*** to be moved in relation to the insertion point (origin) that is by default the center of the luminous dimensions. The value entered is applied to the ***Symbol*** by shifting it on the 0-degree axis toward the top of the screen in the *Luminaire* Editor.

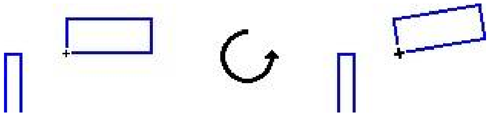
When placed in the **Design Environment**, the displacement orients in conjunction with the ***Symbol*** orientation.

The most common use for this feature is with wall-mounted *luminaires* as in the example at right where a 12in x 6in wallpack is displaced 3in (0.25ft).

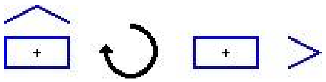


Orientation rotates the ***Symbol*** clockwise about the origin. This value adds **Orientation** angle to *luminaires* when placed in the **Design Environment**. The examples at right have an **Orientation** angle of 90 degrees; the two examples are with and without a **Displacement**.

Tilt is applied in the Y-Z *plane* of the *luminaire* such that the ***Symbol*** is tilted counterclockwise when viewed from the right elevation in the ***Luminaire*** **Editor** as in the area lighting example at right.



Optical Spin rotates the *candela* distribution clockwise with respect to the ***Symbol***. Visual automatically selects the **Optical Arrow Component** to make this change clear. See Components Panel for more information.

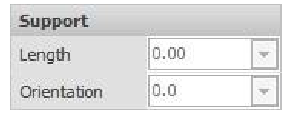


Remember that dimensional information is input in terms of decimal feet or meters.

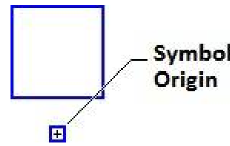
7.2.1.5 Symbol Tab Support Panel

In general these fields are used to configure elements of a *pole*-mounted ***Luminaire Type*** used in **Exterior** lighting *models*.

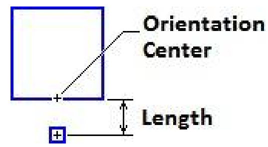
The **Support** *panel* is uneditable for certain configurations, which don't have supports, like downlights. Choose an **Exterior Configuration** to enable use of these parameters. See [Graphic Panel] for more information.



The origin for the ***Symbol*** is the center of the *pole*.



For *pole*-mounted configurations, Visual assumes a **Displacement** of half the *luminaire* **Length** such that these parameters are related to an origin as in the graphic at right. These parameters will be scaled by the **Size Factor**. See [Graphic Panel] for more information.



The **Length** of the **Support** is the distance from the *pole* to the edge of the ***Symbol***.

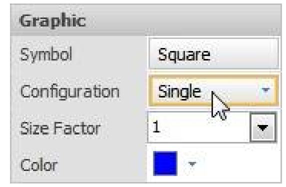
Orientation is the clockwise rotation angle of the **Support** with respect to the 0-degree axis that points to the top of the screen. The **Orientation** of the ***Symbol*** (as indicated in the **Position** *panel*) will be automatically changed to rotate the *luminaire* when a **Support** change is made.

Support parameters impact calculations in that the *luminaire* center is moved and rotated according to the user inputs.

7.2.1.6 Multi-head Luminaires

Symbols with multiple heads can be manipulated in various ways to better mimic real assemblies.

Symbols with multiple heads can be created using the **Configuration** section in the **Graphic** *panel* on the **Symbol** *tab*.

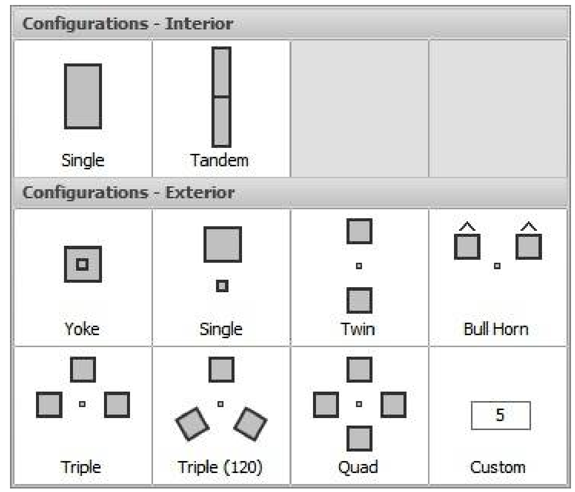


Interior and **Exterior** groups are provided, but **Exterior Configurations** can be used in an **Interior** calculation.

Note: **Exterior Configurations** include poles and therefore enable the **Support** *panel* input fields in the **Symbol** *tab*. See Support Panel for more information.

Left-click the desired configuration and Visual will apply the change to the **Symbol** in the **Luminaire Editor**.

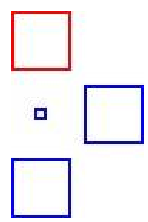
The **Custom Exterior Configuration** will place the indicated number of *luminaires* in a polar array around a central *pole* as in high-mast lighting.



It is possible to select a single head of a multi-head **Configuration** so as to modify only one head with parameters discussed in this sub-chapter.

To select a head, left-click and left-click again to make a window around the desired head. The selected head will be highlighted in red. Unlike selecting in the **Design Environment** the window does not have a "crossing" variant; it is inclusionary only.

To un-select a selected head, simply select blank space with a window.

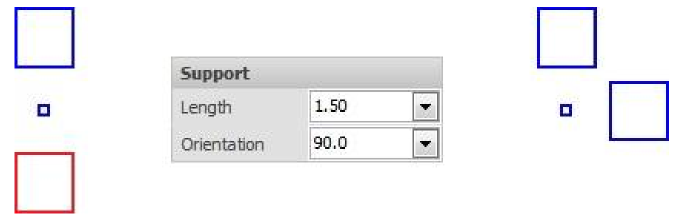


Changes made to any parameter on the **Symbol** *tab* will impact all heads of a multi-head **Symbol** in an equal fashion. **Symbols** with multiple heads are not merely a modification of the **Symbol**; additional instances of the *photometric file* are included and positioned to more accurately represent reality.

Illustrative Example 1

To make the **Symbol** at far-right, start with a ***Photometric File*** for an area *luminaire*, choose a **Twin Exterior Configuration**, and then select a single head. Then change the **Support Orientation** to "90" and the resultant **Symbol** would be applicable for positioning site lighting on a corner.

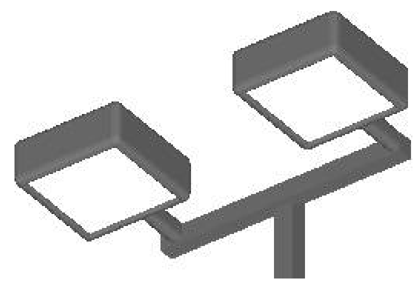
Note that the default **Length** most likely needs to change so the heads don't overlap as would be the case in reality.



Illustrative Example 2

The **Bullhorn Configuration** is pre-built for convenience and can be manipulated as necessary, but illustrating how to construct it will further illustrate how to use some of the parameters. The goal is to simulate the assembly at right.

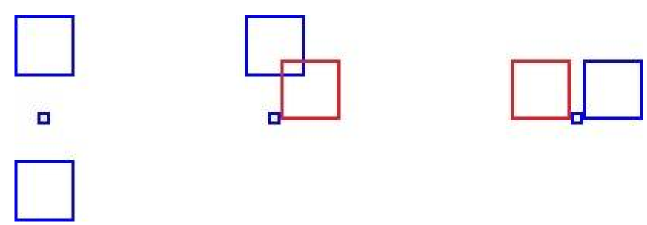
This configuration might be used on tennis courts or in situations where a field-rotatable area lighting is not available.



Select a **Twin Exterior Configuration**.

Select the lower head and set **Support Orientation** to "90" as we want that support to point in the 90-degree direction. With the lower head still selected, set the **Position Orientation** to 0 to point the head in that direction.

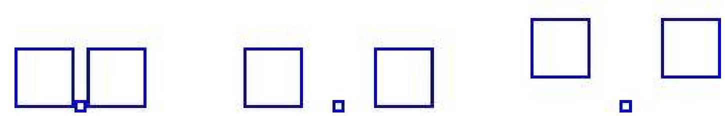
Select the other head and set **Support Orientation** to 270 and **Position Orientation** to 0.



Thus far, the *luminaires* are oriented properly but not positioned properly. Be sure to left-click in whitespace to de-select *luminaires*.

Recall that a 0.75ft **Support** is the default. A bullhorn will in reality have *luminaire* spacing of nominally 3ft, so the appropriate **Length** is 1.5. Both supports are changed at the same time because no *luminaire* is selected.

Lastly, the *luminaires* need to be moved forward to account for the arm attached to the housing; in this case, 0.75ft. To do this, add 0.75 to the value in the



Displacement textbox. Again, both supports are changed at the same time.

7.2.2 Model Tab

The ***Model*** *tab* allows for the specification and manipulation of the solid *model* used in **Shaded** and **Rendered** **[Display Modes](#)**.

The ***Model*** *tab* consists of: the **Toolbar** at the top, the large ***Model*** **Pane** that displays the ***Model***, and various *panels* on the right.

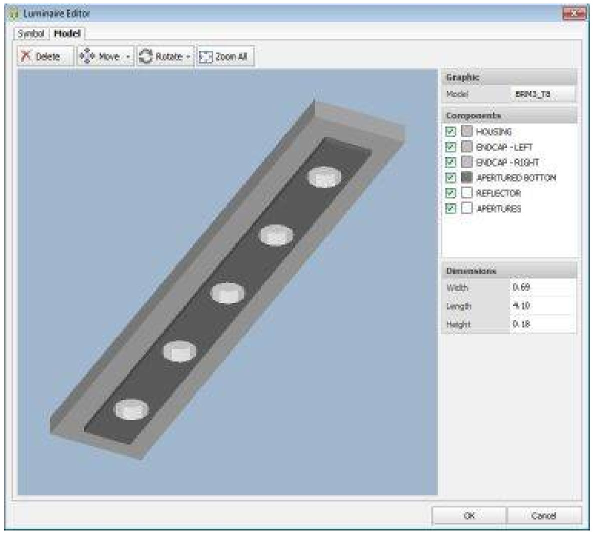
In the ***Model Panel***, the mouse can be used to manipulate the view of the ***Model*** just as the view would be changed in the **Design Environment.**

3-D Orbit the view by left-click-drag.

Pan the view by right-click-drag.

Zoom by rolling the mouse wheel.

For information on creating solid *models*, see [Luminaire Models](#)



7.2.2.1 Model Tab Toolbar

The **Toolbar** includes several buttons to manipulate the ***Model*** in the event that positional issues arise and editing the base ***Model*** file is not possible or practical.

Delete removes all associated solid *model* information.

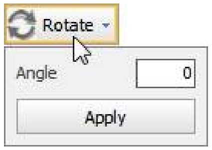
Move shifts the *Model* to correct alignment issues that may arise.

Dimensions are in feet. "X" refers to the normal *Cartesian* X-axis; i.e. to the right on the screen. "Y" refers to "up" on the screen. "Z" refers to in and out of the screen. All of these are with respect to a plan view of the ***Symbol*** as it appears in the ***Luminaire*** **Schedule**.

Moving the ***Model*** is an advanced feature and should be done carefully.

Rotate changes the plan view orientation of the ***Model*** with respect to the ***Symbol***. Rotation occurs counterclockwise when the ***Model*** is viewed in plan view as it appears in the ***Luminaire*** **Schedule**.

Rotating the ***Model*** is an advanced feature and should be done carefully.



Zoom All changes the view to include the entire ***Model***.

The **Undo** function in Visual will not impact changes made in the ***Model*** *tab*. To reset the *model*, the file must be re-selected or a new choice must be made from the database.

7.2.2.2 Model Tab Parameter Panels

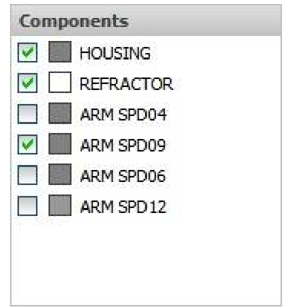
The parameters of the solid *model* can be modified to fit the product specifically chosen to yield the most accurate **Shaded** or **Rendered** view possible.

The **Graphic** *panel* contains the **Model Select…** button that allows a *DWG* format *model* file to be chosen. Clicking the button will open a file *dialog* to allow for selection. Only *DWG* format files may be imported and specific information is necessary in the file.

The **Components** *panel* lists the available components in the *Model* file. The color of each **Component** can be changed by clicking the colored box next to the name.

Some files may contain multiple product options such that certain **Components** would need to be unselected to make the ***Model*** *coordinate* with the options desired.

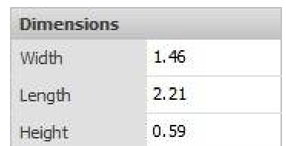
For example, in the *model* file at right, multiple arms are available (4", 9", and 12") so the arms <u>not</u> used should be unchecked by left-clicking those associated boxes.



The **Dimensions** *panel* allows the ***Model*** to be scaled by a *linear* factor in each of the *Cartesian* axes with **Length**, **Width**, and **Height** the same as in the ***Symbol Tab***; see <u>Dimensions Panel</u> for more information.

Changes are applied to all **Components**; i.e. flanges and arms will be stretched as well, which may not yield a desirable result in certain cases.

The value entered is the new dimension in feet not a scaling factor.



It will likely be necessary to consult specification sheets to determine which **Components** can be validly combined. Specification sheets can be viewed on the manufacturer's website or in the Visual program if it is an Acuity Brands product. See <u>Selecting a Photometric File</u> for more information.

7.3 Luminaire Templates

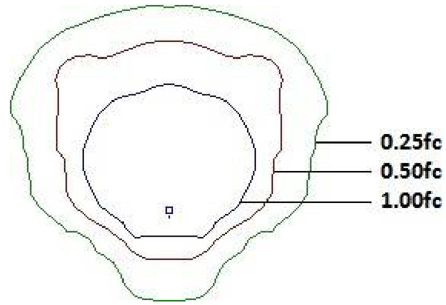
Luminaire Templates are assigned in the **Luminaire Schedule**; see Luminaire Schedule for more information.

A ***Template*** is one or more iso-*illuminance* lines (contours) attached to the ***Symbol***. and is generally used in exterior projects related to roadway, site, and area lighting.

Because *illuminance* generally increases closer to a *luminaire*, all points inside an iso-*illuminance* line will have *illuminance* greater than or equal to the iso-*illuminance* line value.

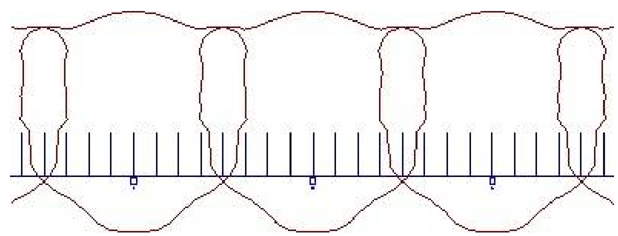
Luminaire **Templates** allow for quick design to meet common site lighting criteria in parking lots where a minimum *illuminance* needs to be met.

Alternately, **Templates** show the general shape of the effect of the *luminaire candela* distribution and are useful for design even when they are not specifically used to meet design criteria.



Since *illuminance* is additive, and the *illuminance* inside a contour is greater than the iso-*illuminance* line value, appropriate values can be assigned related to design criteria, and **Templates** can be overlapped to design to meet minimum *illuminance* criteria quickly. This method says nothing about uniformity criteria, so in most cases a point-by-point analysis is still necessary.

In the example at right, ***Template*** iso-*illuminance* lines of 0.5fc are overlapped to ensure that a 1.0fc minimum is maintained along a curb line in part of a parking lot.



To apply **Templates** to one or more **Luminaire Types**, select the desired **Luminaire Types** and click the ***Template*** button in the **Luminaire Editor Toolbar**. Remember that multiple **Luminaire Types** can be selected by holding the *Ctrl* key while left-clicking entries.

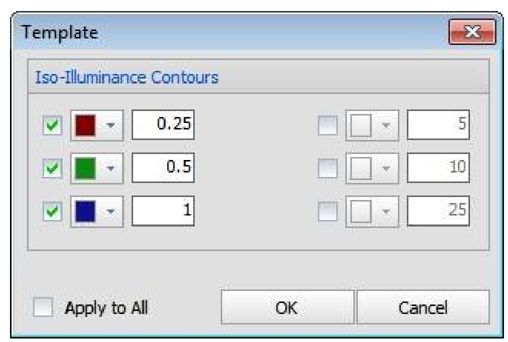
Clicking the ***Template*** button initiates the **Template Editor**. This editor allows for the assignment of values and colors for up to eight iso-*illuminance* lines per ***Template***.

To assign an iso-*illuminance* line to the ***Template***, left-click the check box next to an entry. Inactive entries are gray in color and are uneditable.

To edit the value of an iso-*illuminance* line, modify the value in the *text box*.

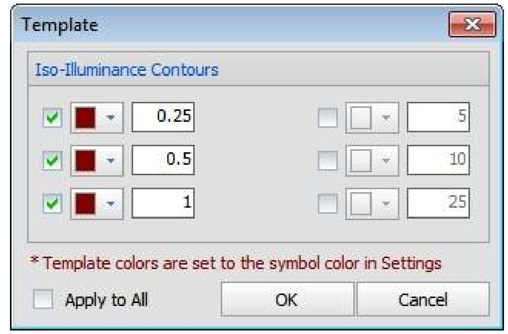
To change the color of the iso-*illuminance* line, click the **Color** button. Clicking the **Color** button initiates the **Color *Dialog***. See Using the Color Dialog for more information.

The entry order of values has no impact on any aspect of how **Templates** are displayed.



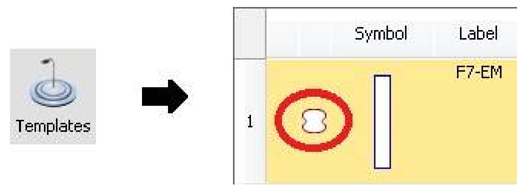
Selecting the "Apply to All" checkbox will associate the chosen values and colors to **Templates** for all **Luminaire Types** in the **Luminaire Schedule** *regardless of what is in the **Active Item** selection set*.

Template Color can be connected to the ***Symbol*** **Color** in the **Settings** ***Dialog***. When this option has been selected, Visual provides notification in the **Template Editor** and **Color** selections are overridden by the **Settings** ***Dialog*** choice(s). See Luminaires Settings for more information.



Luminaire **Types** with assigned **Templates** are indicated at the far left of each entry. The *symbol* indicates that a *Template* is assigned not the shape or any other property of the *Template*.

To view the assigned parameters of a ***Template***, select the ***Luminaire Type*** and left-click the ***Template*** **Button** in the ***Luminaire*** **Editor Toolbar**.



Global display of **Templates** is controlled with the **Templates** button on the ***Luminaire*** *tab* of the **Ribbonbar**. The yellow highlight indicates display of templates is turned on.

Different ***Template*** lines can be assigned to different ***Luminaire*** **Types** by repeating the process described above for each set of desired ***Template*** configurations and/or values. Note that ***Template*** iso-*illuminance* lines become part of the ***Symbol*** and can then be left-clicked when selecting a *luminaire* in commands.

7.4 Placing and Orienting Luminaires

Visual includes many ways to place and modify ***Luminaires***.

The ***Luminaire*** *tab* of the **Ribbonbar** contains placement and modification and display commands.

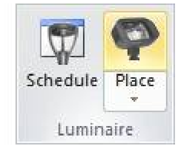
The **Home** *tab* of the **Ribbonbar** also contains the most commonly used commands.

Luminaires are copied, moved, and arrayed like any other objects.

7.4.1 Place Luminaires

Place is the most common method of inserting ***Luminaires*** into the **Design Environment**.

The **Place** command can be found on the **Luminaire** *tab* and the **Home** *tab* of the **Ribbonbar**.



The **Home** *tab* button is dual function; the upper portion executes the command, the lower portion initiates a *drop-down menu*.

Once a selection has been made other than the default, the upper button portion will change to execute that command with the next press and the graphic is changed accordingly. Selecting one of the other commands from the *drop-down menu* will revert the button to that mode.

Place (Default)

Place and Orient

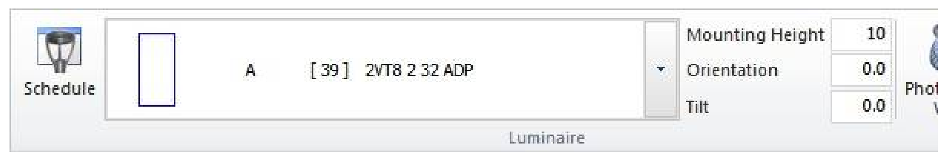
Place and Aim

Re-Aim

To insert a *luminaire*, one must first be defined in the **Luminaire Schedule**. See The Luminaire Schedule Editor for more information.

To **Place** a *luminaire*, select a ***Luminaire Type*** from the graphical list. Select the *coordinates* desired with the mouse, keyboard entry or **Object Snap**.

After a *luminaire* is inserted with **Place**, Visual continues the command to allow for multiple insertions. To end the command, right-click or press *Enter*.



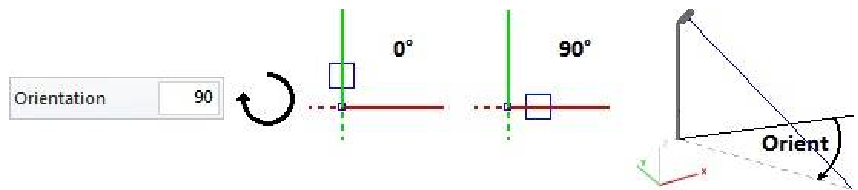
By clicking the ***Luminaire Type* List** during command execution, all defined **Luminaire Types** are shown and a selection can be made.

Symbol, **Type**, and **Catalog Number** are shown to identify types in complex projects.

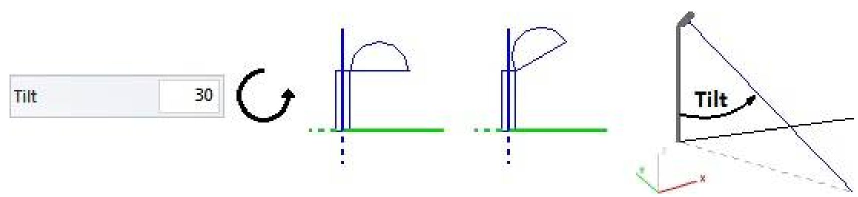
Preceding the **Catalog Number** is a number in square brackets representing the number of that ***Luminaire Type*** currently inserted in the **Design Environment**.

Mounting Height is the distance from the ***Active Plane*** that the *luminaire* will be inserted. **Mounting Height** is always applied in the z-direction. Changes to the ***Active Plane*** orientation (i.e. moving to the X-Z or Y-Z *planes*) will still result in the ***Mounting Height*** being applied in the Z-direction.

Orientation is the rotation angle applied in the horizontal *plane*. This angle is in reference to the 0° axis of the ***Luminaire Symbol*** defined in the **Luminaire Editor**. Angles are applied in a clockwise fashion and the impact can be immediately seen prior to placement as shown at right.



Tilt is the rotation angle applied in the vertical *plane*. Unlike **Orientation**, **Tilt** angle is applied in place of the angle used to define the ***Luminaire Symbol*** in the **Luminaire Editor**. Angles are applied in a counterclockwise fashion when viewed from the **East Elevation**, with 0° being straight down; thus a positive tilt angle rotates the *luminaire* up.

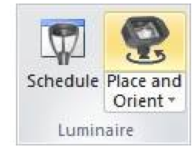


See Luminaire Display Options for further explanation of augmentation to ***Luminaires*** to aid in design.

7.4.2 Place and Orient Luminaires

Place and Orient is one of the most common methods for inserting ***Luminaires*** into the **Design Environment**. This command allows for placement and graphical manipulation of the **Orientation** parameter for each placement instance.

The **Place and Orient** command can be found on the **Luminaire** *tab* and the **Home** *tab* of the **Ribbonbar**.



The **Home** *tab* button is dual function; the upper portion executes the command, the lower portion initiates a *drop-down menu*.

Once a selection has been made other than the default, the upper button portion will change to execute that command with the next press and the graphic is changed accordingly. Selecting one of the other commands from the *drop-down menu* will revert the button to that mode.

Place (Default)

Place and Orient

Place and Aim

Re-Aim

To insert a ***Luminaire***, one must first be defined in the **Luminaire Schedule**. See [Luminaire Schedule](#) for more information.

To **Place and Orient** a ***Luminaire***, select a ***Luminaire*** from the **Luminaire Type List** then select the *coordinates* desired for the location of the ***Luminaire*** with the mouse, keyboard entry or **Object Snap**. Secondly, specify the **Orientation** with the mouse, keyboard, or **Object Snap**. Visual displays the angular change as the mouse is moved to illustrate the end result.

After a ***Luminaire*** is inserted with **Place and Orient**, Visual continues the command to allow for multiple insertions. To end the command, right-click or press *Enter*.

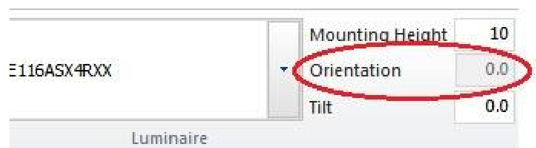
By clicking the **Luminaire Type List** during command execution, all defined **Luminaire Types** are shown and a selection can be made.

Symbol, **Type**, and **Catalog Number** are shown to identify types in complex projects.

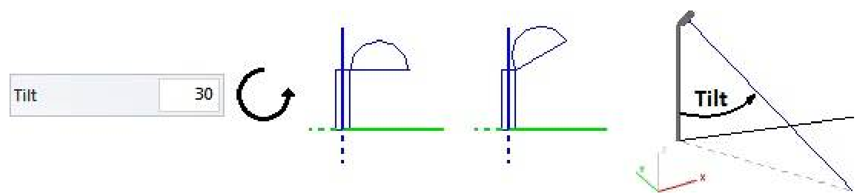
Preceding the **Catalog Number** is a number in square brackets representing the number of that ***Luminaire Type*** currently inserted in the **Design Environment**.

Mounting Height is the distance from the ***Active Plane*** that the ***Luminaire*** will be inserted. ***Mounting Height*** is always applied in the z-direction. Changes to the ***Active Plane*** orientation (i.e. moving to the X-Z or Y-Z *planes*) will still result in the ***Mounting Height*** being applied in the Z-direction.

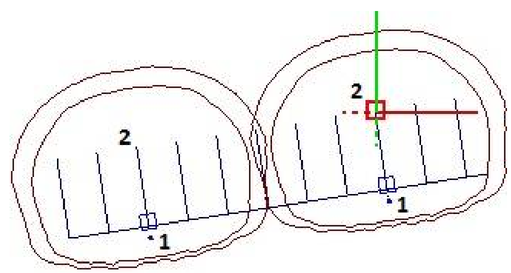
Orientation is solely specified by user input at the **Command Line** in this command. The **Orientation** parameter *text box* is accordingly inactive.



Tilt is the rotation angle applied in the vertical *plane*. Unlike **Orientation**, **Tilt** angle is applied <u>in place of</u> the angle used to define the ***Luminaire Symbol*** in the **[Luminaire Editor](#)**. Angles are applied in a counterclockwise fashion when viewed from the **East Elevation**, with 0° being straight down; thus a positive tilt angle rotates the *luminaire* up as would be expected.



This command is useful with odd-angled alignments necessary in site lighting, as shown at right where the angle is specified by using **Object Snap** to align to the parking lot line.

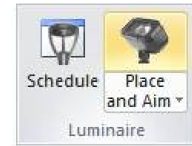


See [Luminaire Display Options](#) for further explanation of augmentation to ***Luminaires*** to aid in design.

7.4.3 Place and Aim Luminaires

Place and Aim allows ***Luminaires*** to be graphically aimed in the direction of a chosen *coordinate*. This command allows for placement and graphical manipulation of the **Orientation** and **Tilt** parameters for each placement instance. This method is useful for *floodlighting*, track lighting, sports lighting, and landscape lighting.

The **Place and Aim** command can be found on the **Luminaire** *tab* and the **Home** *tab* of the **Ribbonbar**.



The **Home** *tab* button is dual function; the upper portion executes the command, the lower portion initiates a *drop-down menu*.

Once a selection has been made other than the default, the upper button portion will change to execute that command with the next press and the graphic is changed accordingly. Selecting one of the other commands from the *drop-down menu* will revert the button to that mode.

Place (Default)

Place and Orient

Place and Aim

Re-Aim

To insert a ***Luminaire***, one must first be defined in the **Luminaire Schedule**. See The Luminaire Schedule Editor for more information.

To **Place and Aim** a ***Luminaire***, select a ***Luminaire Type*** from the graphical list. Select the *coordinates* desired for the ***Luminaire*** location with the mouse, keyboard entry or **Object Snap**. Visual then provides instant feedback by placing the aim point at the mouse *crosshairs* and shows the resultant **Aiming Line** and ***Luminaire*** orientation as the mouse is moved. Specify the aiming point with the mouse, keyboard, or **Object Snap**.

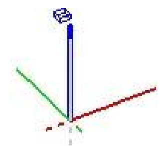
After a ***Luminaire*** is inserted with **Place and Aim**, Visual continues the command to allow for multiple insertions. To end the command, right-click or press *Enter*.

By clicking the **Luminaire Type List** during command execution, all defined **Luminaire Types** are shown and a selection can be made.

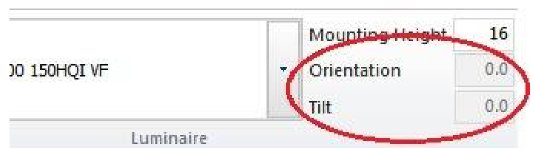
Symbol, **Type**, and **Catalog Number** are shown to identify types in complex projects.

Preceding the **Catalog Number** is a number in square brackets representing the number of that ***Luminaire Type*** currently inserted in the **Design Environment**.

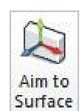
Mounting Height is the distance from the ***Active Plane*** that the ***Luminaire*** will be inserted. ***Mounting Height*** is always applied in the z-direction. Changes to the ***Active Plane*** orientation (i.e. moving to the X-Z or Y-Z *planes*) will still result in the ***Mounting Height*** being applied in the Z-direction.

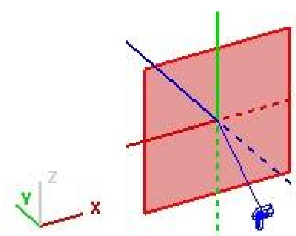


Orientation and **Tilt** are solely specified by user input at the **Command Line** in this command, most often with the mouse. The **Orientation** and **Tilt** parameter text boxes are accordingly inactive.



Aim to Surface (found on the **Luminaire** *tab*) is applicable to the [Place and Aim]() command. Because in many *floodlighting* applications it is necessary to have the ***Luminaire*** aimed onto a specific surface, Visual can determine when the mouse is placed "over" a **Solid Object** and the ***Active Plane*** can be automatically and temporarily changed to the *plane* of that **Solid Object** such that when the mouse is clicked the aiming point is placed in the *plane* of that **Solid Object**.





See [Luminaire Display Options]() for further explanation of augmentation to ***Luminaires*** to aid in design.

7.4.4 Reaiming Luminaires

Once inserted into the **Design Environment**, ***Luminaires*** can be **Reaimed** if necessary.

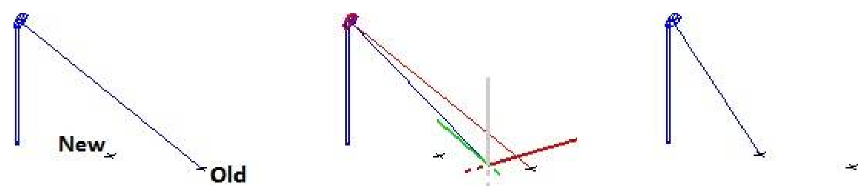
The **Reaim** command can be found on the ***Luminaire*** *tab* and the **Home** *tab* of the **Ribbonbar**.

The **Home** *tab* button is dual function; the upper portion executes the command, the lower portion initiates a *drop-down menu*.

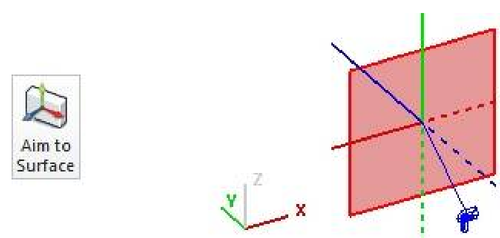
Once a selection has been made other than the default, the upper button portion will change to execute that command with the next press and the graphic is changed accordingly. Selecting one of the other commands from the *drop-down menu* will revert the button to that mode.

To **Reaim** a ***Luminaire***, left-click the *luminaire* ***Symbol*** or the **Aiming Line** (if displayed). Visual will highlight the selected *luminaire*. Specify the new aiming point with the mouse, keyboard, or **Object Snap**.

While in the command, Visual displays the previous **Aiming Line**, the new **Aiming Line** attached to the mouse *crosshairs*, and the resultant ***Symbol*** alignment as the mouse is moved.



Aim to Surface (found on the ***Luminaire*** *tab*) is applicable to the **Reaim** command just as it would be to the initial **Place and Aim** command. Visual can determine when the mouse is placed "over" a **Solid Object** and the ***Active Plane*** can be automatically and temporarily changed to the *plane* of that **Solid Object** such that when the mouse is clicked the aiming point is placed in the *plane* of that **Solid Object**.



See [Luminaire Properties] for information about displaying aiming lines.

Luminaire Display Options

After ***Luminaires*** have been placed in the **Design Environment**, there are ways to augment the display to aid in design.

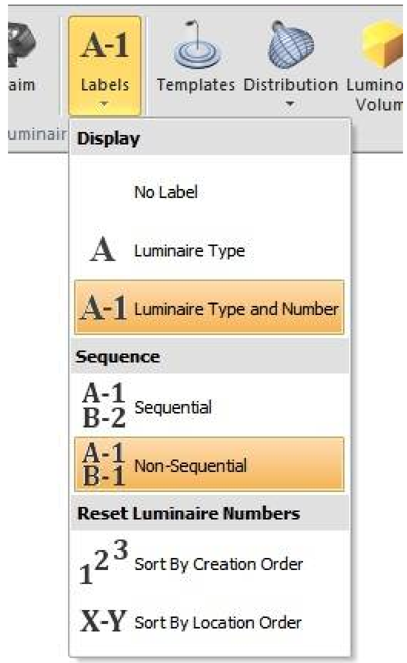
Luminaire display options are found on the **Luminaire** *tab* of the **Ribbonbar**.

Luminaire **Labels** can be shown with the **Luminaire Type** or the ***Luminaire Type*** **and Number**.

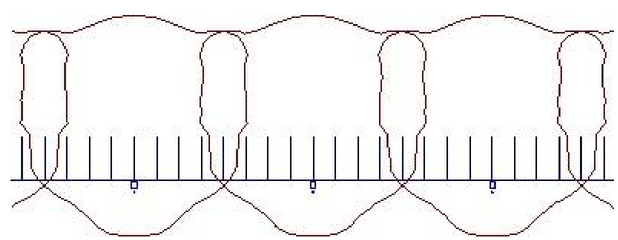
When the **Display** is set to ***Luminaire Type*** **and Number**, Visual activates the following additional options:

Sequence tells Visual how to handle numbering across **Luminaire Types**. **Sequential** will number ***Luminaires*** regardless of ***Luminaire Type***. **Non-Sequential** will re-start numbering for each ***Luminaire Type***.

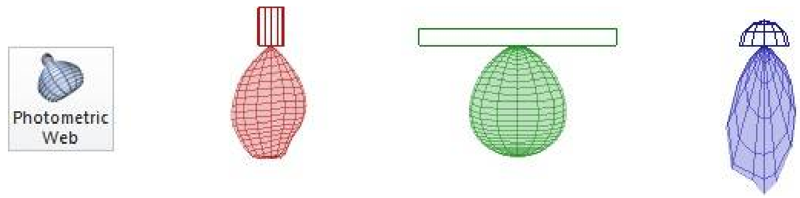
Reset Luminaire Numbers. controls the numbering used with the **Sequence** options. **Sort By Creation Order** tells Visual to number ***Luminaires*** based on the order they are placed (created) in the **Design Environment** regardless of where they are placed. **Sort By Location Order** tells Visual to use the internal algorithm for sorting based on the relative position in the *Cartesian* X-Y *plane*.



The **Templates** button turns on or off the global display of iso-*illuminance* templates for **Luminaire Types** where **Templates** have been defined in the **Luminaire Schedule**. See Luminaire Templates for information on defining **Templates**.



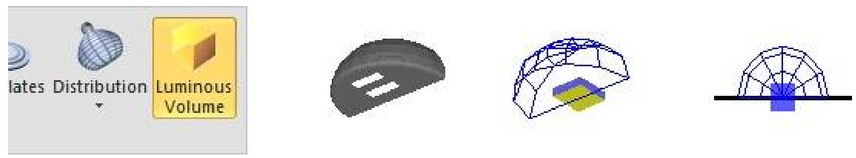
The **Photometric Web** button turns on or off the display of the **Photometric Web** for the *luminaire* currently being placed. It does not impact already placed ***Luminaires***; see Luminaire Properties for information on controlling display of placed ***Luminaires***.



The **Photometric Web** illustrates the shape of the *candela* distribution and provides visual feedback as to proper alignment. Note that the magnitude is scaled to allow for all sizes to be visible. For example, a 32W *CFL downlight* will have the same magnitude as a 4-*lamp troffer* or a 1000W metal halide floodlight even though actual *candlepower* could be 10,000X different.

Analogous to the **Photometric Web** button when inserting ***Luminaires***, the **Distribution** button found on the **Luminaire** *tab* of the **Ribbonbar** initiates a *drop-down menu* that allows the user to turn on or off **Photometric Webs** in the **Design Environment** for all ***Luminaires***.

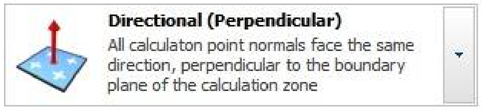
The **Luminous Volume** button directs Visual to display the luminous dimensions graphically (as seen in the wireframe view at middle-right) for each placed ***Luminaire*** in the **Design Environment** in conjunction with the ***Symbol*** as defined in the Luminaire Schedule.

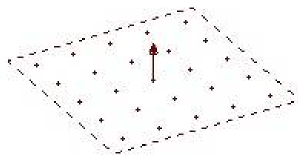


Design Audit will automatically turn on this feature when an interference is found. At right, the wall sconce ***Symbol*** is aligned properly but the alignment of the ***Symbol*** and the ***Photometric File*** is incorrect, yielding half of the luminous area inside a wall as can be seen in plan view.

Chapter 8 - Calculations and Results

Visual's primary function is to calculate *illuminance* levels at distinct locations in the lighting *model* for the purpose of lighting system performance verification. This chapter provides a brief overview of the calculations and the techniques for interpreting the results.





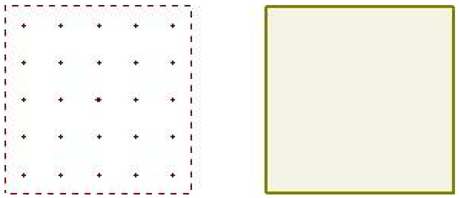
Basic knowledge of lighting equipment and metrics is necessary prior to using Visual to be able to understand the ramifications of choices made in the program and the resultant numbers. Most local sections of the Illuminating Engineering Society provide *Fundamentals of Lighting* classes to suit this purpose.

An advanced discussion of the Visual Calculation Engine is provided in the Appendices of this manual.

8.1 Calculation Zones

Calculation Zones are an integral part of any lighting model. Statistical information related to **Calculation Zones** is displayed in the **Sidebar**. See Statistics and The Sidebar for more information.

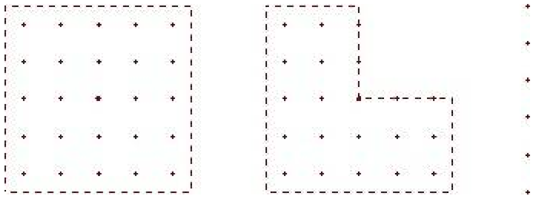
Calculation Zones can be lighting-based (***Illuminance***, ***Luminance***, etc) or power-based (**Lighting Power Density**). By default, Visual shows L**ighting Calculation Zones** in dark red and **Lighting Power Density Zones** are shown with a olive border and are furthermore shaded.



Lighting Calculation Zones can be defined by rectangular areas, areas bounded by a *polygon*, or can be locations along a *linear* path. **Calculation Zones** can also be placed directly on surfaces (**Solid Objects**).

The boundary of the **Calculation Zone** is indicated by a dashed line and points indicated by crosses are placed in an array defined by the user.

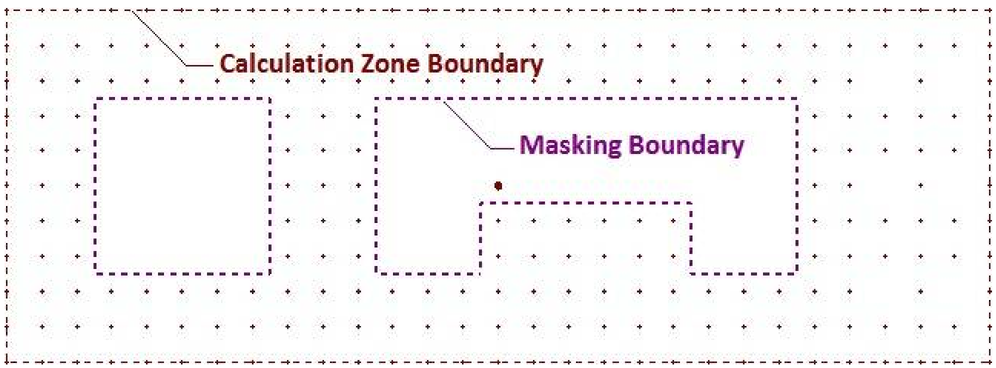
Visual assumes the light meter orientation to be perpendicular to the defining (bounding) plane. This can be modified at creation or by editing **Properties** after creation.



Lighting Calculation Zones can be modified to remove points that are unwanted using the ***Masking*** commands. Points can be **Masked** with rectangles, polygons, by surface, or individually.

Mask boundaries are shown with a dashed purple line.

The display of the **Mask** boundary can be turned on or off in the **Settings** dialog.

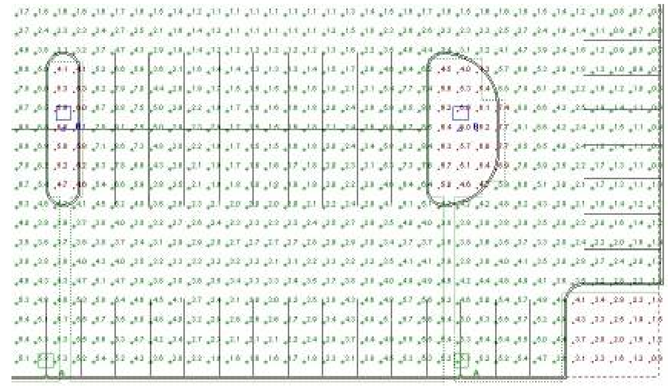


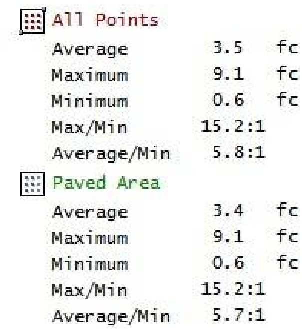
Statistical Zones can be created to report information about part of a **Lighting Calculation Zone**. **Statistical Zones** are displayed in the **Statistics** *tab* of the **Sidebar** separately from their parent zone.

Statistical Zones can be created with rectangles, polygons, or by selecting surfaces. **Statistical Zones** can be grouped in the **Sidebar** for an additional level of reporting and analysis.

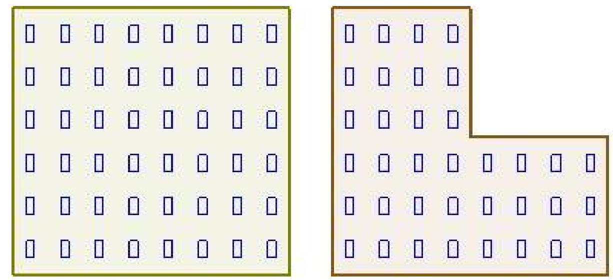
Statistical Zone boundaries are shown with a dashed dark green line. Notice how the internal points are omitted by astute boundary selection. Calculation points included in the **Statistical Zone** have a different *symbol*.

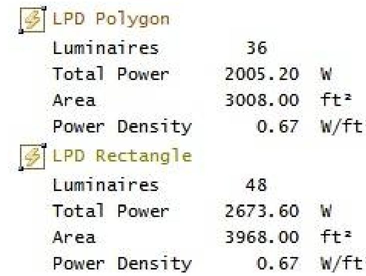
For example, only the paved area could be shown for a parking lot. Points in the **Statistical Zone** are indicated with a green asterisk *symbol* by default.



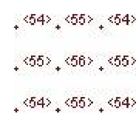


Lighting Power Density (**LPD**) **Zones** can be defined by rectangular areas, areas bounded by a *polygon*. They have associated *luminaires* specifically applied to the calculation. **LPD Zones** can also be placed directly on surfaces (**Solid Objects**).





When changes have been made to the lighting model that require a re-calculation, Visual will indicate that **Calculation Zone** values may no longer be valid by bracketing point values.

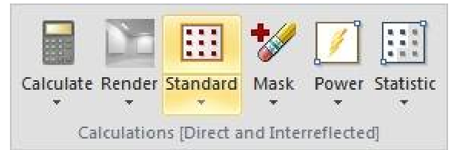


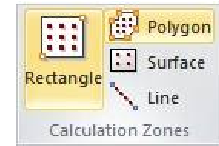
The following section describes the process of entering **Calculation Zones** along with the information required to produce appropriate results.

8.1.1 Rectangular and Polygonal Calculation Zones

Calculation Zones may exist along a *linear* path or within *planar* regions bounded by a rectangle or *polygon*.

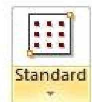
The buttons for the various types of **Calculation Zones** can be found in the **Calculations** *panel* on the **Home** *tab* or the **Calculation Zone** *panel* on the **Calculations** *tab* of the **Ribbonbar**.



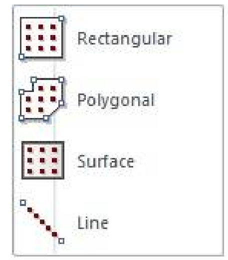


The **Home** *tab* buttons are dual function; the upper portion executes the command, the lower portion initiates a *drop-down menu*.

Once a selection has been made other than the default, the upper button portion will change to execute that command with the next press and the graphic is changed accordingly. Selecting one of the other commands from the *drop-down menu* will revert the button to that mode.



Rectangular (Default)



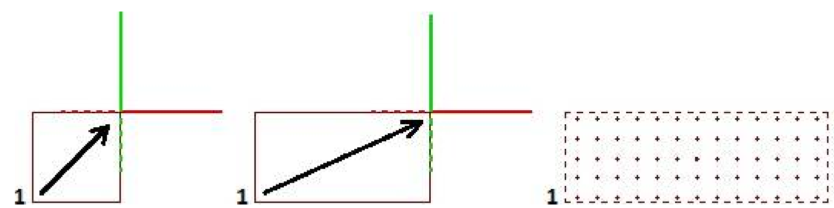
Polygonal

Rectangular and ***Polygonal*** **Calculation Zones** share a similar interface in the **Properties** *tab* of the **Ribbonbar** that is shown upon command execution.

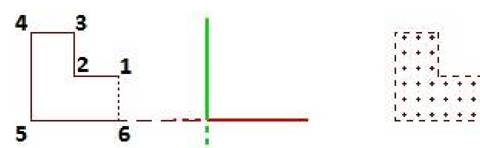
See Calculation Zone Parameters for information on specific parameters.

Note that the basic process of creating **Calculation Zones** is identical to that of creating **Background** or **Solid Rectangles** and **Polygons** except that additional information must be entered on the **Properties** *tab* to space and format the points.

To construct a **Rectangle Calculation Zone**, specify the *coordinates* of the first *vertex* using the mouse, keyboard, or **Object Snap**. In the command, moving the mouse causes Visual to draw the implied **Rectangle** showing what will be created when the command is completed. To end the command, right-click the mouse or press *Enter*. Various parameters can be specified in the **Properties** *tab* as discussed below.



To construct a ***Polygon*** **Calculation Zone**, specify the *coordinates* of the *vertices* using the mouse, keyboard, or **Object Snap**. In the command, moving the mouse causes Visual to draw two types of implied lines: the small-dash line connects the first *vertex* and the last *vertex* specified and the large-dash line connects the cursor to the last *vertex* specified. To end the command, right-click the mouse or press *Enter*. Various parameters can be specified in the **Properties** *tab* as discussed below.



When changes have been made to the lighting *model* that require a re-calculation, Visual will indicate that **Calculation Zone** values may no longer be valid by bracketing point values.

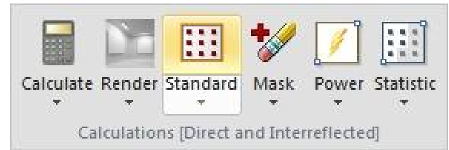
In all cases, the default point normal (virtual light meter) orientation is **Directional (Perpendicular)** that corresponds to a direction perpendicular to the *plane* of the **Calculation Zone** bounding rectangle, *polygon*, or line. Several other options can be chosen to change how Visual orients the virtual light meter. See Calculation Types for other meter orientation options.

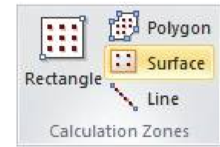
Statistical information related to **Calculation Zones** is displayed in the **Sidebar**. See Statistics and The Sidebar for more information.

8.1.2 Placing Calculation Zones on Existing Solid Objects

The lighting levels on surfaces are frequently of interest because the illumination of a surface is often the primary objective (wall-washing, facade lighting, etc.) of a project and a lighting *model*.

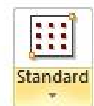
The buttons for the various types of **Calculation Zones** can be found in the **Calculations** *panel* on the Home *tab* or the **Calculation Zone** *panel* on the **Calculations** *tab* of the **Ribbonbar**.



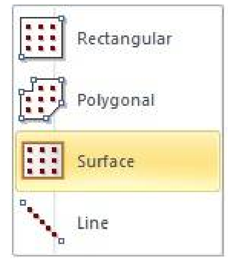


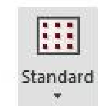
The **Home** *tab* buttons are dual function; the upper portion executes the command, the lower portion initiates a *drop-down menu*.

Once a selection has been made other than the default, the upper button portion will change to execute that command with the next press and the graphic is changed accordingly. Selecting one of the other commands from the *drop-down menu* will revert the button to that mode.



Rectangular (Default)

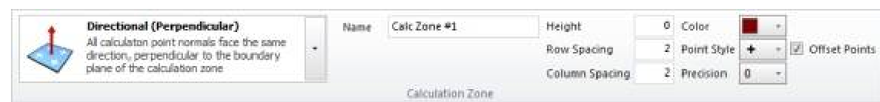




Surface

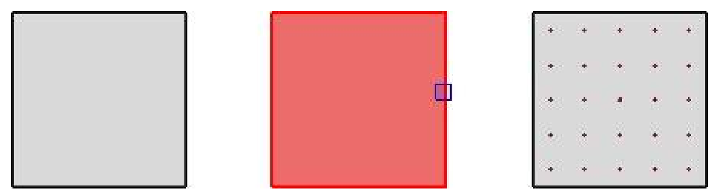
Surface Calculation Zones have the identical interface in the **Properties** *tab* of the **Ribbonbar** that is found when placing **Rectangle** and ***Polygon*** **Calculation Zones**.

See [Calculation Zone Parameters]() for information on specific parameters.



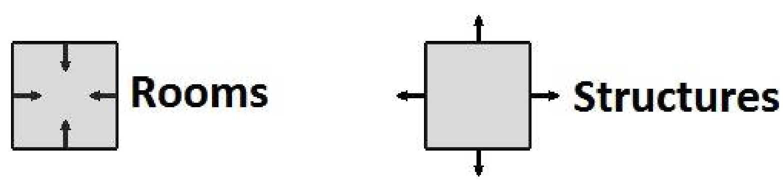
To place a **Calculation Zone** on a **Surface**, select the desired **Surface** to use as the basis by left-clicking, specify parameters as necessary in the **Properties** *tab*, and press *Enter* or right-click to end the command. The selection of a **Surface** provides the bounding *polygonal* (or rectangular) shape just as if that shape had been provided while executing the commands as described in [Rectangular and Polygonal Calculation Zones]().

Note that the **Height** is applied from the **Surface** itself not the *Cartesian coordinate* system.



The normal of the **Calculation Zone** (and therefore the virtual light meter) will be pointed to the interior when placed on **Room Surfaces** and pointed to the exterior when placed on **Structure Surfaces.**

For the same reasons, **Calculation Zones** placed on **Room Surfaces** will be offset to the interior of the **Room**. **Calculation Zones** placed on **Structure Surfaces** will be offset to the exterior of the **Structure**. This of course assumes a non-zero **Height** is specified.



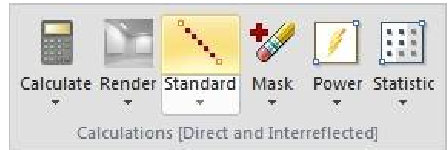
The default point normal (virtual light meter) orientation is **Directional (Perpendicular)** that corresponds to a direction perpendicular to the *plane* of the **Calculation Zone** bounding rectangle, *polygon*, or line. Several other options can be chosen to change how Visual orients the virtual light meter. See Calculation Types for other meter orientation options.

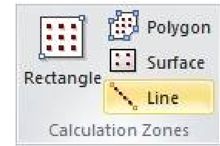
Statistical information related to **Calculation Zones** is displayed in the **Sidebar**. See Statistics and The Sidebar for more information.

8.1.3 Line Calculation Zones

A **Calculation Zone** based on a *linear* path can be placed in a similar fashion to other **Calculation Zones**. This is most commonly used for the analysis of spill light and light trespass.

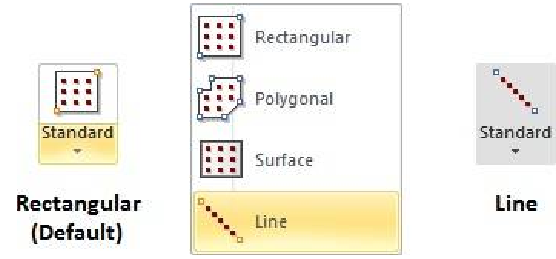
The button for the **Line Calculation Zone** command can be found in the **Calculations** panel on the **Home** *tab* or the **Calculation Zone** panel on the **Calculations** *tab* of the **Ribbonbar**.





Accessing the **Line** command from the **Home** *tab* requires the use of the dual-function button; the upper portion executes the command, the lower portion initiates a drop-down menu.

On first use, the button will show the default **Rectangular** mode. To select the **Line** option for the button, click the lower portion with the arrow, select **Line** from the *drop-down menu*, and the command will be initiated. The button will remain in **Line** mode until another choice is made from the *drop-down menu*.



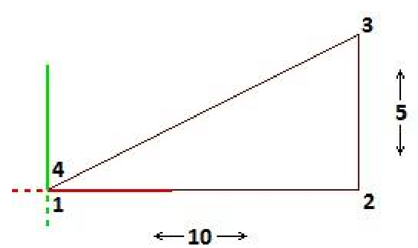
Line Calculation Zones share a similar interface in the **Properties** *tab* to **Rectangle** and ***Polygon*** **Calculation Zones** of the **Ribbonbar** that is shown upon command execution. Note that the field name changes to **Point Spacing** and thus **Column Spacing** is not applicable and inactive.

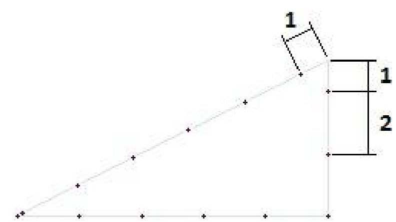
See [Calculation Zone Parameters]() for information on specific parameters.

Note that the basic process of entering **Calculation Zones** is identical to that of entering **Background** or **Solid Rectangles** and **Polygons** except that additional information must be entered on the **Properties** tab to space and format the points.

To construct a **Line Calculation Zone**, specify the coordinates of the first *vertex* using the mouse, keyboard, or **Object Snap**. Specify additional *vertices* as necessary. Right-click the mouse or press *Enter* to end the command. Various parameters can be specified in the **Properties** *tab* as discussed below.

Calculation Zone points are spaced starting at the first *coordinate* entered and the user-specified spacing is continued around corners. At right, a spacing of 2 units is applied to a triangular path. Note how the calculation points turn the corner at point 3. The gray lines are for illustration and are not drawn normally.





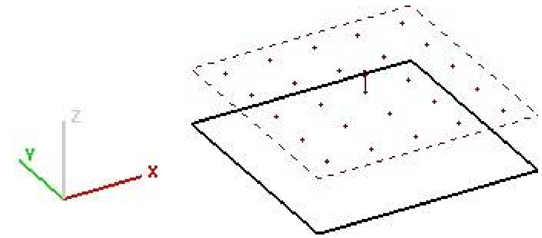
The default point normal (virtual light meter) orientation is **Directional (Perpendicular)** that corresponds to a direction perpendicular to the plane of the **Calculation Zone** bounding rectangle, *polygon*, or line. Several other options can be chosen to change how Visual orients the virtual light meter. See [Calculation Types]() for other meter orientation options.

Statistical information related to **Calculation Zones** is displayed in the **Sidebar**. See [Statistics]() and [The Sidebar]() for more information.

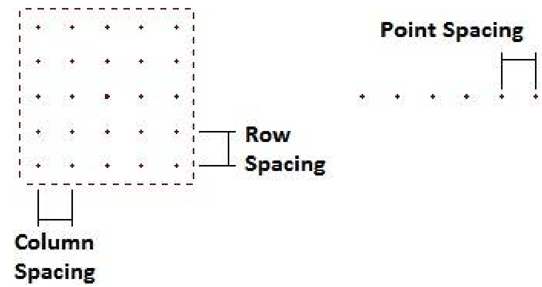
8.1.4 Calculation Zone Parameters

All **Calculation Zone** types share the same parameters to control position, spacing, and format of calculation points.

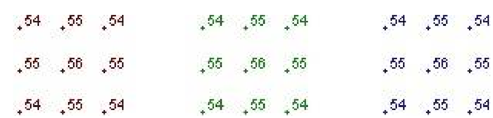
Calculation Zones are often placed at some level above grade (*workplane* height). While this can certainly be accomplished by choosing the correct *coordinates* when entering the **Calculation Zone** parameters, the **Height** field provides an alternative method. When a **Height** value is entered, the points in a **Calculation Zone** will be displaced perpendicularly from the working *plane* (*plane* of the *crosshairs*) in the direction nearest the point of view. For horizontal **Calculation Zones** this will typically be in the direction of the positive Z-axis as would be commonly desired.



Rectangular and ***Polygonal*** **Calculation Zones** result in an array of points and thus, spacing values must be entered for each dimension of the array. In the case of a **Line**, calculation points are spaced with the specified increment along the path of the **Line**.

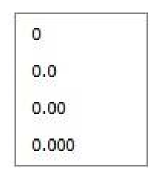


Color can be selected from the **Properties** *tab* in the **Ribbonbar** that will automatically be shown. This selection modifies the points and the associated numerical text. See [Using the Color Dialog] for information on selecting **Color**.

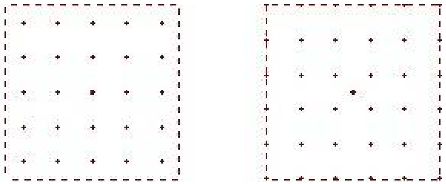


The **Point Style** for a **Calculation Zone** can be chosen at creation. Clicking the button initiates the drop-down graphical menu that illustrates the available **Point Styles** at right.

Precision specifies how many decimal places should be shown for the **Calculation Zone**. Clicking the button initiates the *drop-down menu* to allow for the selection of 0 to 3 digits. It is not possible to display more than 3 digits because it is beyond the accuracy of *photometric* testing in most cases.



The **Offset Points** checkbox tells Visual to either center the grid of calculation points (checked) or to start spacing in the lower left corner (the corner with the smallest x, y, and/or z *coordinates* if creation occurs outside the x-y *plane*), which is likely to leave space between the last points and the edges of the boundary.

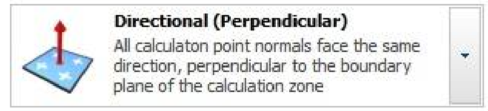


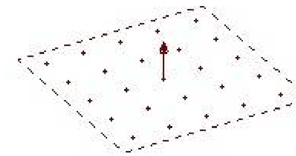
In this section, reference is made to parameter specification on the **Properties** *tab* of the **Ribbonbar** while one of the **Calculation Zone** commands is being executed. See Calculation Zone Properties for more information on modification of parameters after creation.

8.1.5 Calculation Types

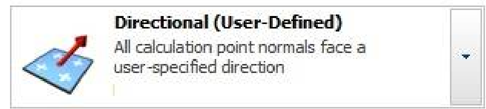
All **Calculation Zone** types share the same options to control virtual light meter ("meter") orientation. Each of the options found in the **Properties** *tab* when creating a **Calculation Zone** provides descriptive text as a reminder of the meter orientation.

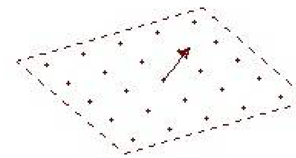
The default for all **Calculation Zone** types is **Directional (Perpendicular)**. This option positions the meter perpendicular to the *plane* that defines the **Calculation Zone**. This is the most common use be it for horizontal or vertical surfaces.



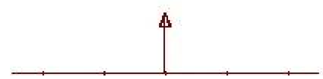


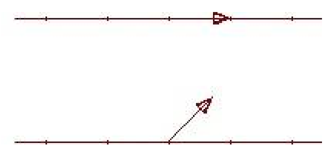
The **Directional (User-Defined)** option allows the point normals to be oriented uniformly in any specified direction. This is commonly used for calculating vertical *illuminance* in a horizontal grid. When this option is chosen, the **Command Line** will prompt for the base and destination points of a *vector* to establish the direction of the point normals. The exact location of the chosen base and head of the *vector* is immaterial as they only serve to describe a direction *vector*. For example, (0,0,0) as the *base point* and (1,0,1) as the destination produces a 45° tilt of the meter in the X-Z *plane*. The base and destination points may be entered with the mouse or keyboard.



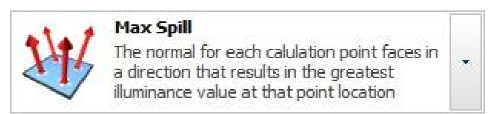


For **Directional Calculation Zones**, Visual draws a unit *vector* showing the orientation of the meter. Because **Calculation Zones** are often large, it may be necessary to **Zoom** to see the *vector*. The tail of the *vector* lies in the *plane* defining the **Calculation Zone**, while the head points in the direction the meter faces. This normal *vector* will not be shown for other **Calculation Zone** types.

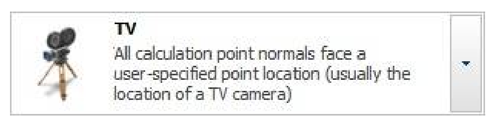


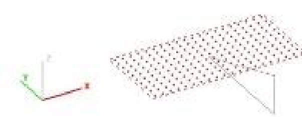


The **Max Spill** option calculates the maximum possible *illuminance* value from all the *luminaires* in the *model* regardless of orientation. This option is typically applied when light trespass is of concern and the "worst case" values on adjacent property are desired. The **Max Spill** option requires no point normal specification.



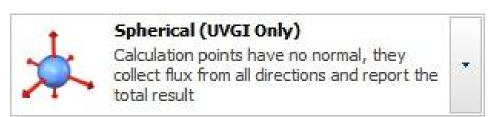
The **TV** option establishes point values based on a single viewing position for sporting events and other applications where special lighting consideration must be given to the operation of television cameras. Each calculation point normal in the **Calculation Zone** is oriented toward the single camera location. When the **TV** option is selected, the **Command Line** will prompt for the *coordinates* of the **TV** camera and a line is drawn from the center of the zone to the camera for reference.





Moving the **Calculation Zone** does not move the camera location.

Spherical orientation of the meter can be assigned for use with **UVGI** calculations. See [UVGI Calculations] for more information.

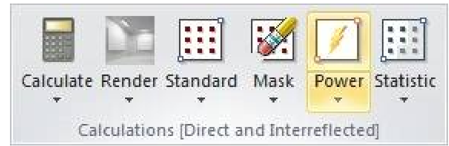


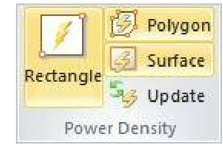
Meter **Tilt** and **Orientation** as well as **TV** camera location can be modified after creation by editing Calculation Zone Properties.

8.2 Power Zones

Power Zones are used to analyze and illustrate performance of lighting systems related to lighting power density (LPD). LPD quantifies the amount of power required to provide lighting to a space. LPD is often limited by building codes and is an integral part of sustainability programs such as LEED.

The buttons for the various types of **Calculation Zones** can be found in the **Calculations** *panel* on the **Home** *tab* or the **Power Density** *panel* on the **Calculations** *tab* of the **Ribbonbar**.

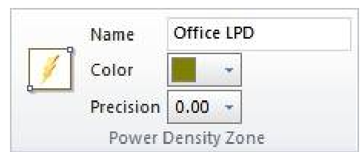




The **Home** *tab* buttons are dual function; the upper portion executes the command, the lower portion initiates a *drop-down menu*.

Once a selection has been made other than the default, the upper button portion will change to execute that command with the next press and the graphic is changed accordingly. Selecting one of the other commands from the *drop-down menu* will revert the button to that mode.

Rectangular and ***Polygonal*** **Power Zones** share a similar interface in the **Properties** *tab* of the **Ribbonbar** that is shown upon command execution.

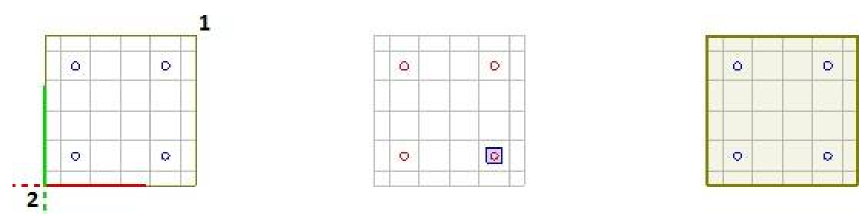


Name allows **Power Zones** to be individually identified for later use and presentation clarity.

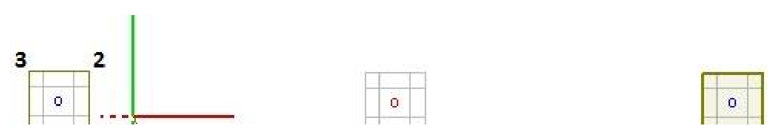
Color can be selected to modify the highlight given to the zone in the **Design Environment**. See [Using the Color Dialog] for information on selecting **Color**.

Precision specifies how many decimal places should be shown for the **Calculation Zone**. Clicking the button initiates the *drop-down menu* to allow for the selection of 0 to 3 digits.

To create a **Rectangular Power Zone**, select the two necessary corners that define the rectangle with the mouse, keyboard entry, or **Object Snap**. Right-click the mouse or press *Enter* to advance the command to the next step. Select the *luminaires* to be associated to the **Power Zone**, see [Selecting Objects]. Right-click the mouse or press *Enter* to end the command.

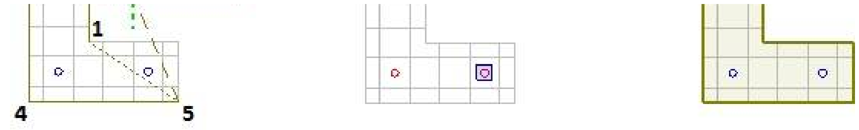


To create a **Rectangular Power Zone**, select the *vertices* necessary to define the *polygon* with the mouse, keyboard entry, or **Object Snap**. Right-click the mouse or press *Enter* to advance the command to the next step. Select the *luminaires* to be associated to the **Power Zone**. Right-click the mouse or press *Enter* to end the

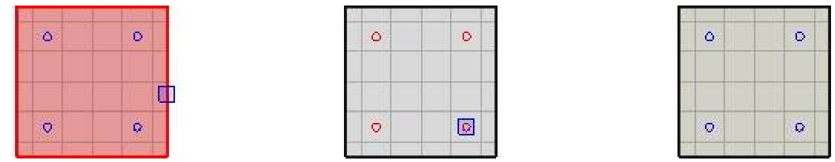


command.

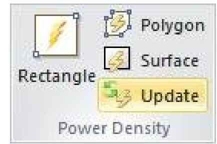
While *drawing* the bounding *polygon*, moving the mouse causes Visual to draw two types of implied lines: the small-dash line connects the first *vertex* and the last *vertex* specified and the large-dash line connects the cursor to the last *vertex* specified.



Creating a **Power Zone** based on a **Surface** is perhaps the most useful of the options available since the **Solid Objects** defining the physical space are likely to overlay the boundary related to LPD. To create a **Power Zone** based on a **Surface**, select the **Surface.** Right-click the mouse or press *Enter* to advance the command to the next step. Select the desired *luminaires* to be associated to the **Power Zone**. Right-click the mouse or press *Enter* to end the command.

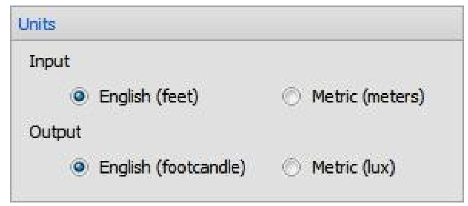


To **Update** a **Power Zone**, select the desired **Power Zone**, right-click the mouse to advance the command, and then add or remove *luminaires* as necessary. See Selecting Objects for information on adding and removing objects from the selection set.



Lighting power density is calculated in terms of Watts per unit area; W/ft² or W/m² depending on system settings. See Settings Luminaires for information on changing the units used in Visual.

Calculations are based on the values in the Luminaire Schedule. Values input to the ***Luminaire* Schedule** should be ballast Watts based on the most common usage of LPD. The value imported to the ***Luminaire* Schedule** from the IES file may be the value measured during testing, *lamp* Watts, or ballast Watts. Care should be taken to include the correct value based on published manufacturer data for the specific *lamp* and ballast components used.

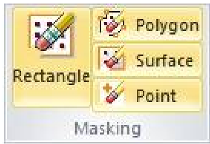


Statistical information related to **Calculation Zones** is displayed in the **Sidebar**. See Statistics and The Sidebar for more information.

8.3.1 Masking Calculation Zones

Certain scenarios require the removal of calculation points from perimeter and internal sections of **Calculation Zones**. In Visual, the removal of calculation points is called ***Masking***.

The buttons for the various types of ***Masking*** can be found in the **Calculations** *panel* on the **Home** *tab* or the ***Masking*** *panel* on the **Calculations** *tab* of the **Ribbonbar**.

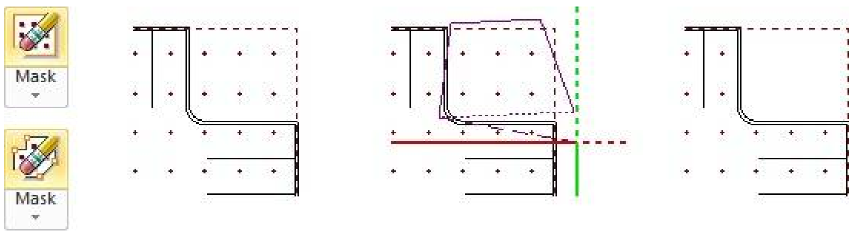


The **Home** *tab* button is dual function; the upper portion executes the command, the lower portion initiates a *drop-down menu*.

Once a selection has been made other than the default, the upper button portion will change to execute that command with the next press and the graphic is changed accordingly. Selecting one of the other commands from the *drop-down menu* will revert the button to that mode.

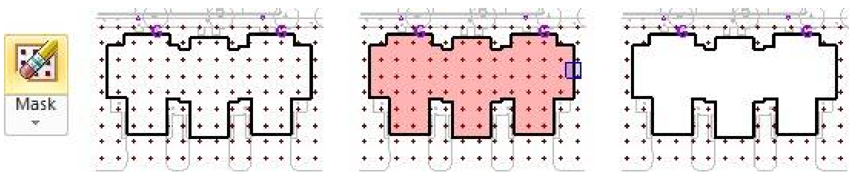
To **Mask** a **Rectangular** or ***Polygonal*** area, select the **Calculation Zone** to be **Masked** by clicking a point, the boundary, or in **Transparent Display Mode**, anywhere inside the boundary. Then select *coordinates* to include the points to be **Masked**, and right-click or press *Enter* to end the command.

At right, a ***Polygonal*** mask is applied to the corner of a parking lot. Note that the *masking* boundary does not always need to be artfully or carefully applied, it simply needs to encompass the points to be removed.



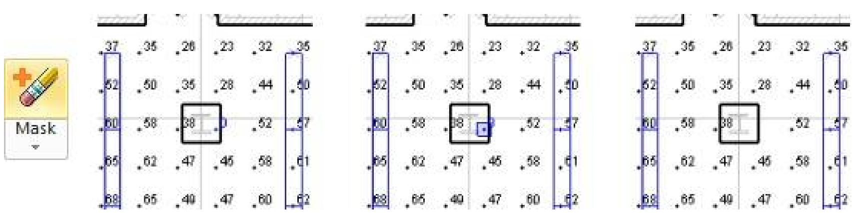
To **Mask** calculation points based on a surface, select the **Calculation Zone** to be **Masked** by clicking a point, the boundary, or in **Transparent Display Mode**, anywhere inside the boundary. The select the **Solid Object** to be used as the basis for the ***Masking***, and right-click or press *Enter* to end the command.

At right, an apartment building (included to block light) is used to remove points in a site lighting project.



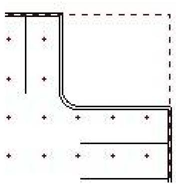
To **Mask** individual points, left-click the point(s) to be removed. Visual instantly removes the point, and allows for removal of additional points. Right-click the mouse or press *Enter* to end the command. Note that Visual will update **Statistics** after ending the command.

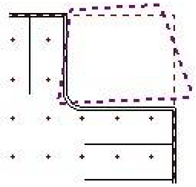
In the example at right, a calculation point is inside a column and should be removed.



Visual can be set to show the boundaries of masked areas. See Calculation Zone Properties for more information. Note that this border is a bit thicker than that of **Calculation Zones** themselves.

At right, the boundary from the ***Polygonal*** *masking* example above is shown with a dashed purple border.





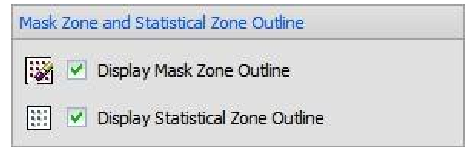
See Unmasking Calculation Zones for information on how to remove ***Masking***.

Remember that ***Masking*** calculation points should be done to produce the most accurate *model*. Removing points should only be done if those points are not truly valid.

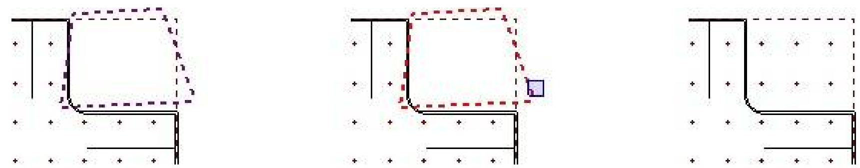
8.3.2 Unmasking Calculation Zones

It may be necessary to remove a **Mask** applied to a **Calculation Zone**.

To remove a **Mask**, the **Settings** must be set to show the **Mask Zone Outline**. See [Calculation Zones Settings](#).

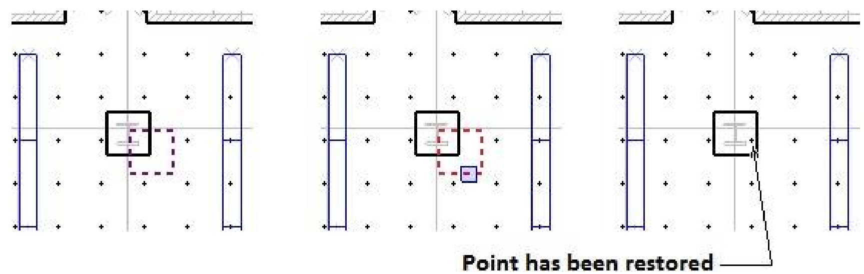


With the **Mask Zone Outline** visible, use the [Erase](#) command to remove the dashed outline as shown at right. The calculation points will be restored.



Calculation Zones masked with the **Mask Point** method, don't have **Mask Zone Outlines** to erase. It is necessary to draw a new **Mask Zone** that includes the points to be unmasked. The location of points can usually be assumed from adjacent points.

This process effectively says "Put the points back no matter how they were removed."



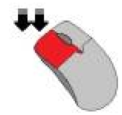
8.4 Statistical Zones

The **Statistics** *tab* of the **Sidebar** provides feedback related to created **Calculation Zones**, **Power Zones**, and **Combined Zones**.

Statistics are shown by default in the **Statistics** *tab* of the **Sidebar**. If closed, the **Statistics** *tab* can be shown by clicking Statistics in the **Windows** menu on the **Ribbonbar**.

The **Statistics** that will be displayed in the **Statistics** *panel* for each **Calculation Zone** can be modified in the Settings Dialog. The defaults are shown at right.

To expand or collapse the **Statistics** for each **Calculation Zone**, double-click on the bold title of the **Calculation Zone** in the **Statistics** *panel*.

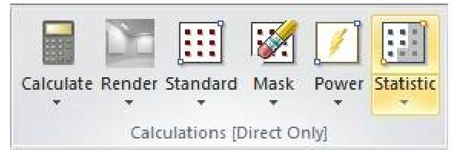


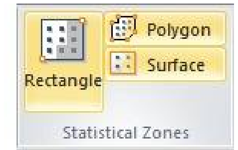
See Statistics for more information about the *tab*, use of the *tab*, and modification of items in the *tab*.

8.4.1 Creating a Statistical Zone

It is often useful to view statistics that are compiled from only a portion of a **Calculation Zone**. In Visual, this is called a **Statistical Zone**.

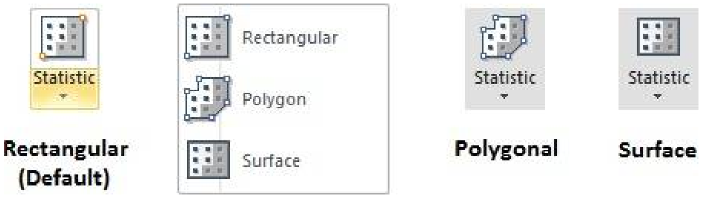
The **Statistical Zone** button can be found on the **Calculations** *tab* and the **Home** *tab* of the **Ribbonbar**.





The **Statistical Zone** button is dual function; the upper portion executes the command, the lower portion initiates a *drop-down menu*.

Once a selection has been made other than the default, the upper button portion will change to execute that command with the next press and the graphic is changed accordingly. Selecting one of the other commands from the *drop-down menu* will revert the button to that mode.

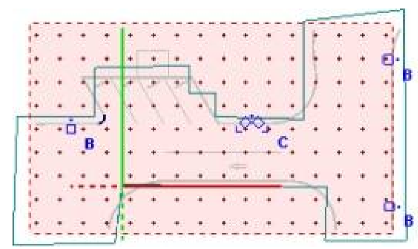


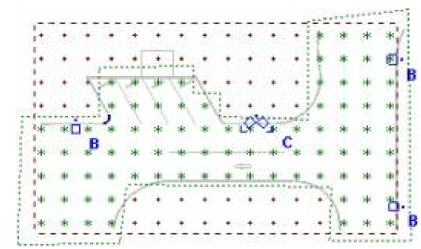
Rectangular (Default) **Polygonal** **Surface**

To create a **Statistical Zone**, select a **Calculation Zone**, then draw a rectangle, *polygon*, or select a surface (depending on the method chosen) where points should be included in the **Statistical Zone**. As it is being drawn, the *polygon* or rectangle is shown in green.

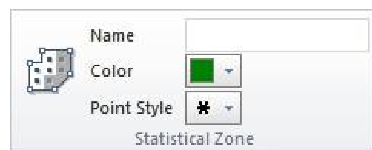
Clicking the second point of the rectangle or right-clicking the mouse in *polygon* mode ends the command and applies the choices made in the **Properties** *tab*.

After creation, the boundary is shown with a green dashed line. Display of the boundary is controlled in [Calculation Zones Settings](#).





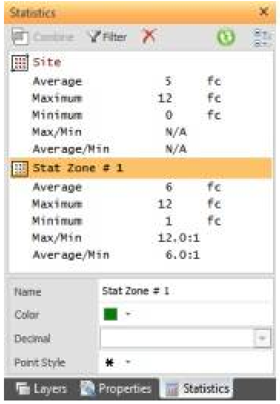
In the command , the **Properties** *tab* allows for naming, and control of the symbols used for the **Statistical Zone** much like that during creation of the base **Calculation Zone**.

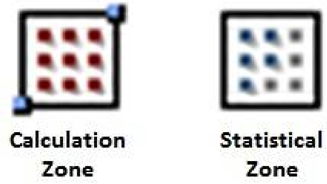


The statistics for the zone are displayed alphabetically in the **Statistics** *tab*.

The **Name**, **Color**, **Decimal** precision, and **Point Style** of the zone can be edited as necessary by left-clicking the zone name. The lower *panel* will be populated with zone parameters. See [Calculation Zone Parameters]() for a description of parameters and modification.

Note that **Statistical Zones** have a slightly different *symbol* in the **Sidebar**.



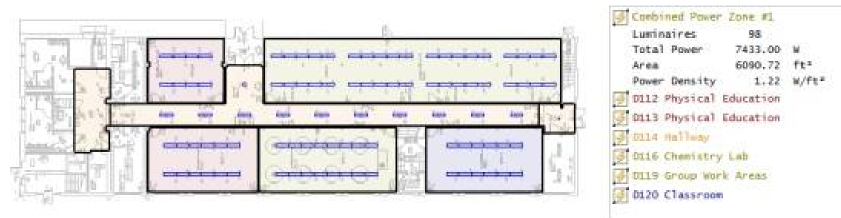


Statistical Zones can be [Erased](), and more importantly they can be [Stretched]() to then change which points are included in the zone.

8.4.2 Combining Zones

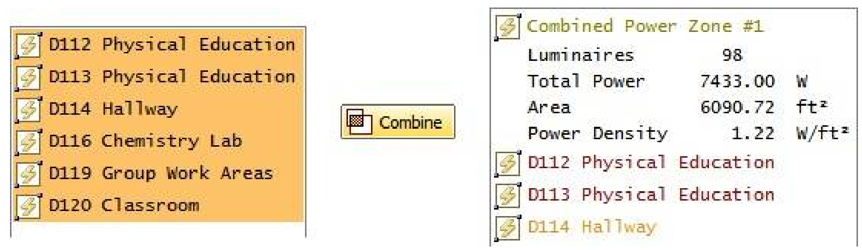
It can be useful to view statistics that are compiled as a combination of two or more **Power Zones** or **Calculation Zones**.

When designing lighting for a building, it is useful to report **Lighting Power Density** for each space type, as well as for the entire building; allowing for illustration of compliance via one or both methods depending on the specification.

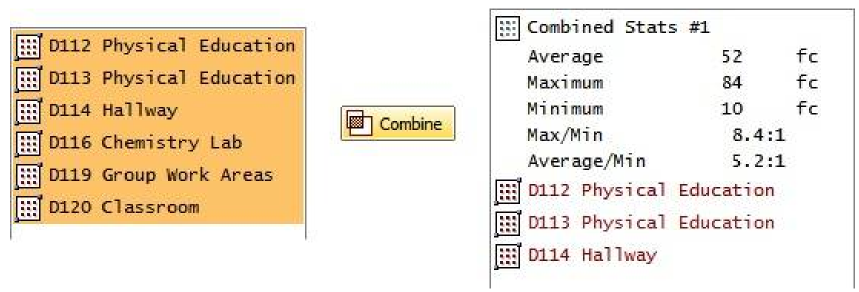


To create a **Combined Power Zone**, first select all the zones to be included in the combined zone within the **Statistics** *tab*; hold down the *Ctrl* key while left-clicking on the desired items.

When all of the desired zones are highlighted, click the **Combine** button at the top of the **Statistics** *tab*. Visual will create the **Combined Power Zone** and display it in the **Statistics** *tab*. The name can be modified as necessary.



The same procedure can be used to create **Combined Calculation Zones**.



8.4.3 Statistics Sidebar Tab

The **Statistics** *tab* is located in the **Sidebar**. The *tab* shows summary data for all **Calculation Zones** and **Power Density Zones** and will change as zones are added and removed.

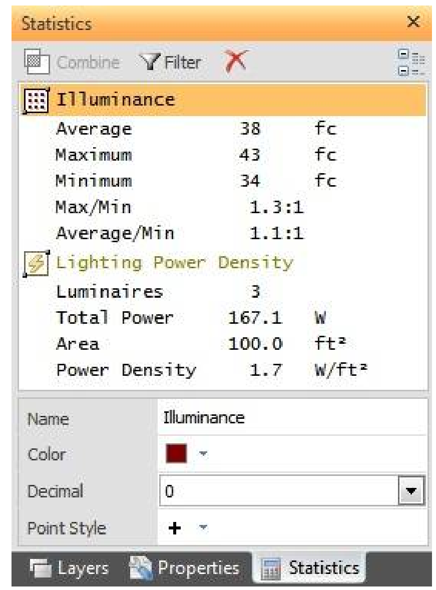
If it is not visible, the **Statistics** (**Sidebar** with **Statistics** *tab* focus) can be shown by clicking the command on the **Windows** sub-menu in the **Options** *panel* of the **Tools** *tab*. *Shift+S* next to the command indicates that this is the *hotkey* to initiate the command.

The **Statistics** *tab* displays both **Calculation Zones** and **Power Density Zones** sorted in alphabetical order by name.

Statistics are displayed for each zone as set in the **Settings** *dialog*. See [Settings Dialog] for more information.

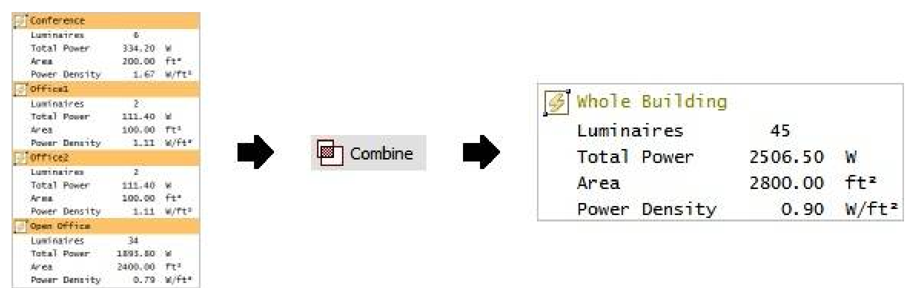
Calculation Zone and **Power Density Zone Properties** can be modified while the **Statistics** *tab* is active in lieu of specifically executing the **Properties** command. To modify **Properties**, click the name of a zone. Visual will populate the **Properties** *panel* at the bottom of the *tab* with the parameters for that zone.

Selected zone names are highlighted in yellow in the **Statistics** *tab* and additionally the associated zone in the **Design Environment** is highlighted in red.

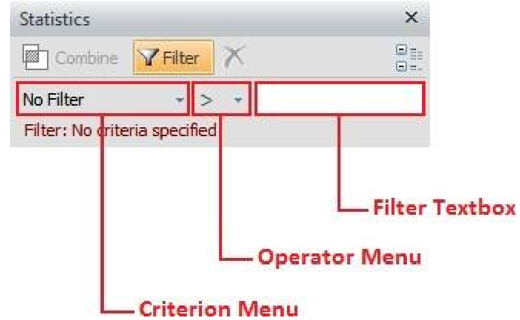


Statistics for multiple **Calculation Zones** and **Power Density Zones** can be selected and **Combined** to provide an overall summary. For instance, multiple **Power Density Zones** could be **Combined** to provide the **Lighting Power Density** for an entire building.

Select the desired zones by left-clicking the names in the **Sidebar**. Select multiple names by holding the *Ctrl* key or *Shift* key. Click the **Combine** button at the top of the **Statistics** *tab*. Visual will make a **Combined** set of **Statistics** and give it a generic name. **Properties** for the combined zone can be manipulated like any other zone; i.e. **Combined** zones can be renamed.



To **Filter Calculation Zones** and **Power Density Zones**, click the **Filter** button to show the **Filter** *panel* in the **Statistics** *tab*. The small down arrow indicates a menu is available, select from the **Criterion Menu**, from the **Operator Menu**, and then enter a value into the **Filter Textbox**. Visual will show only zones meeting that collective criteria.



Note that selecting a criterion applicable to **Calculation Zones** (e.g. "Minimum")automatically means **Power Density Zones** will not be shown and vice versa.

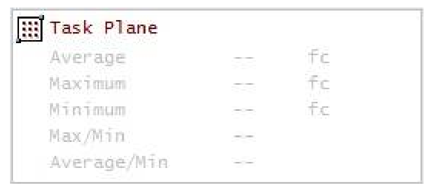
Criteria shown in gray are those not displayed based on system settings in the **Settings** *dialog*. See [Settings Dialog] for more information.

To reset the filter to show all zones, select **No Filter** from the drop down.

Calculation Zones and **Power Density Zones** can be **Deleted** from the **Statistics** *tab* by selecting the zones to be **Deleted** and clicking the **Delete** button on the *tab*.

Display of zones can be compacted by pressing the **Collapse** button in the upper right corner of the **Statistics** *tab*. Visual will show only zone names. After the button is pressed it changes to the **Expand** button and will be highlighted in yellow. Pressing the **Expand** button reverts to the original state where summary data is shown below the name.

If the **Calculation** status needs to be updated, Visual displays greyed text and blank numerical entries for the sub entries of **Calculation Zones**.



Modifications to *luminaires* (changing to a different type, erasing, changing **Wattage** in the ***Luminaire*** **Schedule**, etc) will cause Visual to automatically update **Power Density Zone Statistics**.

Right-clicking a **Calculation Zone** name initiates a pop-up menu providing **Delete**, **Export**, and **Properties** commands.

Exporting a **Calculation Zone** is done in CSV format and includes *illuminance* to five decimal places and the height of each calculation point.

Which statistical values are shown is controlled in the **Settings** *dialog*. See [Calculations Settings] for more information.

8.5.1 Lighting Metrics

A basic knowledge of lighting metrics is necessary to fully integrate Visual into the design process.

8.5.1.1 Illuminance

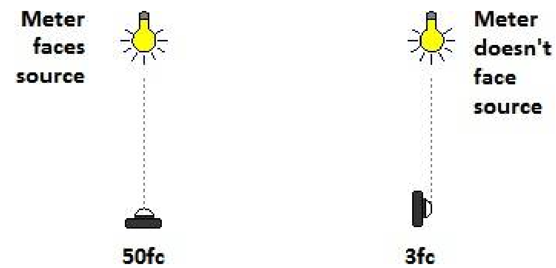
Illuminance is the most common metric used by the lighting industry for system performance verification.

Loosely defined, *illuminance* (E) is the amount of light falling onto an area. Thus, *illuminance* is a density. The *footcandle* is the English unit for *illuminance* and represents the number of lumens (light) incident on an area per square foot of that area. *Lux* is the metric equivalent of the *footcandle* and represents the number of lumens incident on an area per square meter of that area. The units used to display *illuminance* values in Visual may be changed in the Settings Dialog.

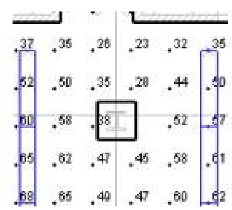
$$E = \frac{I(\theta,\psi)\cdot\cos(\xi)}{D^2}$$

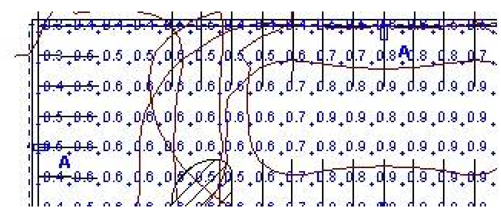
Illuminance is a directional quantity, meaning that one must speak not only of the *illuminance* at a location in the *model*, but of the *illuminance* in a particular direction at a location in the *model*.

One can think of each calculation point as a miniature *illuminance* meter. The value that each *illuminance* meter reports depends on the orientation of the meter. For example, a meter at a particular location will have a greater *illuminance* reading when facing a source than if it faces away from the source.



The most common lighting calculations measure horizontal *illuminance* on a floor or at desk level for interior applications, or on the ground for exterior applications. This is analogous to placing a light meter on one of these surfaces, facing the meter straight up, and taking a reading.



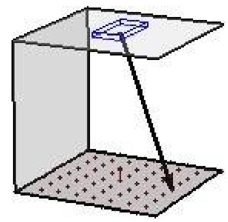


Other common calculations such as vertical *illuminance*, TV *illuminance* and maximum spill *illuminance* require alternate orientations of the light meters. Visual provides the means to specify calculation points to calculate all of these *illuminance* types. Indeed, any orientation of the calculation point normals (light meters) may be achieved. For more information on the placing and orientation of **Calculation Zones** see section Placing Calculation Zones.

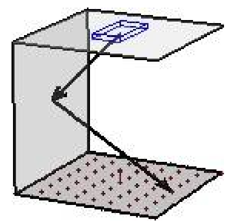
8.5.1.2 The Components of Illuminance

The *illuminance* value at any calculation point in a lighting model has two components. The user can control which types are calculated.

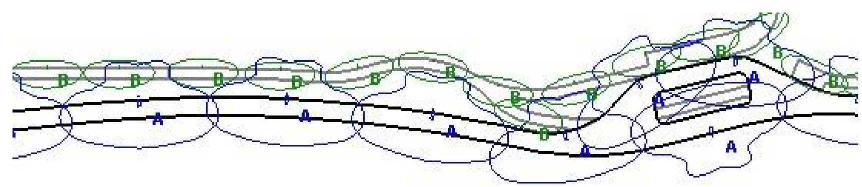
The first component is called the *direct component* and consists of *illuminance* produced at the calculation point by light that reaches the point directly from a ***Luminaire*** without being reflected off any of the **Solid Objects** in the model. The *direct component* of *illuminance* is a relatively straightforward and rapid calculation.



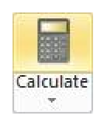
The second component is the *interreflected* component and consists of *illuminance* produced at the point by light that, once emitted from a ***Luminaire***, reflects off of one or more Solid Surfaces in the model before reaching the calculation point. Calculation of the *interreflected* component is more complex and time consuming.



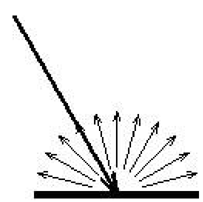
By default, Visual does not calculate the inter-reflected component of *illuminance* for exterior *models*. In exterior lighting *models* the *interreflected* component of *illuminance* is most often considered insignificant and therefore the additional calculation time that would be necessary to calculate this component is unjustified. By default, both components are calculated for interior lighting *models*.



However, the user may calculate this component by changing the **Calculation Mode** as discussed in Initiating a Calculation.



Calculations in Visual are performed with the assumption of perfectly *diffuse reflectance*.



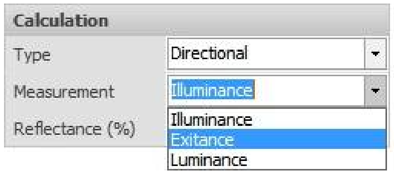
8.5.1.3 Exitance

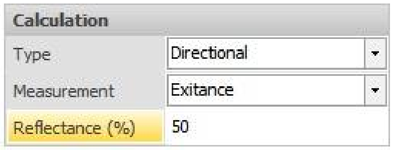
Exitance is the converse of *illuminance*. Rather than the density of light incident upon a surface, *exitance* is the density of light leaving a surface.

In practical terms, *exitance* (M) may be calculated by multiplying the *illuminance* on a surface by the *reflectance* of that surface. The units of *exitance* are lumens/square foot and lumens/square meter.

$$M = \rho \cdot E$$

Visual can report *exitance* by using [Properties]() to change the **Measurement Type** and assign a ***Reflectance*** to a **Calculation Zone** after it is created. Select the **Calculation Zone**, click the **Measurement** list in the **Calculation** *panel* in the **Properties** *tab* and select "*Exitance*", then specify a ***Reflectance***. Right-click or press *Enter* to apply the changes. Visual will immediately apply the ***Reflectance*** without recalculation.





Exitance can be displayed in the **Rendered Display Mode** By selecting from the **Display Menu** on the **Calculations** *tab*. (This is not the same as the **Display** button on the **Home** *tab*.)

8.5.1.4 Luminance

Luminance is another metric of light leaving a surface. Unlike *exitance*, *luminance* is a directional quantity. That is, the *luminance* of a surface is dependant upon the angle at which the surface is viewed.

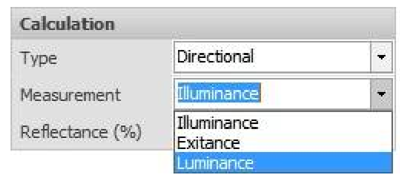
A perfectly *diffuse* surface is special in that it exhibits constant *luminance* over all angles. All surfaces in Visual are modeled as perfectly *diffuse*, so this in practice results in the *luminance* of a surface being directly proportional to the *exitance* of the surface and the *illuminance* on the surface. The units of *luminance* are lumens/square foot/steradian or lumens/square meter/steradian.

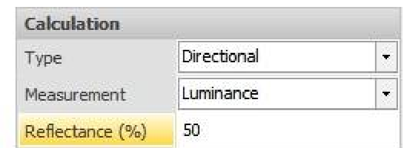
$$L = \frac{\rho \cdot E}{\pi}$$

Brightness is the perceptual analog of *luminance*. The mathematics and perception research are complex and beyond the scope of this manual. The simplest relationship is expressed by the Stevens Power Law shown at right. Effectively, a 2x increase in brightness requires 8x more *luminance*.

$$B = \alpha \cdot L^{0.33}$$

Visual can report *luminance* by using [Properties]() to change the **Measurement Type** and assign a ***Reflectance*** to a **Calculation Zone** after it is created. Select the **Calculation Zone**, click the **Measurement** list in the **Calculation** *panel* in the **Properties** *tab* and select "*Luminance*", then specify a ***Reflectance***. Right-click or press *Enter* to apply the changes. Visual will immediately apply the ***Reflectance*** without recalculation.





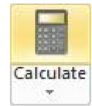
Luminance can be displayed in the **Rendered Display Mode** By selecting from the **Display Menu** on the **Calculations** *tab*. (This is not the same as the **Display** button on the **Home** *tab*.)

Brightness can similarly be displayed by making that choice form the sub-menu.

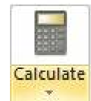
8.5.2.1 Initiating a Calculation

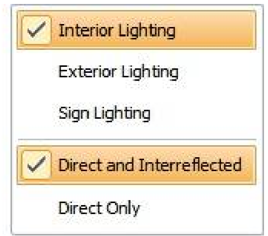
Once the necessary components of a lighting *model* have been created, Calculating only requires pressing a single button.

The **Calculate** button can be found on the **Home** *tab* and the **Calculations** *tab* of the **Ribbonbar**. The **Calculate** button becomes active after at least one *Luminaire* and **Calculation Zone** are placed. See Placing and Orienting Luminaires and Placing Calculation Zones.



The **Calculate** button is dual function; the upper portion executes the command, the lower portion initiates a *drop-down menu*. Once a selection has been made, that choice will remain until Visual is closed, or a new choice is made.



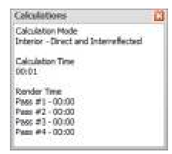


Choose the most appropriate **Calculation Type** from the upper 3 choices by left-clicking. **Interior Lighting** and **Exterior Lighting** set a large number of parameters used in surface analysis, initial flux evaluation, radiative transfer analysis, and processing renderings specific to either case. Under normal circumstances, no difference in calculations will be seen. **Sign Lighting** expands analysis to provide proper modeling of shadows caused by sign lettering. This mode is much slower than the others and should be chosen judiciously.

Choose **Direct and *Interreflected*** or **Direct Only** as desired. The choices are obvious. **Direct Only** still considers **Solid Objects** as light blockers.

The **Status Bar** indicates which mode has been chosen.

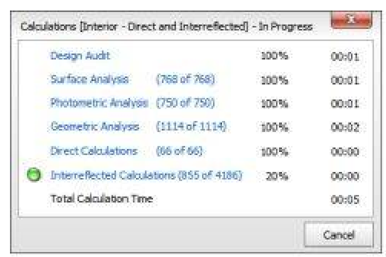
Left-clicking the **Status Bar** section initiates a *dialog* providing details about the last calculation.

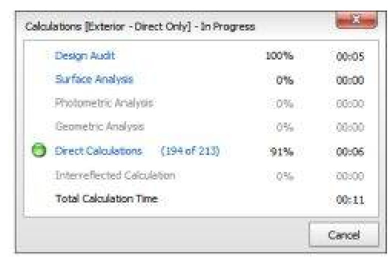


Once activated, calculation progress is shown in the **Calculations *Dialog***.

The *dialog* indicates which mode has been chosen and shows progress in the various steps of analysis. Pressing the **Cancel** button halts progress, closes the *dialog* and returns to the **Design Environment** as normal.

When calculating **Direct Only**, several sections (shown in gray at far right) are skipped.





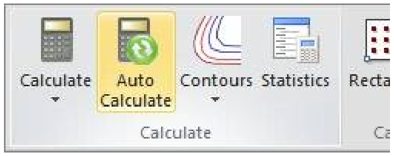
When changes have been made to the lighting *model* that require a re-calculation, Visual will indicate that **Calculation Zone** values may no longer be valid by bracketing point values.

8.5.2.2 Automatic Calculation Feature

When making minor adjustments and/or revisions to a lighting *model* it is often useful to see the updated values after each modification.

Visual has an **Automatic Calculate** feature that, when on, recalculates the *model* after any change that could effect the *illuminance* (or other metric) values.

To toggle the **Automatic Calculate** feature on or off select **Auto Calculate** from the **Calculations** tab of the **Ribbonbar**.



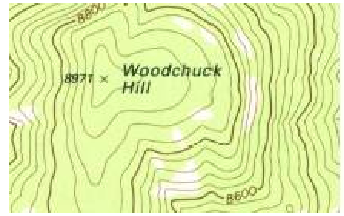
It is recommended that this feature be used at the end of *model* creation when fine-tuning is being done, not at the start of the project. There is no detriment to using the feature early-on, but it is very much inefficient since a majority of actions would require a recalculation.

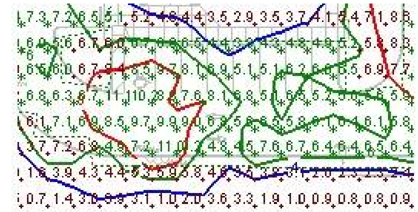
8.5.2.3 Setting and Displaying Contours

Contours are contour lines that are drawn on top of **Calculation Zones** showing constant values. These are most often associated to *illuminance*, but are based on the metric used to define the **Calculation Zone**. See Lighting Metrics for discussion of different metrics.

Just as contours on topographical maps show constant elevation, **Contours** in Visual most often show constant *illuminance*.

The magnitude of the *illuminance* (or other metric) is then analogous to elevation on the topographic map.





To show **Contours**, click the **Contours** button on the **Calculations** *tab* of the **Ribbonbar** to initiate the sub-menu.

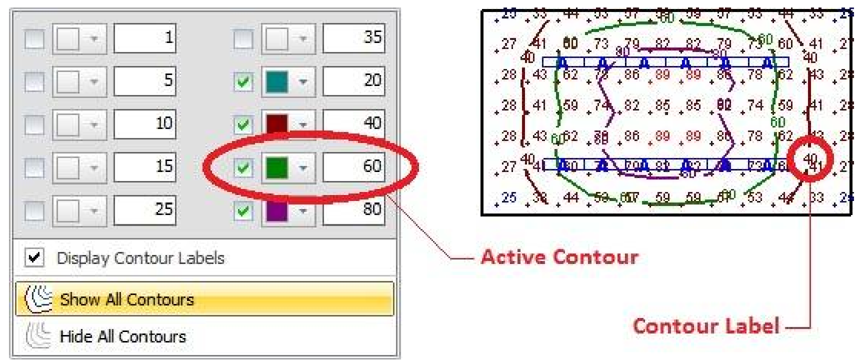
On the sub-menu, place a check in the desired number of contour line checkboxes to activate them.

The **Color** for each **Contour** Line can be specified by clicking the Color button.

Once activated, specify the iso-*illuminance* value in each textbox.

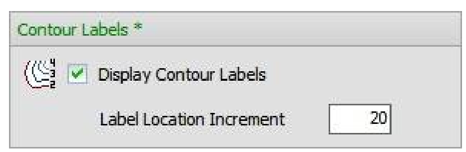
Select **Show All Contours** to turn the feature on.

Conversely, select **Hide All Contours** to turn the feature off.



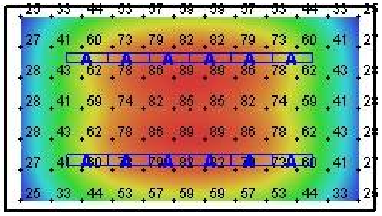
The display of **Contour Labels** can be toggled in the **Contours** sub-menu as shown above. This can also be toggled in the Settings *dialog*.

Contour *Label* increment is set on the **Contours** *tab* of the Settings *dialog* and uses the base *drawing* units. For example, "20" implies each *label* will be placed nominally 20 feet or meters apart.

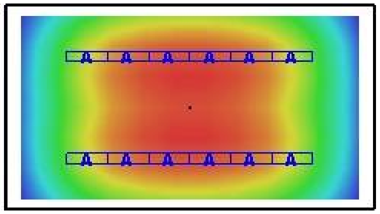


Contours can be displayed in a **Shaded** fashion (with pseudocolor) by editing Properties for a **Calculation Zone** and placing a check in the **Shaded** box in the **Properties** *tab*.

The method used to **Shade** is that chosen in the Calculation Zones Settings.



Note that the display of **Calculation Points** can be toggled in Properties as well. This is likely useful when displaying a **Calculation Zone** with **Shading** as discussed above but depends on user preference.



Contours are displayed to the boundary points not the bounding edge of a **Calculation Zone**. This is due to the fact that construction of the contour lines requires values for interpolation; values are not known past the last points on the edges, regardless of the bounding *polygon*.

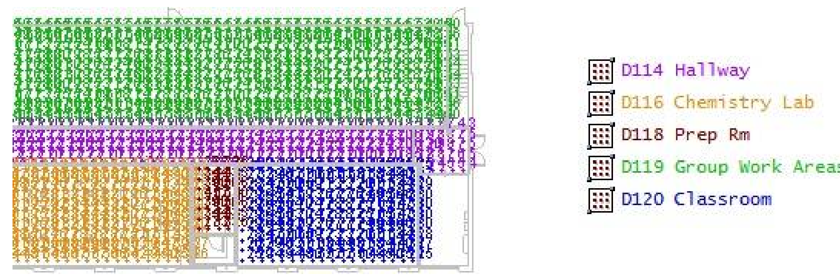
8.5.2.4 Color-Coding Illuminance Values

Visual provides several options for color-coding *illuminance* values.

Calculation Zones can be colored at creation by making choices in the **Properties** *tab*. See Calculation Zone Parameters.

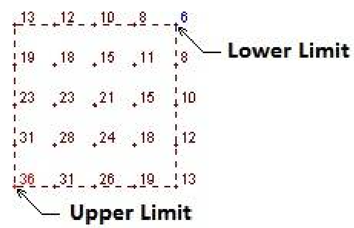
After creation, **Calculation Zone** color can be modified in the Properties *tab* of the **Sidebar**. See Calculation Zone Properties

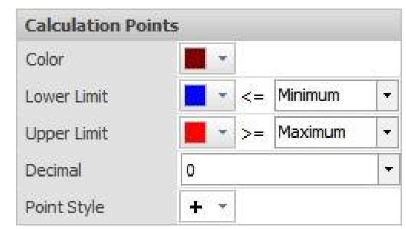
This can allow for easier identification in more complex projects.



Point values can be highlighted based on an **Upper Limit** and/or a **Lower Limit**. To modify highlights, edit the **Calculation Zone** Properties, and make **Color** and/or **Value** selections as desired.

The default is to highlight the **Maximum** and **Minimum** values. New defaults can be set in the Calculation Zones Settings

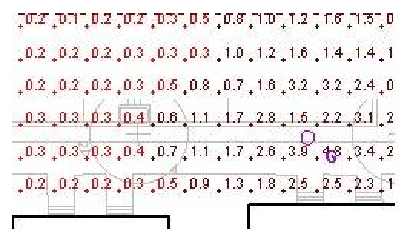


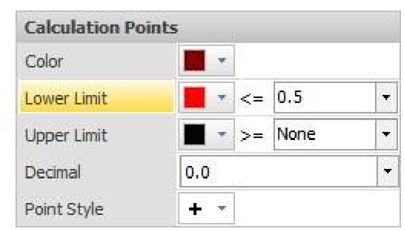


Using the **Lower Limit** to highlight all points below a **Minimum** value required in a specification provides quick feedback, particularly in site lighting projects.

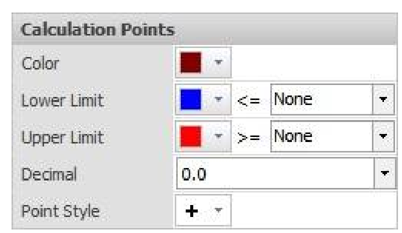
Values can be set by editing Properties and selecting a common value from the list or typing a custom value. At right, the specification calls for 0.5fc minimum at any point, and values below that are shown in red.

The same process could be used to find **Upper Limit** values above a criteria or related to unacceptable *max/min* ratios.





The **Lower Limit** and **Upper Limit** can be set to not highlight at all. Edit the **Calculation Zone** Properties, and select "None" in both the **Lower Limit** and **Upper Limit** listboxes.

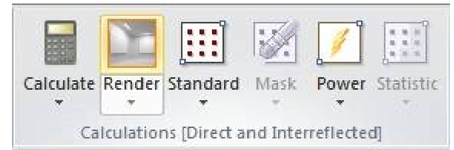


See Setting and Displaying Contours for information about **Contours** and color coding with shading methods.

8.6 Rendering

Rendering in Visual is a single-click task that is in most cases a quick task. The view can be manipulated without need for a new **Rendering** due to the fact that all surfaces are perfectly *diffuse*. **Renderings** can be equally generated for interior and exterior projects. Note that exterior **Renderings** require a **Solid Object** to be placed to mimic the ground, and it may be advantageous to change the background color of the **Design Environment** in the **Environment Settings**.

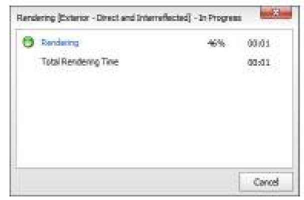
The **Rendering** button can be found on the **Calculations** *tab* and the **Home** *tab* of the **Ribbonbar**. To execute the command, left-click the top portion of the button.



After initiating the command, a Calculation will be performed if a valid solution is not present. Visual will then display the **Rendering In Progress** window to report the completeness of the calculations necessary to generate the **Rendering**.

This is the first of up to four "passes" made to refine the **Rendering**.

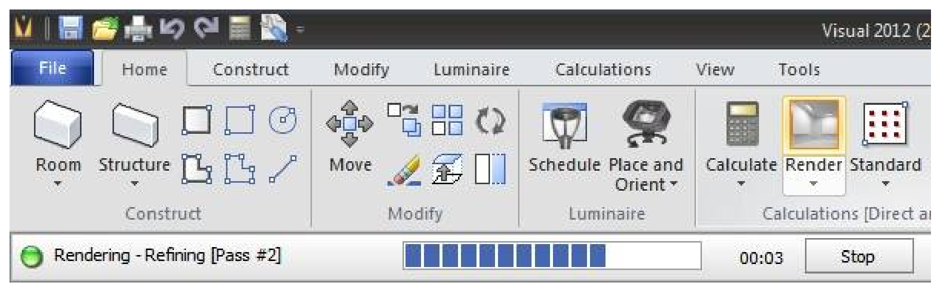
After the first pass is complete, Visual displays the current **Rendering** in Rendered Display Mode. The View can be changed without impacting the rest of the process where Visual will enhance the **Rendering** to provide greater detail.



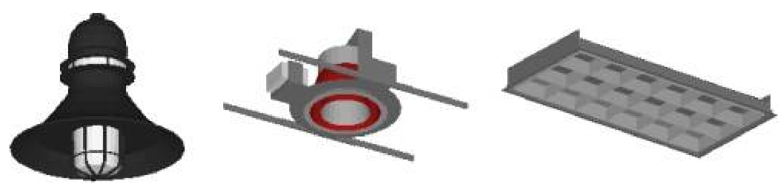
After the first pass, the **Rendering Status Bar** is displayed at the top of the **Design Window**. If the results are immediately unacceptable, the process can be cancelled by clicking the **Stop** button.

Visual will proceed through up to four passes to analyze the surfaces. In this process, Visual determines where high gradients exist and where more analysis is needed. After each pass is completed, Visual displays the newly refined **Rendering**.

When the process is complete, Visual will close the **Rendering Status Bar**.



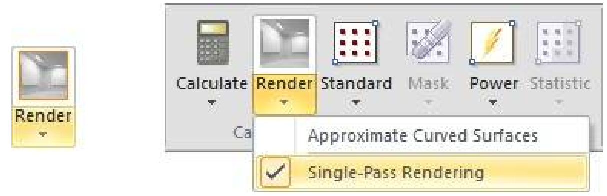
Luminaires are displayed in a **Rendering** as defined in the **Model** *tab* of the **Luminaire Editor**. If a **Luminaire Model** is not defined, the ***Luminaire Symbol*** will be used.



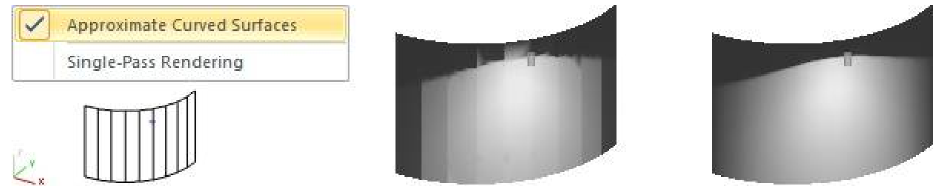
The **Render** button is dual function. The lower portion of the button initiates a sub-menu that allows for selection of options in the **Rendering** process.

Left-click an item to toggle the option on or off.

Single-Pass Rendering is just that; only one pass as described above will be completed to provide an ever quicker analysis to provide proof of concept prior to a full **Rendering**.

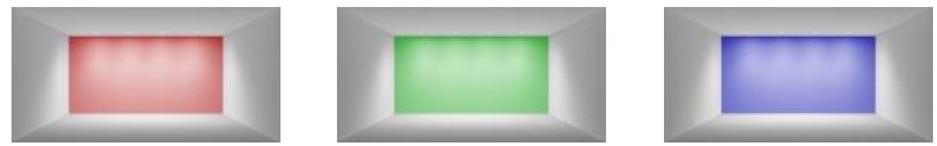


Approximate Curved Surfaces tells Visual to use additional analysis beyond the actual **Solid Objects** in the *model* to generate more visually correct data that drastically reduces "faceting" as illustrated at middle-right. The system default is to have this option active, as shown at far right.



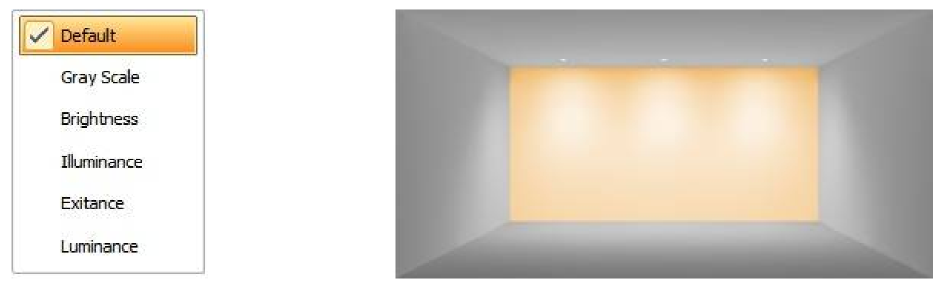
Renderings can be colorized by choosing appropriate **Colors** at **Solid Object** creation or by modifying **Solid Object Properties** after creation.

The modification of **Solid Object Color** does not require a new **Rendering** to be performed, assuming the new **Color** has the same ***Reflectance*** as the one used for the last calculation. To provide fast yet useful **Renderings**, Visual does not track the colored components of light and therefore does not provide a prediction of interaction between colored surfaces.



On the **Calculations** *tab* of the **Ribbonbar**, the **Display** button in the **Render** *panel* allows for varying metrics to be used in **Rendered Display Mode**. Clicking the button initiates a sub-menu with multiple choices. The default mode is to use **Solid Object Colors** as they are defined in the **Design Environment**.

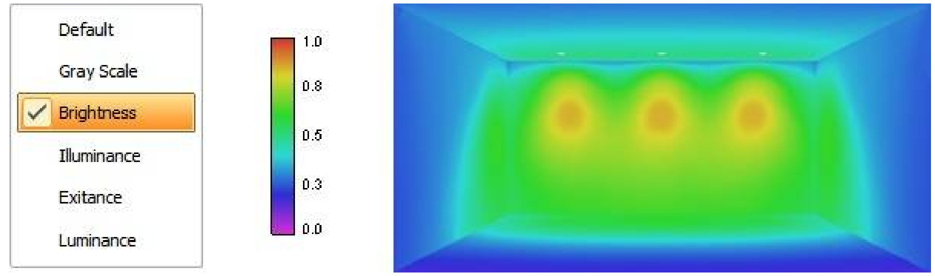
Pseudocolor is controlled on the Calculation Zones Settings in the **Pseudo-Color Shading** *panel*.



The **Gray Scale** mode converts all **Colors** to the gray equivalent.

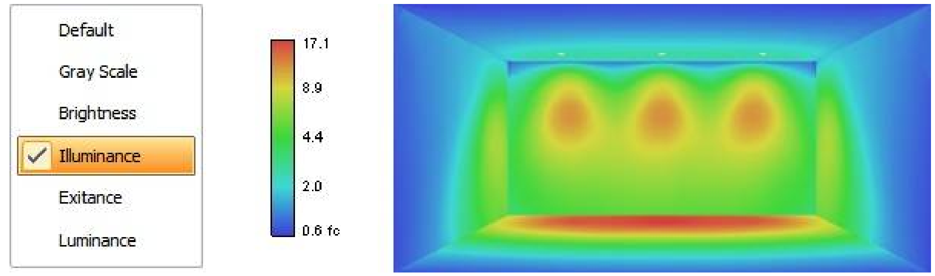
The **Brightness** mode displays the pseudocolor from 0.0 to 1.0.

A colored scale is provided in the lower left corner of the **Design Window**. Since brightness is a concept based on human perception, no units are involved.



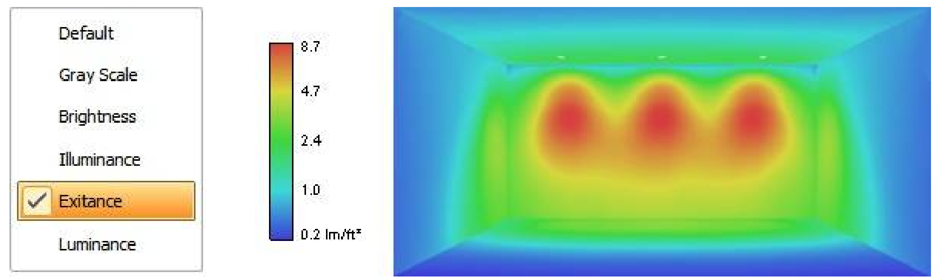
The ***Illuminance*** mode shows the **Rendering** with pseudocolor shading that maps *illuminance* onto all surfaces with actual calculated *illuminance* used for scaling.

A colored scale is provided in the lower left corner of the **Design Window**. ***Illuminance*** is shown with units of footcandles (fc)



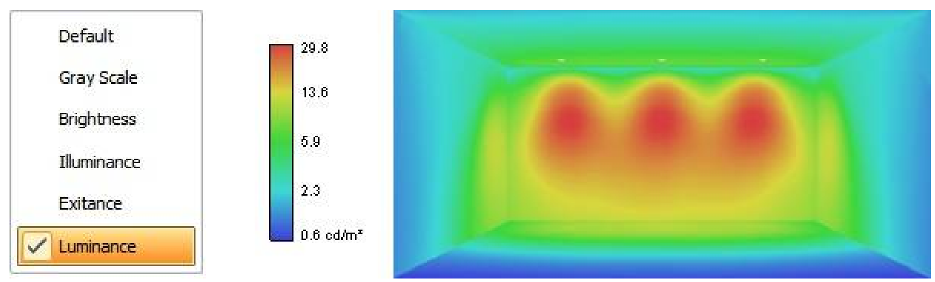
The ***Exitance*** mode shows the **Rendering** with pseudocolor shading that maps the *exitance* off all surfaces. Note that Exitance factors *illuminance* by the ***Reflectance*** of the base **Solid Object**.

A colored scale is provided in the lower left corner of the **Design Window**. ***Exitance*** is shown with units of lumens per square foot or lumens per square meter based on system unit settings.



The ***Luminance*** mode shows the **Rendering** with pseudocolor shading that maps the *luminance* of all surfaces. See Luminance for discussion of how that varies from brightness and *exitance*.

A colored scale is provided in the lower left corner of the **Design Window**. ***Luminance*** is shown with units of *candela* per square meter regardless of system units.



See Rendering in the appendices for advanced information on the **Rendering** process.

Chapter 9 - View

Visual provides a fully interactive 3-D interface for the construction and analysis of lighting *models*. This section will describe Visual's approach to 3-D viewing and introduce each of the associated tools and commands.

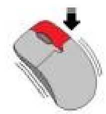
The **View** *tab* in the **Ribbonbar** contains a number of tools and commands used to easily and intuitively manipulate the Visual view.

All view commands are transparent, meaning that they can be initiated while in the midst of other commands if necessary.

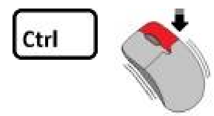
9.1 Mouse Navigation

The most intuitive form of navigation in Visual is to use the mouse to **Pan**, **Zoom**, and **3-D Orbit** in the **Design Window**.

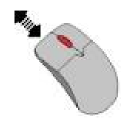
Panning in the **Design Window** refers to moving left-right and up-down in the *plane* of the computer screen while keeping the view angle constant. Hold the right mouse button and move the mouse to pan.



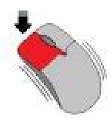
While a command is being executed, holding the *Ctrl* key and the right mouse button will **Pan** in the **Design Window** as the mouse is moved.



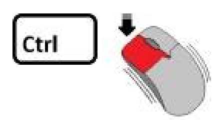
Visual will **Zoom In** on the current view without changing the view angle by rolling the mouse wheel forward. Conversely, rolling the mouse wheel rearward will **Zoom Out**. **Zooming** with the mouse wheel works whether or not a command is being executed.



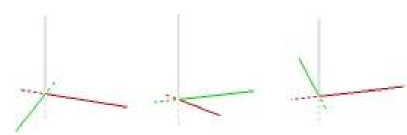
Holding the left mouse button will change the view angle in a **3-D Orbit** fashion. This means you are "grabbing" the **Design Window** just like you would a real object in front of you. For example, placing the mouse at the top of the screen, holding the left button, and moving the mouse downward causes more of the top of the *model* to be viewed.



While a command is being executed, holding the *Ctrl* key and the left mouse button will **3-D Orbit** in the **Design Window** as the mouse is moved.

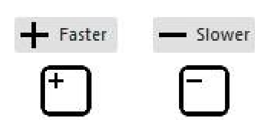


While in **3-D Orbit** mode, clicking on an object will orbit about that object. Clicking in open space will rotate about the center of the entire *model* space or the center of the screen depending on many variables. The *crosshairs* and **Global Axis** (if activated) will orbit in conjunction with the mouse movement to indicate the view direction.



The sensitivity of mouse movement in Visual can be controlled the "+" and "-" keys or the analogous commands in the **Navigation** *panel* of the **View** *tab* on the **Ribbonbar**. "+" increases mouse sensitivity so that a given mouse movement makes more movement on the screen.

Sensitivity can also be controlled in the **Navigation Speed** *panel* found on the **View** *tab* of the **Ribbonbar**.



9.2 Basic Viewing

As a 3-D *drawing* space, the Visual **Design Environment** can show various views to aid in the design and analysis of lighting *models*. In addition to the capabilities with the mouse to change the view, buttons are located in multiple locations for convenient access.

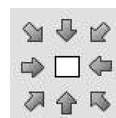
All **View** manipulation commands are located in the **Navigation** *panel* found on the **View** *tab*.

The **Home** *tab* contains the most common commands in the **View** *panel*.

Display commands and Views are discussed in separate sections.

Zoom All shows the entire *model* while holding the view angle constant.

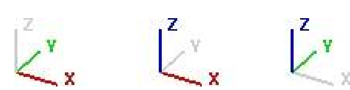
The nine fixed view buttons allow for simple navigation around the *model*. There are four elevation views, four isometric views (the corner buttons), and the center button returns to the default **Top View**. See Keyboard Commands for analogous keyboard hot keys.



The **Navigation** *panel* in other *tabs* provides a truncated set of commands on each of the main **Ribbon** bar *tabs* to allow for convenient access to the basic navigation buttons. This includes **Zoom All**, **Zoom Window**, and **Zoom Previous**, as well as the nine buttons for the standard views.

Zoom All, **Zoom Window**, **Zoom Previous**, **Zoom In**, **Zoom Out**, and **Zoom to Center** are also included in the **Status** bar in proximity to the command line where *coordinate* entry occurs and changing the view may be necessary at that time.

Visual can display a **Global Axis** in the lower left hand corner of the **Design Window** that provides constant feedback as to the view direction and active *plane*. See Environment Settings for information on controlling the display. See Mouse Pointer Navigation and Cartesian Coordinates for information on axes, color-coding, and



related information.

For more information see View Commands in Chapter 12.

9.3 Display Mode

Visual is capable of displaying the lighting *model* in several ways to allow for easier design, modification, and analysis of lighting *models*. **Solid Objects** are those mostly impacted by these commands, but the display of other objects can be changed as well; for example, ***Luminaires*** and **Background Lines** would be drawn in a perspective fashion when that mode is chosen.

The **View** *tab* contains all of the commands for modifying the **Display Mode**. The default mode is an **Orthographic** projection with **Wireframe** solids.

The **Rendered Display Mode** is that which is based upon the actual photometry of ***Luminaires*** and how the light reflects with **Solid** objects. Unlike other **Display Modes**, this mode requires a rendering to be performed prior to display. In the **Rendered Display Mode**, Visual will display ***Luminaires*** using the 3-D *model* defined in the ***Model*** *tab* of the ***Luminaire*** **Editor**. See Rendering for more information.

The **Shaded Display Mode** uses object **Color**/***Reflectance*** properties to opaquely shade **Solid** objects. Objects behind **Solids** will not be shown. Visual uses an ambient light source to differentiate between surfaces of the same color. In the **Shaded Display Mode**, Visual will display ***Luminaires*** using the 3-D *model* defined in the ***Model*** *tab* of the ***Luminaire*** **Editor**.

The **Transparent Display Mode** shows the **Solid** object edges thick as in **Wireframe Display Mode**, but also shades the surface in relation to the assigned *reflectance*/color while still being translucent. Objects (**Solids**, ***Luminaires***, and **Background**) behind **Solids** will be visible. ***Luminaires*** will continue to be shown as a wireframe consistent with the ***Symbol*** chosen in the ***Luminaire*** **Schedule**.

The **Wireframe Display Mode** is the default when Visual is opened. This mode displays **Solids** by only showing the bounding edges, just as if the solid *model* was composed only of wire. **Solid** object edges are shown as lines that are thicker (bolder) than **Background** objects, and will be the **Color** of the **Layer** on which they reside.

Without changing how **Solid Objects** are displayed as described above, Visual can display the **Design Environment** in one of two graphical projection modes:

Orthographic projection displays the *model* with parallel lines (and surfaces) remaining parallel.

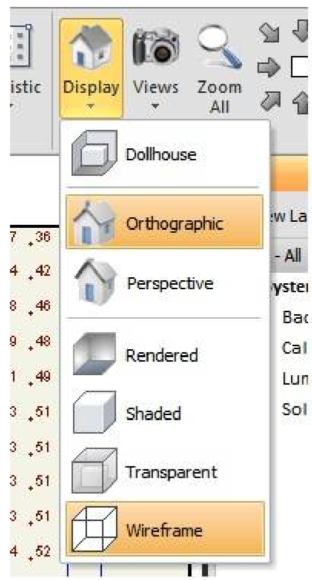
Perspective projection displays the *model* much as it would appear in reality. Parallel lines (and therefore surfaces) will appear to converge at two vanishing points.

Also independent of both surface shading and projection method, Visual can make internal objects visible by removing the "outer wrapper":

As the name implies, the **Dollhouse** mode "opens" the *model* much like a child's dollhouse. **Solid Objects** nearest to the view camera are removed to allow the objects farther from view to be seen.

The **View** *panel* of the **Home** *tab* on the **Ribbonbar** also includes a drop-down menu button that contains all the **Display Modes** described here.

This button is also present in the **View** *panel* of the **Properties** *tab* when executing commands.



9.4 Saving Views

Visual can save **Views** with respect to the angle of the "camera" as well as **Layer** visibility and other parameters, which is useful when comparing the performance (especially in the **[Rendered]** view) of different lighting systems.

The **Views** *drop-down menu* is available on both the **Home** *tab* and the **View** *tab*.

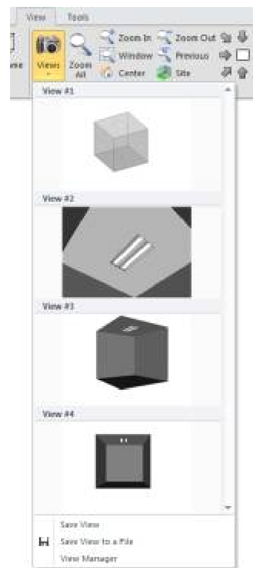
To save a **View** for later use, position the camera where desired using **[View]** commands: zoom, choose a standard isometric view, navigate with the mouse, select the **[Display Mode]**, etc.

Clicking the **Views** button pulls down the sub-menu for saving and managing **Views**.

Save the current **View** by clicking **Save View**. At a later time, the **View** can be reproduced in the **Design Environment** or in the **[Print Editor]**.

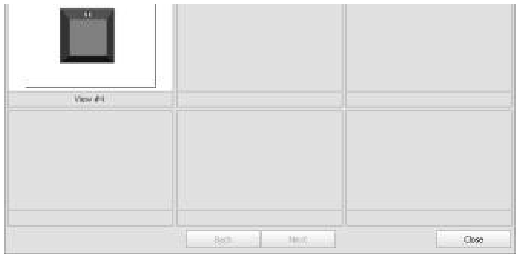
The current **View** can be saved to a JPG, PNG, or BMP format image file by clicking **Save View to a File.**

Retrieval of a saved **View** is done by simply clicking on the button showing the desired **View** in the *dialog* initiated by the **Views** button.



The **View Manager** allows the user to rename saved **Views**. To change the name of the **View** , click on the **View** name, Visual will highlight all of the existing name, and a new name can be entered.

The **View Manager** allows the user to delete saved **Views**. Deleting a **View** does not modify any other parameters in Visual; it only removes the user-defined preset **View**. To delete a saved **View**, move the mouse over the thumbnail of the saved image to be deleted, an X in a red square will appear in the upper right corner of the thumbnail, then click the X to delete.

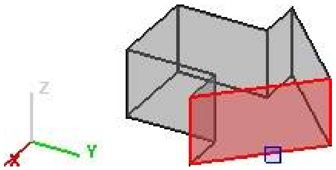


9.5 Align to Plane

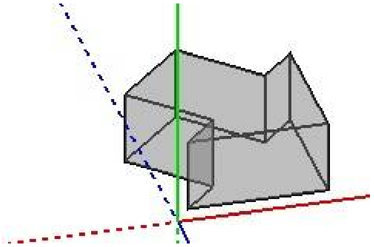
It is possible to have Visual change the **Active *Plane*** to align with a specified **Solid Object**.

Align to *Plane* is found in the **Status Bar**.

Select the **Solid Object** to which the ***Active Plane*** is to be aligned by left-clicking with the mouse. Different (not additional) **Solid Objects** can be chosen if necessary to make the desired selection.



Right-click the mouse or press *Enter* to end the command and Visual will change the **Active *Plane***. Note that the axes are aligned to the surface and have changed to be full screen.



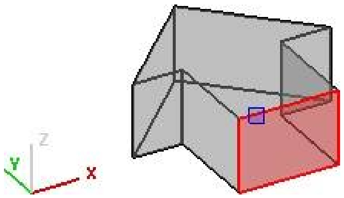
Pressing the *Home* key sets the ***Active Plane*** back to the X-Y *plane*.

9.6 Align to View

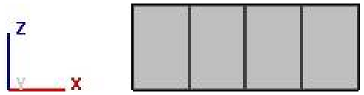
It is possible to have Visual change the **View** to align with a specified **Solid Object**.

Align to View is found in the **Status Bar**.

Select the **Solid Object** to which the **View** is to be aligned by left-clicking with the mouse. Different (not additional) **Solid Objects** can be chosen if necessary to make the desired selection.



Right-click the mouse or press *Enter* to end the command and Visual will change the **View**.



Chapter 10 - Tools

Visual includes various tools to provide design aids, system setting control, and other functions.

10.1 Customize Dialog

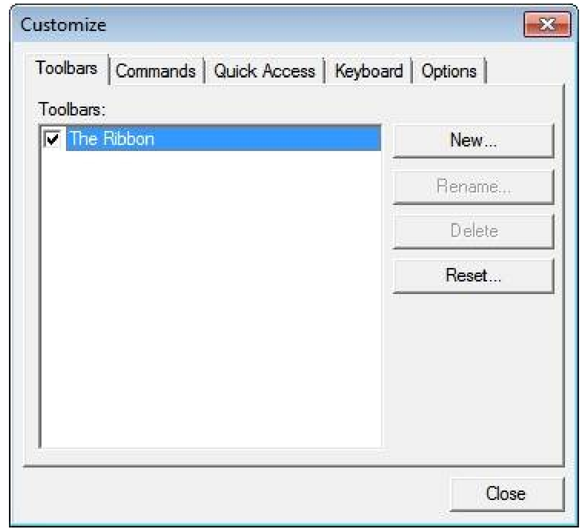
The **Customize** *dialog* allows advanced users to have control of some of the graphical user interface of Visual.

The **Toolbars** *tab* controls which commands are shown.

Clicking **New** will create a **Toolbar** below the **Ribbonbar**. A *dialog* box will be shown to name the new **Toolbar**.

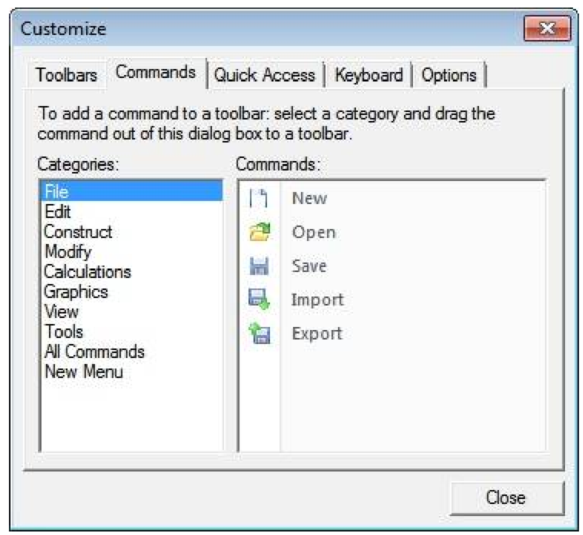
If additional **Toolbars** are present, they can be renamed and deleted using the appropriate buttons on this ***Tab***.

Command buttons can be placed on a user-defined **Toolbar** from the **Commands** *tab* or by left-click-dragging buttons from existing *tabs* of the **Ribbonbar**. Note that moving buttons from default **Ribbonbar** *tabs* will make it challenging for Visual Support to assist users.



The **Commands** *tab* allows individual commands from any *tab* to be placed on other *tabs* or on a **Custom Toolbar**.

Select a **Category** to find a command of interest. Left-click-drag a command from the listing on the right to a **Toolbar** or ***Tab***.



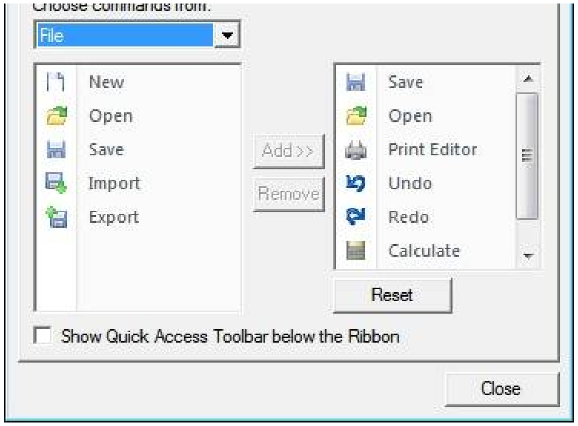
The **Quick Access** *tab* allows control of which commands are shown in the **Quick Access Toolbar**. Currently assigned commands are shown in the right pane.

Chose a menu **Category** from the drop-down and then left-click the desired

command in the left pane. Click the **Add** button to place the command on the **Quick Access Toolbar**. Conversely, click a command in the right pane and click **Remove** to delete a command from the **Quick Access Toolbar**.

Placing a check in the box will move the **Quick Access Toolbar** to a location below the **Ribbonbar**.

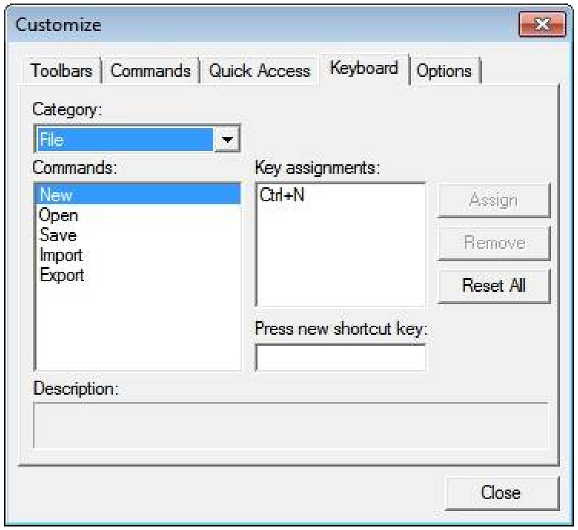
Clicking the **Reset** button will return the **Quick Access Toolbar** to the factory defaults.



The **Keyboard** *tab* controls *hotkey* assignment. Visual includes multiple hotkeys as outlined in [Keyboard Commands](). These can be expanded or changed.

Click a **Category** to find a command of interest. Click the command in the left pane. If a *hotkey* assignment has been made, it will be shown in the right pane.

To assign a new *hotkey*, left-click in the **Press new shortcut key** box and press the key combination to be assigned. Click the **Assign** button. If the selected *hotkey* is in use, Visual will alert to this situation. Choose to overwrite the current assignment or cancel the operation.



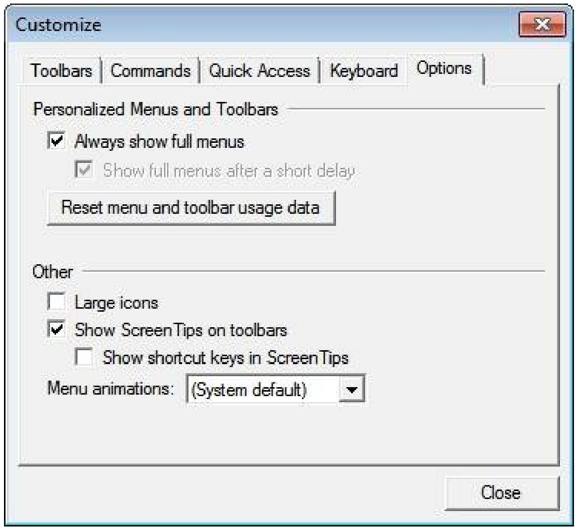
The **Options** *tab* controls menus and icons.

Clicking **Large Icons** displays larger icons in any user-defined **Toolbars**. This does not impact the **Ribbonbar**.

Screen Tips are shown when the mouse hovers over a button. Unchecking this box removes that feature. If **Screen Tips** are active, Visual can also show the *hotkey* combination (if assigned) in the **Screen Tip** in the format *Command* (*hotkey*); for example "Explode (Shift+E)". This is particularly useful for new users to learn hotkeys.

How menus appear can be modified by making a selection in the **Menu Animations** drop-down.

Note that *Personalized Menus and Toolbars* is not a valid selection for Visual. This section is displayed as part of the core tool used to write the computer code behind Visual and changes made in this *dialog* have no impact on program operation.



10.2 Design Tools

Design Tools can be found on the **Tools** *tab* of the **Ribbonbar**. These **Tools** are HTML-based and open in browser windows. Each tool has a tutorial and help information of its own.

Area - The tool is designed to allow users to quickly determine *pole* spacing from an *illuminance* criteria or *illuminance* levels from user specified spacing.

Interior - The tool is designed to perform *lumen method* calculations on a rectangular room. The *lumen method* determines average *illuminance* achieved on the *workplane* using a derived property of *luminaire photometrics* and room geometry called the coefficient of utilization.

Flood - The tool was developed to help specifiers select flood, sign, and wall lighting products. The tool only considers the direct illumination component's effect on the wall.

Roadway - The tool calculates the largest spacing between regularly spaced poles on a continuous straight and flat roadway using the calculation procedure defined in the IES RP-8-2000 *American National Standard Practice for Roadway Lighting*. This tool includes the changes to the calculation procedure in the 2007 errata.

Template - The tool allows for simultaneous comparison of two *luminaire* templates. This is a great way to quickly and visually contrast the performance of outdoor fixtures.

Wallwash - The tool was developed to help specifiers select flood, sign, and wall lighting products. The tool only considers the direct illumination component's effect on the wall.

Economic - The tool is designed to provide users with an interface to perform basic life cycle cost analysis. This tool is based on the IES RP-31-1996 *Recommended Practice for the Economic Analysis of Lighting*.

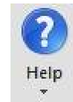
Report - The tool provides a method of viewing, comparing, and printing, standard *photometric* report information.

All **Design Tools** can alternately be accessed outside of Visual at http://www.visual-3d.com/tools/.

10.3 Help Tools

Help Tools provide varied information related to Visual.

The **Help** sub-menu is accessed from the **Options** *panel* on the **Tools** *tab* of the **Ribbonbar**.



Contents opens the **Help** *dialog*.

Support links to the Support web *page* with contact information.

Hot Keys opens the PDF of shortcut keys current available on the Visual website.

Knowledgebase links to the Support Search web *page* to allow for research of commonly asked questions and answers.

Training opens a link to the Acuity Brands Center for Light and Space schedule *page* where Visual training opportunities can be found among other opportunities in a browser window.

Videos links to a *page* containing all available videos on the Visual website in a browser window.

Website links to the home *page* of the Visual website in a browser window.

Activate License opens a *dialog* that allows for entry of an activation code after purchasing Visual.

Deactivate License opens a *dialog* that deactivates the license code on the current machine and returns it to the cloud to be used on another computer.

About Visual provides detailed information about: **Version Number**, **Serial Number**, **License Number**, and to whom the codes are registered and licensed.

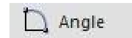
10.4 Measurement Tools

Tools are provided to measure basic properties of elements in Visual.

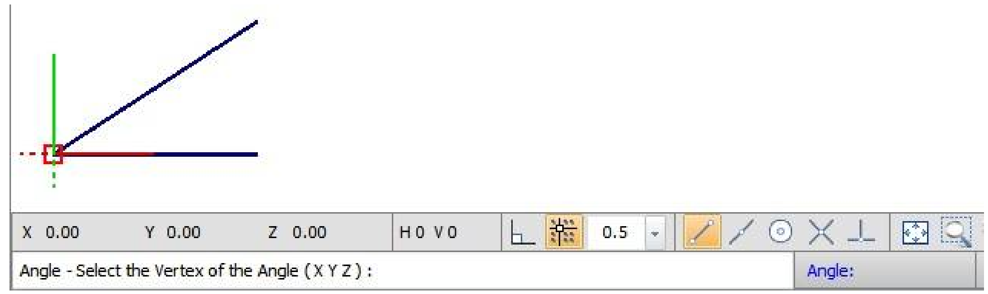
10.4.1 Angle Tool

The **Angle Tool** is found in the **Measurement** *panel* on the **Tools** *tab* of the **Ribbonbar**.

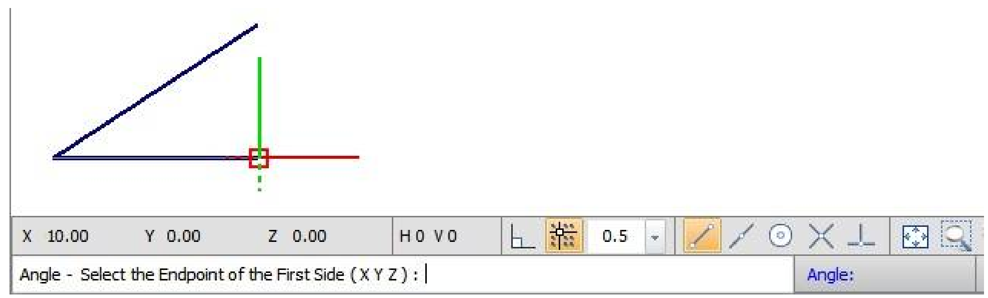
The **Angle** command measures the **Angle** between objects based on a ***Vertex*** and two **Endpoints**. On-screen cues in the **Status Bar** aid in command entry.



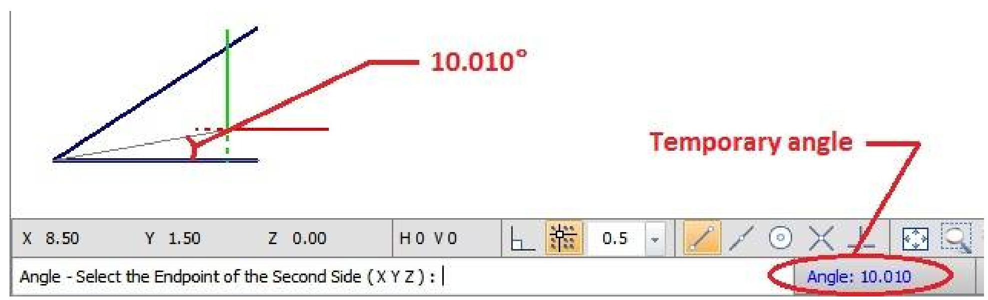
Select the ***Vertex*** of the **Angle** to be measured. it is not necessary to use **Object Snap** but it is convenient and accurate.



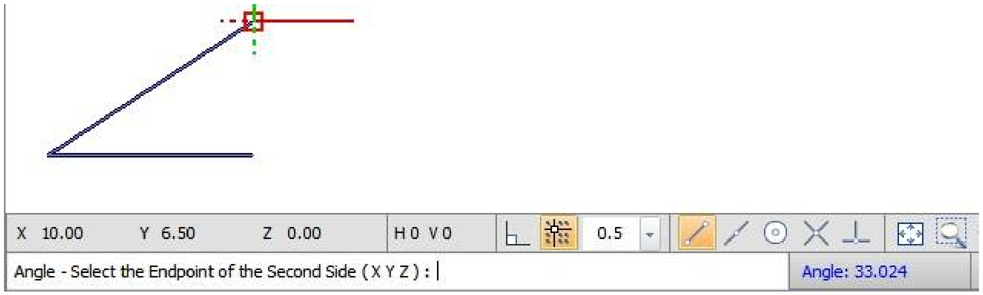
Select the **Endpoint** of the first edge of the **Angle**.



Visual displays the **Angle** from the first edge to the temporary second edge drawn from the selected ***Vertex*** to the cursor. Visual draws a thin black line illustrating this reference. This allows for multiple, quick, approximate measurements by moving the cursor to a location near desired points.

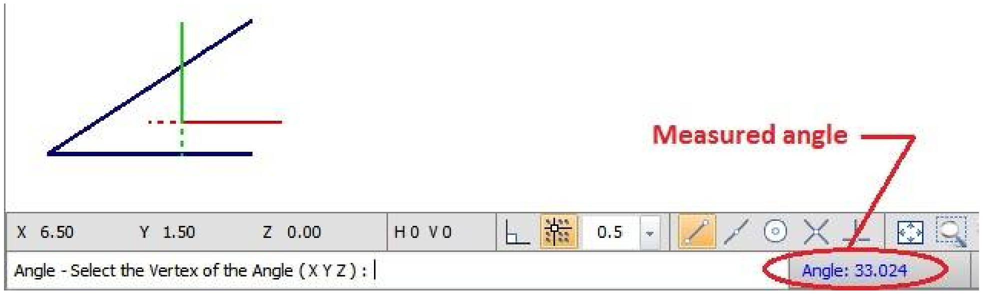


Select the **Endpoint** of the second edge of the **Angle**.



Visual will display the measured **Angle** in the **Status** bar. The **Angle** command is automatically restarted to measure additional **Angles** as can be seen from the command direction in the **Status Bar** that is the first step in this process.

To exit the command, right-click the mouse.



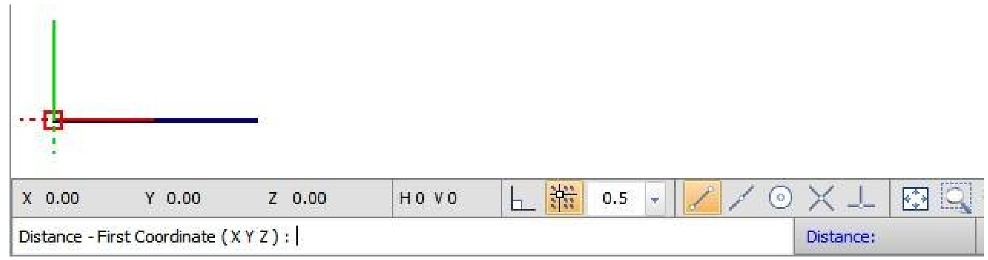
Lines do not need to be present for the command to provide a result. **Lines** are used here to more clearly illustrate the concept. The inputs may be based on real or imaginary lines, or **Solid Objects**.

10.4.2 Distance Tool

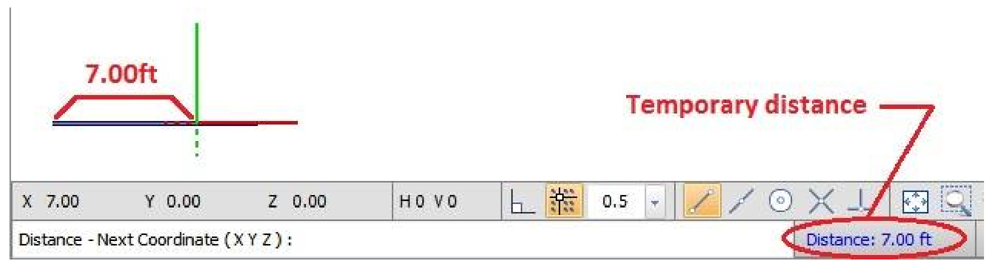
The **Distance Tool** is found in the **Measurement** *panel* on the **Tools** *tab* of the **Ribbonbar**.

The **Distance** command measures the **Distance** between two points as specified.

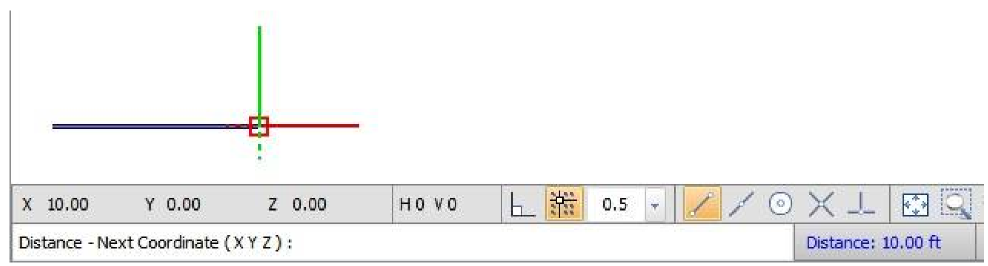
Select the first point.



Visual displays the **Distance** from the first point to the cursor. Visual draws a thin black line illustrating this reference; obscured at right. This allows for multiple, quick, approximate measurements by moving the cursor to a location near desired points.

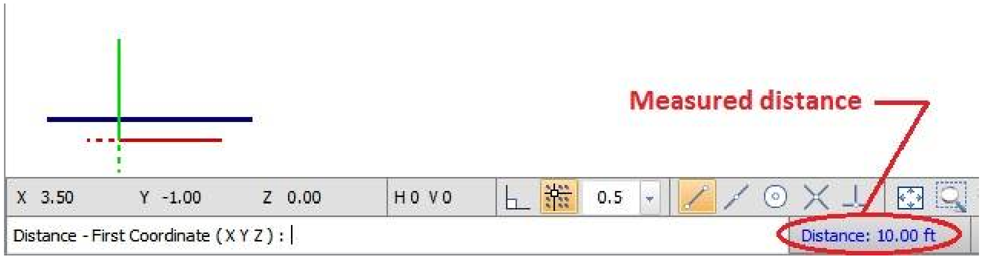


Select the second point.



Visual will display the **Distance** in the **Status** bar. The **Distance** command is automatically restarted to measure additional **Distances** as can be seen from the command direction in the **Status Bar** that is the first step in this process.

To exit the command, right-click the mouse



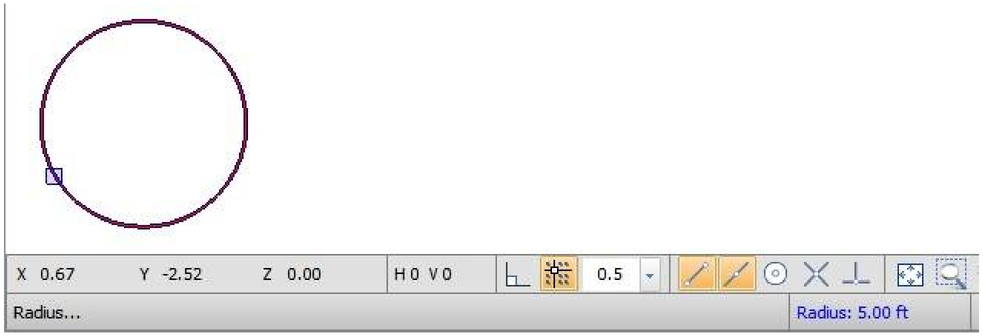
Lines do not need to be present for the command to provide a result. **Lines** are used here to more clearly illustrate the concept. The inputs may be based on real or imaginary lines, **Solid Objects** or ***Luminaires***.

10.4.3 Radius Tool

The ***Radius*** **Tool** is found in the **Measurement** *panel* on the **Tools** *tab* of the **Ribbonbar**.

The ***Radius*** command measures the ***Radius*** of **Background** objects. The command does not operate on **Solids**.

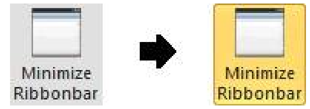
After clicking a **Background** object, Visual displays the ***Radius*** in the **Status Bar**.



10.5 Minimize Ribbonbar

The **Minimize Ribbonbar** command is found in the **Options** *panel* of the **Tools** *tab* on the **Ribbonbar**.

The **Minimize Ribbonbar** command changes the behavior of the **Ribbonbar** to allow for a larger working space in the **Design Window**. When the function is active, the button will be highlighted in yellow.



Minimizing the **Ribbonbar** means that only the *tabs* will be shown until a *tab* is clicked. When a *tab* is clicked, Visual will "pull down" the **Ribbonbar** to allow for further command execution.

Clicking the active button will turn off the feature and maximize the **Ribbonbar**.

10.6 Settings Dialog

The **Settings** *dialog* is accessed in the **Options** *panel* of the **Tools** *tab*.

Clicking the **Settings** button initiates the **Settings** *dialog*.

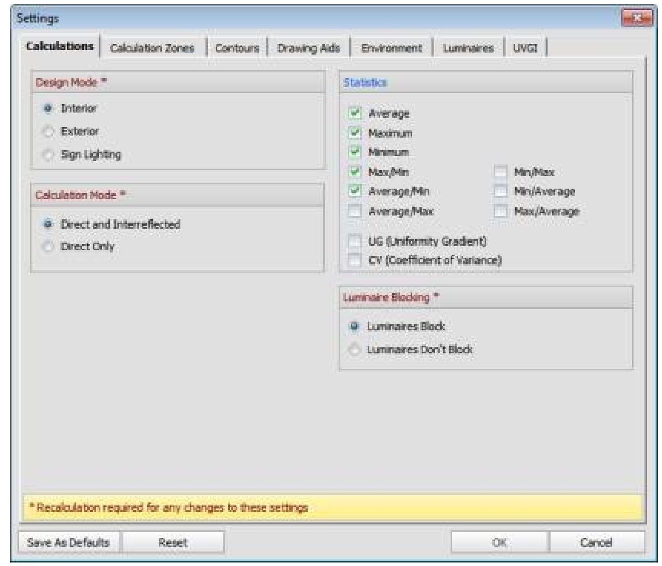
Seven *tabs* allow for advanced control of functionality and setting of defaults.

Make selections as desired and click **OK** to exit and save those choices. Click **Cancel** to exit without saving changes.

Click **Save As Defaults** to use the current choices every time Visual is opened. Choices can be made on multiple *tabs* and then **Save As Defaults** can be selected.

Click **Reset** to change all **Settings** back to the system defaults.

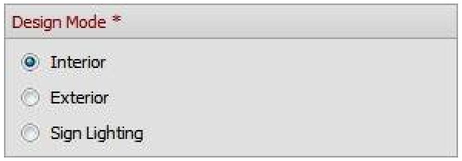
At the bottom of each *tab* in the *dialog*, Visual displays helpful tips about **Settings** and color-codes that to individual sections. At right, Visual indicates which **Settings** will require a recalculation to be put into affect.



10.6.1 Calculations Tab

The **Calculations** *tab* is found in the **Settings** *dialog* accessed in the **Options** *panel* of the **Tools** *tab* on the **Ribbonbar**.

The **Design Mode** *panel* controls calculation engine parameters. Exhaustive testing has been done to remove the need for an overwhelming number of "sliders". Select the mode that is most applicable to the project type.

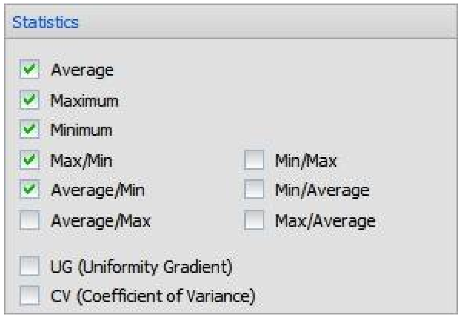


Interior Mode and **Exterior Mode** set a large number of parameters used in surface analysis, initial flux evaluation, radiative transfer analysis, and processing renderings specific to either case. Under normal circumstances, no difference in calculations will be seen.

Sign Lighting Mode expands analysis to provide proper modeling of shadows caused by sign lettering. This mode is much slower than the others and should be chosen judiciously.

The **Calculation Mode** *panel* controls whether or not Visual makes calculations of the *interreflected* component of radiative transfer. **Direct and *Interreflected*** calculates both components whereas **Direct Only** is the *direct component* only. **Direct Only** is assigned when a new **Exterior Project** is created from the **File** menu and is appropriate for area lighting, roadway, and sports projects.

The **Statistics** *panel* controls which statistical calculations are performed and displayed in the **Statistics** *tab* of the **Sidebar**. See The Sidebar and Statistics for more information.

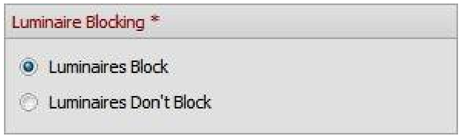


Selection of statistical quantities should be obvious except two used primarily in sports specifications:

Uniformity Gradient - This calculates the local change in lighting quantity (e.g. *illuminance*) between adjacent points in the grid. The reported value is the highest found in the calculation grid. In summary, the value quantifies how quickly lighting quantity changes and controls "bright and dark spots".

Coefficient of Variance - This is an advanced statistical calculation defined as the standard deviation divided by the mean (average) of all points. In brief, as applied to sports lighting, this is the average difference from the average, and thus measures the concept that one low *illuminance* should not overly impact the overall acceptability of a design, depending on how low that minimum may be.

The ***Luminaire*** **Blocking** *panel* controls if Visual considers ***Luminaires*** to be light blockers or not. The implication of the two choices is as indicated in their titles. This option does not make the ***Luminaires*** *reflect* light in the radiative transfer system.



Console Mode tells Visual to open a Windows command-prompt window and

display the calculation process and minimal feedback information in a step-by-step process. This setting is for advanced users only.

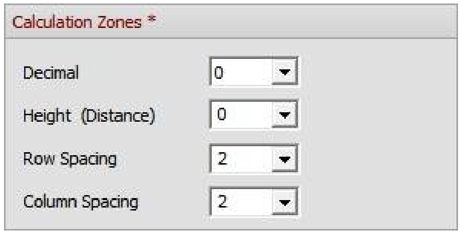
Settings made in subgroups indicated with a "*" and shown in dark red will not take effect until a recalculation is performed.

Choices made apply to the current session. Click **Save As Defaults** to apply settings to other sessions. See The Calculation Engine for detailed information on how calculations are performed.

10.6.2 Calculation Zones Tab

The **Calculations Zones** *tab* is found in the **Settings** *dialog* accessed in the **Options** *panel* of the **Tools** *tab* on the **Ribbonbar**.

The **Calculation Zones** *panel* controls dimensional parameters used in Visual.



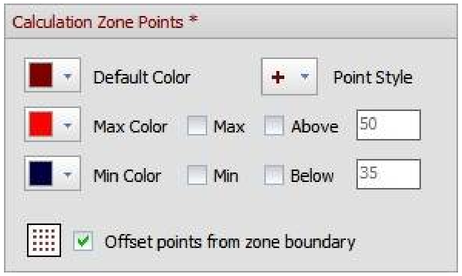
Decimal is the number of decimals displayed after the integer value. None, one, or two decimal values can be displayed. Only the options shown in the drop-down are valid.

Height (Distance) is the height offset from the selected *coordinates* that the *plane* will be placed. This may be above or below a **Surface** if **Calculation Zones Surface** is used to place the **Calculation Zone**, depending on the direction of the **Surface Normal**. A selection can be made from the choices in the pull-down or a value can be typed.

Row Spacing is the distance (in feet or meters) between points on the X-axis. A selection can be made form the choices in the pull-down or a value can be typed.

Column Spacing is the distance in (feet or meters) between points on the Y-Axis. A selection can be made from the choices in the pull-down or a value can be typed.

The **Calculation Zone Points** *panel* controls the formatting of points and values.



Default Color is the **Color** that will be assigned to newly created **Calculation Zones**.

Point Style allows for the selection of a default style for the calculation point marker.

Max Color is that which is assigned to the maximum value in a zone. Unchecking the **Max** checkbox turns off highlighting. Selecting the **Above** checkbox means that values above the value in the textbox will be highlighted in the **Max Color** selection.

Min Color is that which is assigned to the minimum value in a zone. Unchecking the **Min** checkbox turns off highlighting. Selecting the **Below** checkbox means that values below the value in the textbox will be highlighted in the **Min Color** selection.

Offset points from zone boundary means Visual will offset points a certain amount depending on point spacing and **Calculation Zone** dimensions. This yields a grid of points centered in the selected area. Unchecking the box causes Visual to start placing points in the lower left corner of the selected area based on point spacing as specified in the **Calculation Zones** *panel*.

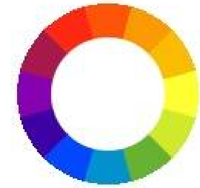
See Using the Color Dialog for more information on **Color** selection.

The **Pseudo-Color Shading** *panel* controls what is displayed in certain modes selected in the **Display** drop-down from the **[Rendering](#)** *panel* of the **Calculations** *tab* in the **Ribbonbar**.

Relative will assign the **Max Color** and **Min Color** to the highest and lowest values in each **Calculation Zone**.

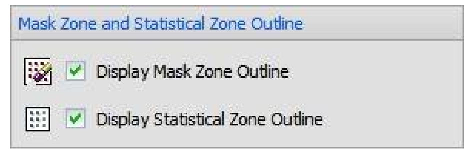
Global will assign the **Max Color** and **Min Color** to the highest and lowest values in all **Calculation Zones** in the *model*.

Selecting the upper **Color Preview Bar** assigns colors between **Max Color** and **Min Color** progressing clockwise around a color wheel. Selecting the lower **Color Preview Bar** progresses counterclockwise.



Selecting **Display Mask Zone Outline** will show a dashed line in the **Design Environment** that indicates where user-selected ***Masking*** has been done. This does not impact what is printed in the **Print Editor**.

Selecting **Display Statistical Zone Outline** will show a dashed line in the **Design Environment** that indicates the boundaries of **Statistical Zones** if present. This does not impact what is printed in the **Print Editor**.

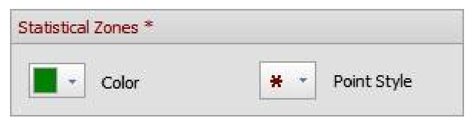


The **Power Density Zones** *panel* controls both the default color and displayed decimal accuracy of **Power Density Zones**. Valid decimal values are only those provided in the drop-down.

The **Statistical Zones** *panel* controls how Visual displays **Statistical Zones** in the **Design Environment**.

Default Color is assigned to both the **Calculation Points** and the associated text value and overrides the base selection of the **Calculation Zones.**

Point Style overrides the selection made in the base **Calculation Zones**.



Settings made in subgroups indicated with a "*" and shown in dark red will not change existing objects.

* Changes are NOT retroactive and will NOT change existing objects

Choices made apply to the current session. Click **Save As Defaults** to apply settings to other sessions.

10.6.3 Contours Tab

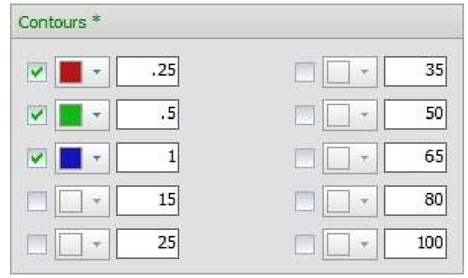
The **Settings Contours** *tab* is found in the **[Settings](#)** *dialog* accessed in the **Options** *panel* of the **Tools** *tab* on the **Ribbonbar**.

The **Contours** *panel* controls which **Contour Lines** are displayed and what **Color** is used for each line.

To activate a **Contour Line**, check the box next to the desired value. Once activated, a **Color** can be assigned. Values can be entered in any order. Any numerical value can be entered in the text boxes.

See Using the Color Dialog for more information on **Color** selection.

Making selections here does not turn on **Contours** . See Setting and Displaying Iso-Illuminance Contours for more information.



The **Contour Labels** *panel* controls the display of **Labels** on **Contour Lines**. Placing a check in the **Display Contour Labels** checkbox turns on labelling. The ***Label*** **Location Increment** is the (nominal) number of feet or meters between **Labels** on each **Contour Line**.

Settings made in subgroups indicated with a "*" and shown in green will have an effect on existing **Contour Lines**.

The settings on this *tab* can also be controlled in the **Design Environment** with the **Contours** drop-down in the **Calculate** *panel* found in the **[Calculations](#)** *tab* of the **Ribbonbar**.

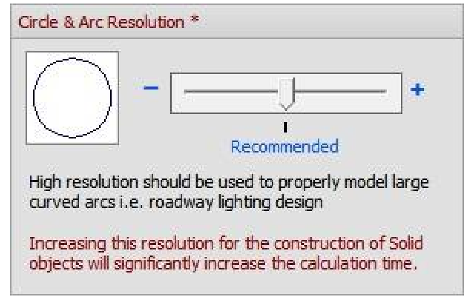
10.6.4 Drawing Aids

The **Settings** ***Drawing*** **Aids** *tab* is found in the **Settings** *dialog* accessed in the **Options** *panel* of the **Tools** *tab* on the **Ribbonbar**.

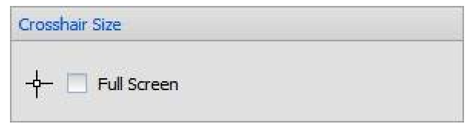
Circles and **Arcs** are drawn in Visual as multi-segment polygons and polylines. The resolution of **Circles** and **Arcs** can be changed to use a greater or lesser quantity of segments depending on the purpose and size of the **Circle** or **Arc**.

As is noted in the settings *panel*, large **Circles** and **Arcs** happen with large projects, and therefore increasing resolution would be appropriate.

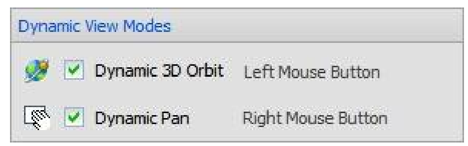
This setting applies to **Background** and **Solid** objects. As is noted in the *panel*, increasing resolution could greatly increase calculation time, but may in fact not increase accuracy in nay meaningful way. Again, this is dependent on the particular situation.



The **Crosshair Size** (the mouse cursor) can be changed from the default 150 pixel size (at full screen) to extend to the edges of the **Design Window** by placing a check in the checkbox.



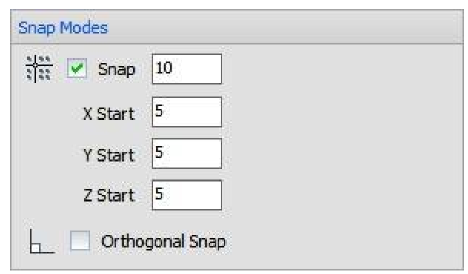
The **Dynamic Modes** *panel* allows control of whether or not the left and right mouse buttons activate the **3D Orbit** and **Pan** functions. If these checkboxes are unchecked, it is necessary to hold the *Ctrl* key to activate these modes. See Mouse Navigation for more information.



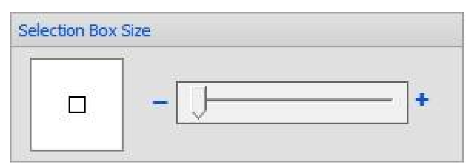
The **Snap Modes** *panel* allows control of default **Snap** settings. Similar control is available in the The Status Bar.

X, Y, and Z Start specifies an alternate **Origin** for the **Snap Increment** while leaving the *Cartesian* origin as (0,0,0). For example, entering the values at right would make the **Cursor Snap** at 5,15,25, etc.; **Snap** starts at 5 and moves in increments of 10.

Orthogonal Snap forces the cursor to move perpendicular (orthogonal) to the *Cartesian* axes. This on/off option is also provided in the **Status Bar**. See Incremental Snap for related information.



The size of the **Selection Box** used to select **Objects** can be changed from 11 pixels to 41 pixels to accommodate personal preference or need for detail. The two extremes are shown at right in actual size. See Selecting Objects for related information.



Smallest **Largest**

Settings made in subgroups indicated with a "*" and shown in dark red will not change existing objects.

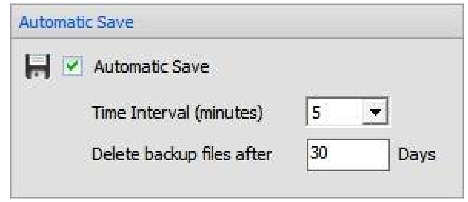
* Changes are NOT retroactive and will NOT change existing objects

10.6.5 Environment

The **Settings Environment** *tab* is found in the **[Settings](#)** *dialog* accessed in the **Options** *panel* of the **Tools** *tab* on the **Ribbonbar**.

Visual is set to **Automatic Save** a backup every 5 minutes and will retain those backup files for 30 days. Settings can be user-modified if necessary. See Automatic Recovery and File Backup for related information.

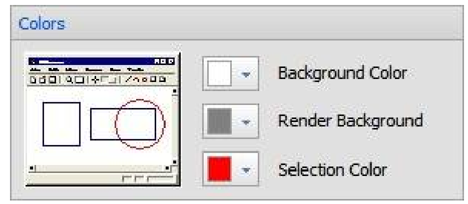
Backup files are located in the directory *[drive]*:\Users*[username]*\AppData\Local\Visual 2012\Support



Background Color sets the color of the **Design Window** in most **Display Modes**.

Render Background is the color used for the **Design Window** when **Rendered Display Mode** is active. See Display Modes for related information.

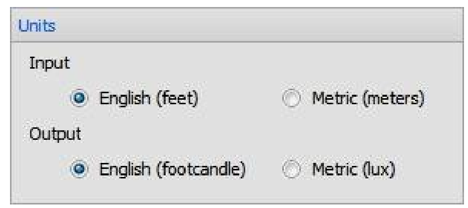
Selection Color is the color used to indicate an object is part of the **Selection Set**. See Selecting Objects for related information.



The **Units** *panel* allows choices for feet or meters and footcandles or *lux*. Changes in distance **Units** will not convert objects already drawn; i.e. a line of length "3" will change from 3 feet to 3 meters and therefore be 3.28 times longer.

Note that ***Luminance*** is calculated in cd/m^2 regardless of **Units** chosen.

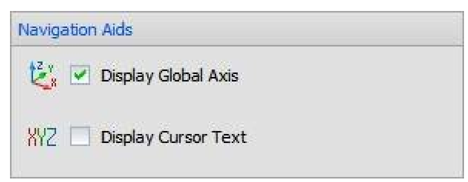
It is strongly recommended that unit choices be made prior to starting a project. Conversion after objects have been created may yield non-obvious results.



Hardware Acceleration can be turned off to remedy issues with certain graphics cards. There is no need to change this setting without the involvement of Visual Support.

A **Global Axis** *icon* can be shown in the lower left of the **Design Window**. See Cartesian Coordinates.

Absolute and **Relative** ***Coordinates*** can be shown near the mouse *crosshairs*. See Mouse Pointer Navigation.



10.6.6 Luminaires

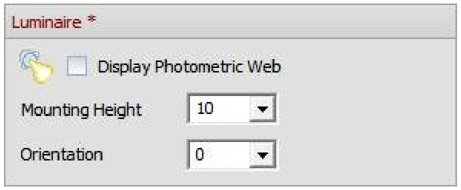
The **Settings** ***Luminaires*** *tab* is found in the **Settings** *dialog* accessed in the **Options** *panel* of the **Tools** *tab* on the **Ribbonbar**.

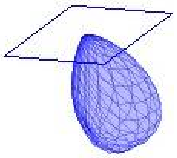
The ***Luminaire*** *panel* sets defaults for ***Luminaire*** placement in the **Design Environment**.

Display ***Photometric*** **Web** will show a scaled 3D mesh of the *candlepower* curve attached to the ***Symbol***.

Mounting Height is the default used when placing a ***Luminaire***, but the ***Mounting Height*** can be modified at placement.

Orientation is the default used when placing a ***Luminaire***, but the **Orientation Angle** can be modified at placement.



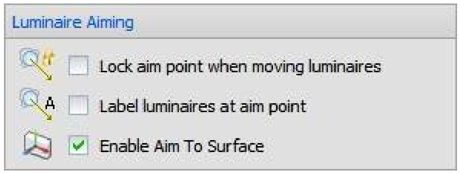


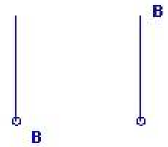
Luminaire **Aiming** *panel* settings are useful in *floodlighting* projects.

The first option will hold the **Aiming Point** *coordinates* constant when **Moving** a *luminaire*.

The second option moves the ***Luminaire Label*** from near the ***Luminaire*** to near the **Aiming Point**.

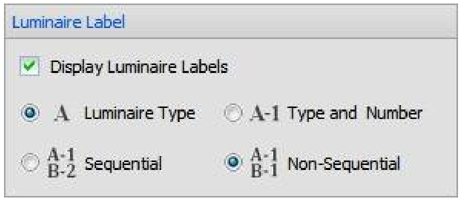
Enable Aim To Surface allows Visual to provide input and as to which surface a ***Luminaire*** is aimed. See Place and Aim Luminaires for more information.





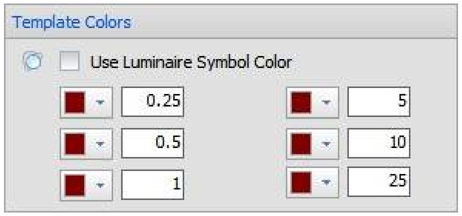
The ***Luminaire Label*** *panel* controls default display of **Labels**. Checking the checkbox tells Visual to display **Labels** by default and activates the rest of the *panel*. Using the top radio buttons, the choice can be made to display just the type or the type and the number. If "Type and Number" is chosen, the lower radio buttons control the default method used to assign numbers.

See Luminaire Display Options for information on making modifications to change the defaults and more information on the topic.



Default ***Template*** **Colors** and magnitude can be set (not to be confused with **Contours**) to apply to new ***Luminaire*** **Types**.

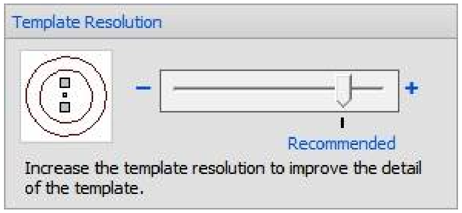
Selecting **Use** ***Luminaire Symbol*** **Color** will assign all ***Template*** lines to the **Color** of the ***Symbol*** and override any other selections.



Template **Resolution** can be changed to include a greater or lesser number of segments in the *polyline* components. The recommended value should be acceptable for a majority of situations.

In some cases, photometry is overly sparse and the user may want greater smoothing between data points. This may not correlate to the reality of *photometric* output so changes should be made with direct knowledge it is necessary and valid.

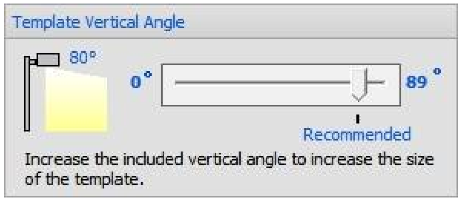
Increasing above the recommended value may cause graphic display lag depending on computer hardware configuration.



Visual includes only a portion of *photometric* output to speed ***Template*** display. Changing the ***Template*** **Vertical Angle** will include more or less *photometric* information. The graphic at the left of the *panel* displays the actual angle of inclusion and a dynamic graphic describing the inclusion angle visually. (The recommended angle is 80°.)

In a vast majority of cases, this setting should not need to be changed. If output is low or ***Template*** lines have very small *illuminance* values, truncation may be seen in the ***Template*** and adjusting the inclusion angle higher would be valid.

Increasing the angle may cause a noticeable lag in certain computer performance aspects depending on computer hardware configuration.



Settings made in subgroups indicated with a "*" and shown in dark red will not change existing objects.

* Changes are NOT retroactive and will NOT change existing objects

10.6.7 UVGI

The **Settings UVGI** *tab* is found in the **Settings** *dialog* accessed in the **Options** *panel* of the **Tools** *tab* on the **Ribbonbar**.

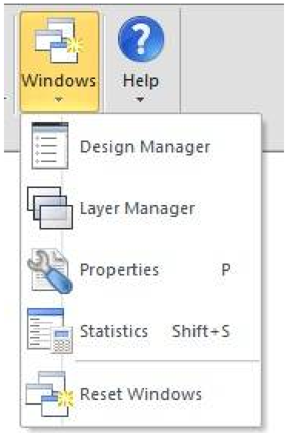
Enabling **UVGI** Calculations allows Visual to calculate ultraviolet germicidal irradiation.

The **UVGI** *tab* will be added to the **Ribbonbar**.

Using this function requires advanced knowledge and a different data set than "normal" lighting. See UVGI Calculations for more information.

10.7 Windows Tools

The **Windows Tools** are found in the **Windows** sub-menu of the **Options** *panel* on the **Tools** *tab* of the **Ribbonbar**.



The **Design Manager** is an always-on-top *dialog*.

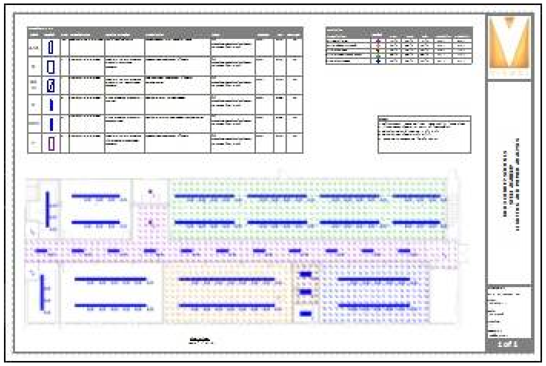
These tools control the display of some **Windows** in the **Design Environment**. The base functions of the features are described in the relevant sections for **Layer Manager**, **Properties**, and **Statistics**. These features are shown in the **Sidebar**.

On occasion, Microsoft Windows and Visual don't communicate properly. This can result in the *tabs* at the bottom of the **Sidebar** disappearing. This command forces a reset of the background computer code and resolves the issue.

Chapter 11 - Print Editor

The **Print Editor** provides a versatile means to compose a complete set of final drawings without the necessity of using an additional *CAD* package.

Visual is capable of multi-*page* printing on any sheet size supported by a printer or plotter.

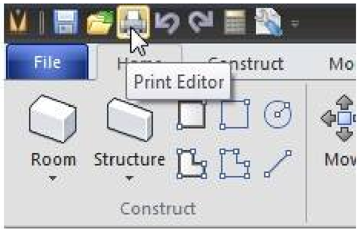


Pages (drawings are referred to as "pages" in Visual) may consist of:

- Title block
- Multiple views (called **Drawings** here)
- Statistics
- *Luminaire* schedule
- *Luminaire* locations
- *Drawing* notes
- Text and *drawing* annotations
- Images
- Specification Sheets

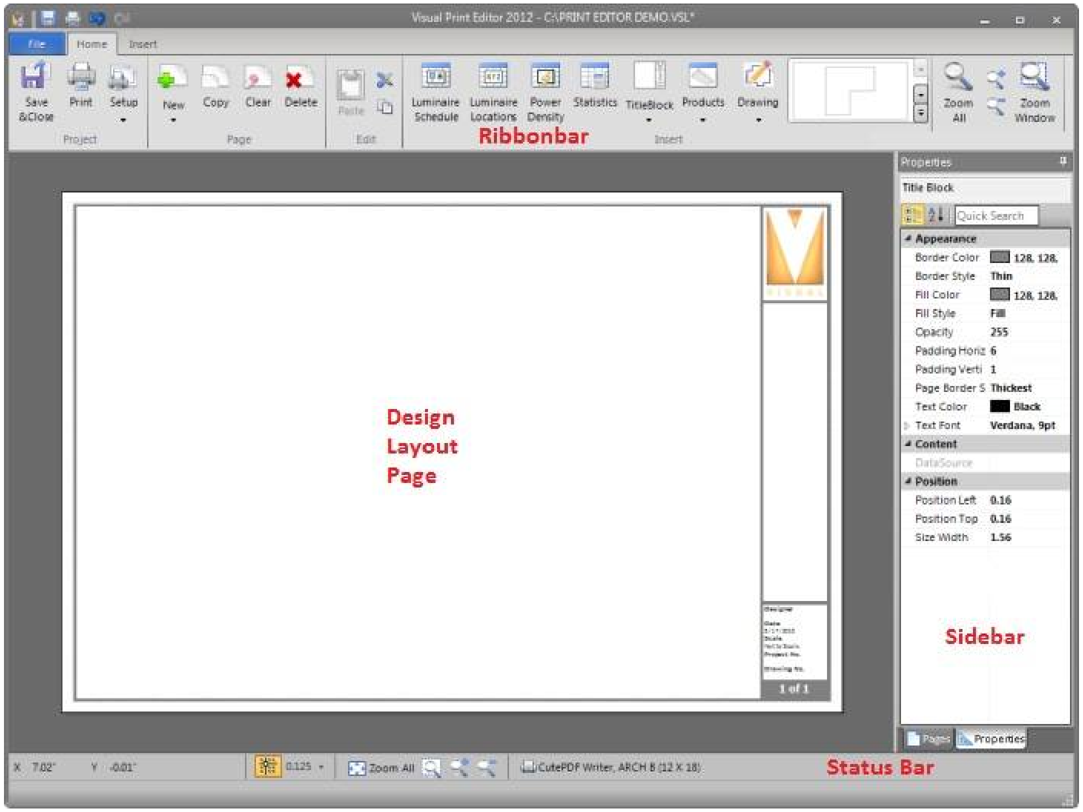
Pages can be printed to any printer (including a PDF printer) or exported to *DWG*/*DXF*.

From the **Design Environment**, the **Print Editor** is accessed by selecting **Print Editor** from either the **File Menu** or the **Quick Access Toolbar**.



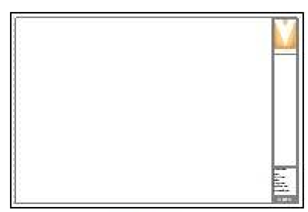
11.1 Introduction

The **Print Editor** is a full screen editor WYSIWYG with a layout much like that of the **Design Environment**. The **Print Editor** includes a **Ribbonbar** with command buttons, a **Design Layout** showing the current ***Page***, a **Sidebar** for viewing a list of **Pages** or editing **Properties**, and a **Status Bar** that provides feedback and access to some commands.

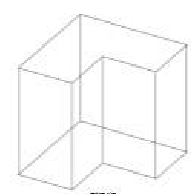


Important Terminology Note:

Pages are shown in the **Design Layout**. **Pages** may contain **Drawings**. To avoid confusion, this manual refers to "drawings" as those objects inserted with the ***Drawing*** button on the **Ribbonbar**. "*Drawing*" does not refer to the whitespace representing the piece of paper in the **Design Layout**; that is called a "*page*".



Page



Drawing

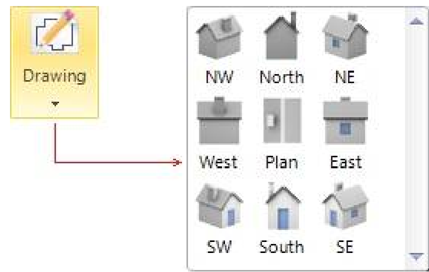
11.1.1 Print Editor Ribbonbar

The **Ribbonbar** is the graphical menu interface housing all **Print Editor** commands. The commands on each *tab* are sub-grouped into *panels* to make navigation easier. Using a **Ribbonbar** style allows easier location of commands via images and text that then allows for more commands to be shown.

Common commands and insertable items are located on the **Home** *tab*.

The **Insert** *tab* contains additional resources available to add to **Pages**.

The presence of a small downward arrow below the button graphic indicates a sub-menu is available for more detailed selection. For example, clicking the ***Drawing*** button initiates the sub-menu showing the nine standard views that can be inserted.

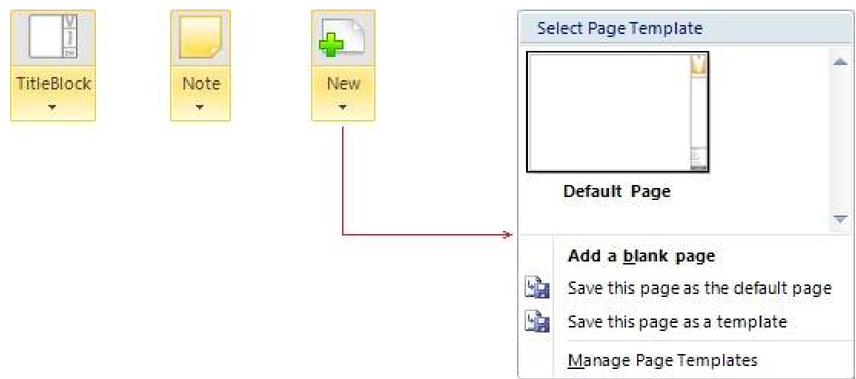


Some buttons with a small downward arrow are dual-function.

Clicking the upper portion executes the command and insert the default item.

Clicking the lower portion initiates a sub-menu to allow for selection of additional available items or related commands.

Title Block, **Note**, and **New** have this function. The **New** sub-menu is shown at far right (modified to show detail).



Left-clicking an object in the ***Page* Layout** will cause the *context-sensitive* **Properties** *tab* to appear. The **Properties** *tab* provides an interface for the specification of object parameters. All versions of the **Properties** *tab* contain the **Edit**, **Format**, and **Zoom** *panels*. Additional *panels* will be shown depending on the object selected. As an example, the *tab* used for **Drawings** is shown at right.

The **Edit** *panel* is always on the far-left side of the **Properties** *tab*. **Cut**, **Copy**, **Paste**, and **Delete** are available. These buttons operate similarly to other Windows-based applications.

The **Format** *panel* is always on the left of the **Properties** *tab*, just to the right of the **Edit** *panel*. Buttons related to various formatting parameters are available. These may be activated in a context sensitive manner when a button doesn't apply to the **Active Object**. See [Using the Format panel](#) for detailed information.

The **Zoom** *panel* is always on the far-right of the **Properties** *tab*. **Zoom All**, **Zoom In**, **Zoom Out**, and **Zoom Window** are available. These buttons function in the same manner as they do in the **Design Environment**.

Specific functionality is covered in various sections of this chapter.

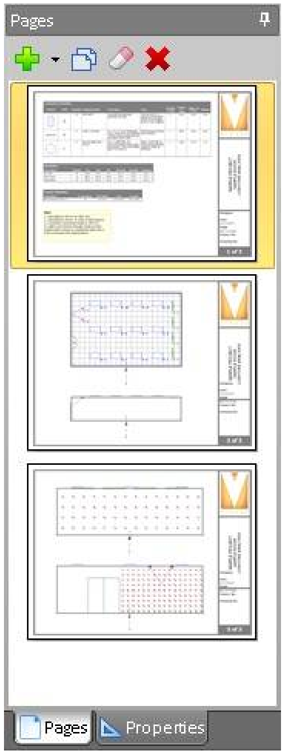
11.1.2 Print Editor Sidebar

The **Print Editor Sidebar** provides convenient access to all created **Pages** and the interface that allows for object parameter modification in the **Properties** *tab*.

The **Pages** *tab* of the **Print Editor Sidebar** shows **Snapshots** of all currently created **Pages**. This allows for easy of movement when multiple **Pages** are created.

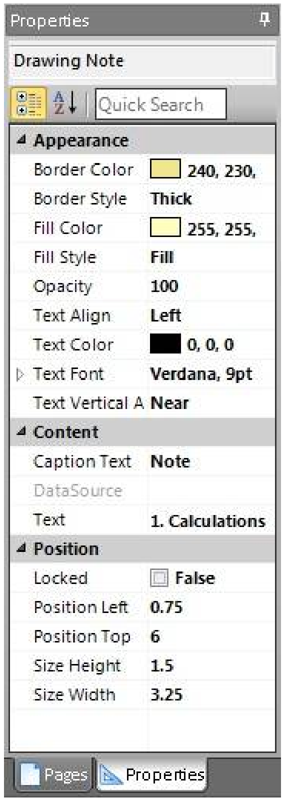
Left-click a ***Page*** **Snapshot** to make that ***Page*** the **Active** ***Page*** and place it in the ***Page*** **Layout Window**.

Buttons at the top of the *tab* allow for **New**, **Copy**, **Clear**, and **Delete** mimicking the ***Page*** *panel* of the **Home** *tab* of the **Print Editor Ribbonbar**.



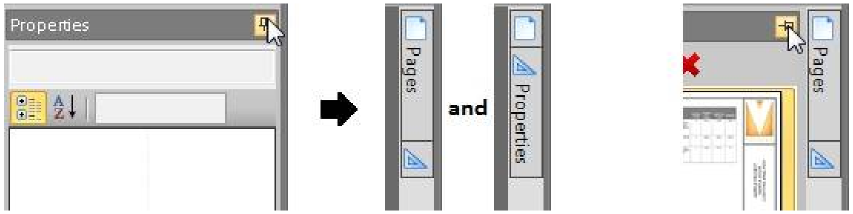
The **Properties** *tab* of the **Print Editor Sidebar** contains various fields that allow for advanced manipulation of ***Page*** entities such as **Font Format** or **Color**.

The **Properties** *tab* contains the many common parameters also accessible from the **Properties** *tab* in the **Print Editor Ribbonbar** such as **Font** formatting options standard to Windows-based applications.



Note: The use of this *tab* is an advanced feature in most cases and should only be necessary if changes are desired to very specific elements of items on a ***Page***. Specific use of the **Properties** *tab* is not covered in this manual. However, it functions as would be expected having used other parts of Visual and most other Windows-based applications. For example, left-clicking a field makes it editable or initiates a *dialog*, the use of which should be self-evident. If use and behavior is non-obvious to the user, it is recommended that use of the **Properties** *tab* be avoided to make these advanced changes.

Left-clicking the pushpin in the upper right corner of the **Sidebar Auto-Hides** or "pins" it to the right side of the **Print Editor Window**. Pinning is indicated by the pushpin pointing to the left, which means that the button is now in the converse "un-pin mode".

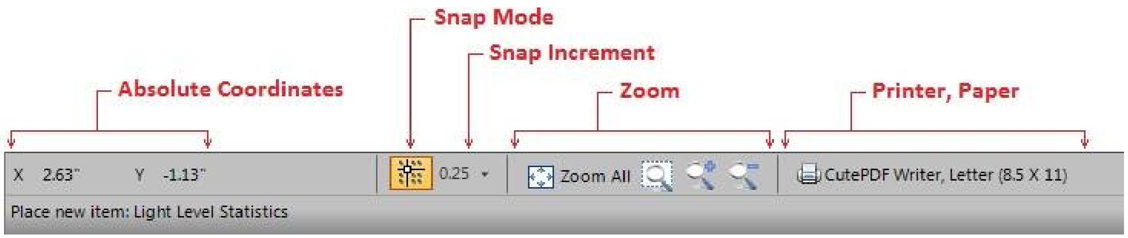


Placing the mouse over the hidden **Sidebar** causes it to expand, or "flyout". Placing the mouse over the ***Page*** *tab* or the **Properties** *tab* causes that particular *tab* to display.

To un-hide or un-pin the **Sidebar**, left-click the pushpin.

11.1.3 Print Editor Status Bar

The **Print Editor Status Bar** is always present at the bottom of the **Print Editor** screen, and contains various buttons and feedback mechanisms to make ***Page*** layout easier. A *toggle button* with a gold color indicates the mode associated with that button is in operation as is shown below for **Snap Mode**.



The components of the **Print Editor Status Bar** are:

Absolute *Coordinates*	This element reports the location (*Cartesian* X,Y) of the mouse *crosshairs* within the ***Page* Layout** with respect to the origin (0,0) that is located at the upper-left corner of the ***Page***. For more information see Cartesian Coordinates.
Snap Mode	This button allows the **Snap Mode** to be turned on or off and indicates the mode is active when it has a gold background. See Incremental Snap for more information about how **Snap** works in the **Design Environment**, which translates to the **Print Editor**.
Snap Increment	This *list box* indicates what snap increment Visual will use if that mode is activated. Three choices are available. Custom increments are not allowed. See Incremental Snap for more information about how **Snap** works in the **Design Environment**, which translates to the **Print Editor**.
Zoom	These buttons allow the quick change of the view by: **Zoom All**, **Zoom Window**, **Zoom In**, and **Zoom Out**. For more information see Zoom for information about how **Zoom** works in the **Design Environment**, which translates to the **Print Editor**.
Printer, Paper	This field shows the currently selected **Printer** and **Paper** configuration. Left-clicking the field is the same as clicking the **Print Setup** button on the **Print Editor Ribbonbar**.

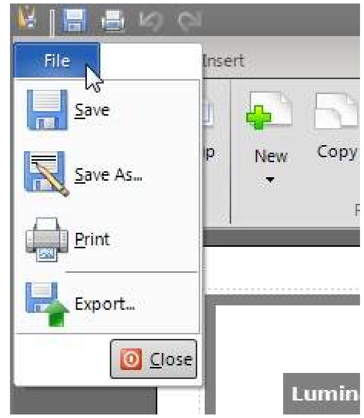
The lower portion of the **Print Editor Status Bar** will report information when manipulating ***Page*** items. For example, the text "Place New Item: Light Level Statistics" will be displayed when placing that item.

11.1.4 Print Editor File Menu

The **File** menu is a part of the **Print Editor Ribbonbar** but functions like a traditional menu instead of as part of the ribbon. The **File** menu is where new projects are created, VSL files are opened and saved, projects are verified with the **Audit** command, *DWG* and *DXF* files are imported and exported, and the **Print Editor** is accessed.

Upon selecting the **File** menu, a *drop-down menu* will appear allowing further selection of several commands.

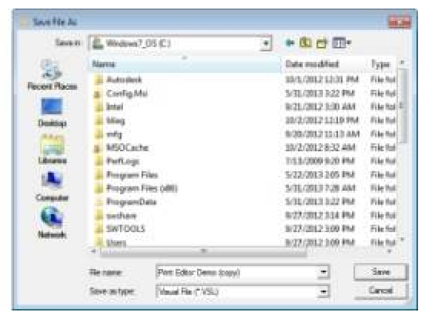
The presence of an ellipsis (...) following a menu command indicates that the command provides access to a *dialog* form, most of which are just like those used in other Windows-based applications.



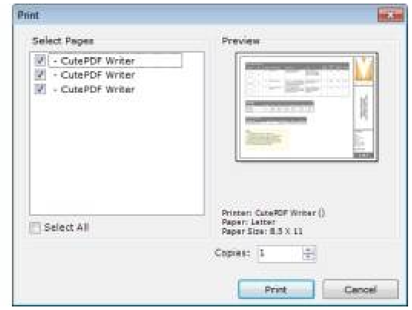
The **Save** command is the same as that in the **Design Environment** and therefore saves the current **Print Editor** and **Design Environment**. The operating system focus likely shifts between windows while accomplishing both save operations.

The **Save As** command is the same as that in the **Design Environment** and therefore saves the **Print Editor** and **Design Environments** as a new VSL file.

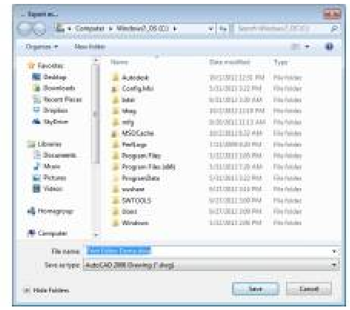
Clicking the command initiates the **Save File As** ***Dialog*** to allow for filename and location specification.

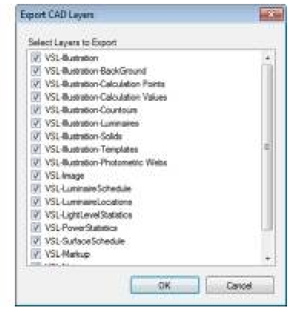


The **Print** command is the same as left-clicking the **Print** button on the **Print Editor Ribbonbar** and initiates the **Print** ***Dialog***. See Printing.

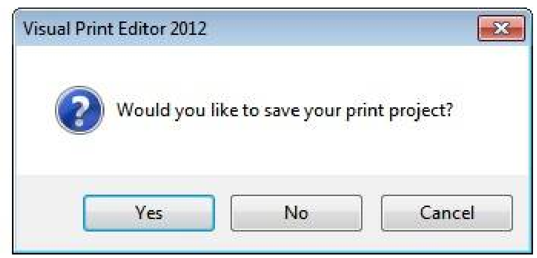


The **Export** command initiates the **Export As** ***Dialog*** that allows for the specification of a file name and one of multiple *CAD* or graphic formats. Once the Save button has been clicked, the **Export** ***CAD*** **Layers** ***Dialog*** appears to allow the user to choose which **Layers** of the ***Page*** **Layout** are exported. Only the current ***Page*** is exported. Clicking **OK** closes all dialogs and **Exports** the file.





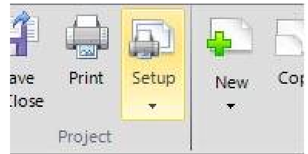
The **Close** button closes the **Print Editor** and returns to the **Design Environment**. If the current ***Page*** **Layout** is not saved, Visual will ask to save or not.



11.2.1 Creating a Page

Initially, the **Print Editor** contains a single blank *page*. It is recommended, although not required, to select a printer and paper size before adding objects to the *page*.

To set the **Active Printer**, select the **Setup** button from the **Project *Panel*** of the **Print Editor Ribbonbar**. Alternately, select the **Print, Paper** field of the **Status** bar.



After clicking either **Setup** button, Visual initiates a *drop-down menu*.

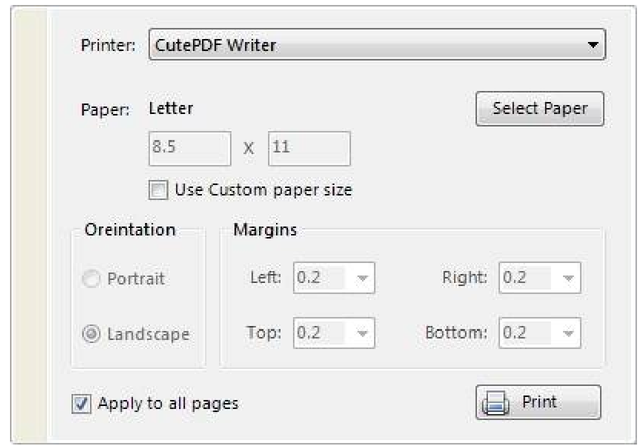
Clicking the **Printer** button in this *dialog* initiates a drop-down to select one of the system **Printers**. The **Printers** shown will vary from computer to computer. Select the desired **Printer** to make it the **Active Printer**.

The **Select Paper** button initiates the Windows printer configuration *dialog* for the **Active Printer** to allow for detailed configuration. Consult specific printer and Windows help for more information.

Apply To All Pages tells Visual to use the same **Printer** and **Paper** parameters for each ***Page***. To apply different settings to each ***Page***, uncheck the checkbox, move to each ***Page*** where a different configuration is desired, press the **Setup** button, and make the desired selections as above.

Closing the *dialog* by clicking in the ***Page* Layout Environment** will save the settings.

Clicking the **Print** button initiates the Visual Print Dialog.

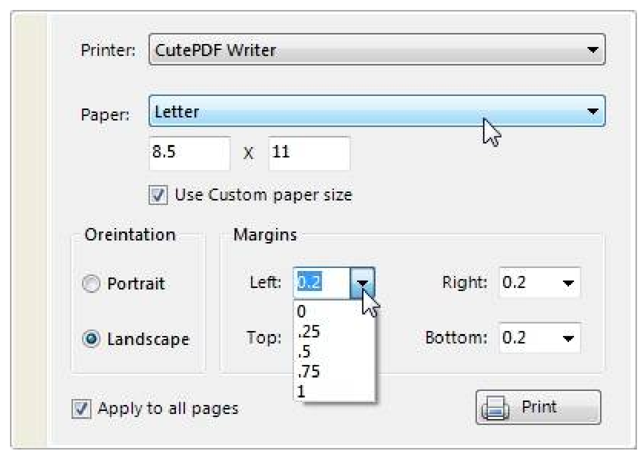


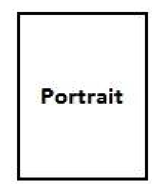
To choose a custom paper size, first check the **Use Custom Paper Size** checkbox.

This will activate the **Paper** button to allow for default choices to be made or a custom size can be typed in the text boxes below the **Paper** button.

Orientation is controlled by making a selection of one of the radio buttons.

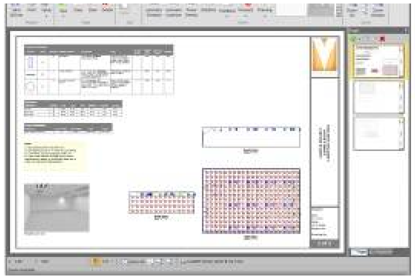
Margins are controlled by making default selections from the combo boxes or typing custom values into the text fields of those boxes.

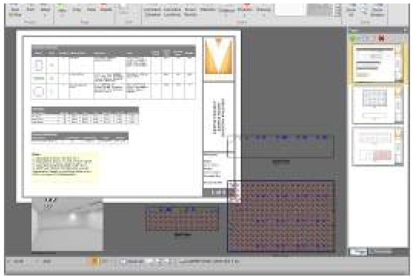




Objects placed in the ***Page* Layout** are referenced to a global (0,0). The "paper" is

referenced to the same (0,0). Therefore, changing the paper size as shown above leaves the objects placed in the same locations, which may or may not place them on the "paper" as shown at far right.



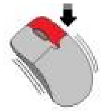


Once a **Paper Size** has been chosen, any of the objects on the **Insert** *tab* of the **Print Editor Ribbonbar** can be placed.

11.2.2 Navigation

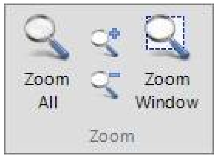
Navigation in the **Print Editor** is very similar to the **Design Environment**. The main exception being that the **Print Editor** is a 2-dimensional space and therefore has no height or Z-dimension.

Click and hold the right mouse button while moving the mouse in the **Print Editor** to move the view in the *plane* of the computer screen.



Use the roller wheel to **Zoom In** (roll forward) and **Zoom Out** (roll rearward) when the mouse cursor is in the ***Page*** **Layout Window.**

The **Zoom** *panel* of the **Print Editor Ribbonbar** contains the **Zoom All**, **Zoom In**, **Zoom Out**, and **Zoom Window** buttons that function as they do in the **Design Environment**.

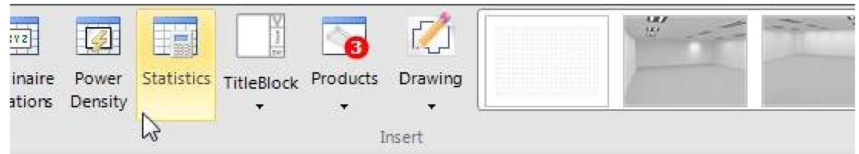


The **Zoom** level is saved for each ***Page***.

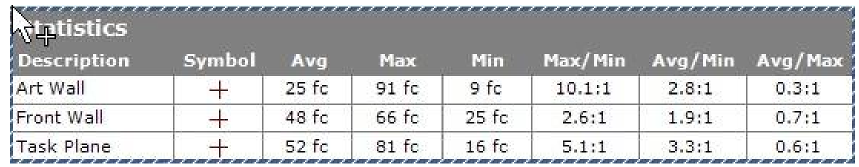
11.2.3 Placing Objects

The placement of any object follows generally the same logical progression.

Choose an object to be inserted from the **Insert** *tab* (or the **Home** *tab*) of the **Print Editor Ribbonbar**; for example **Light Level Statistics**.



The object will be attached to the mouse cursor, which then allows the user to left-click the mouse at the preferred location for the upper-left corner of the object. A plus sign is added to the cursor to indicate an object is being placed.



Description	Symbol	Avg	Max	Min	Max/Min	Avg/Min	Avg/Max
Art Wall	+	25 fc	91 fc	9 fc	10.1:1	2.8:1	0.3:1
Front Wall	+	48 fc	66 fc	25 fc	2.6:1	1.9:1	0.7:1
Task Plane	+	52 fc	81 fc	16 fc	5.1:1	3.3:1	0.6:1

Objects are placed based on the Snap setting in the **Print Editor Status Bar**. A yellow highlight to the **Snap** button indicates objects will be placed on the **Snap Grid** as defined by the adjacent listbox. To change the **Snap Grid**, select the desired value from the choices in the sub-menu. The current value will have a yellow check to the left of the value.

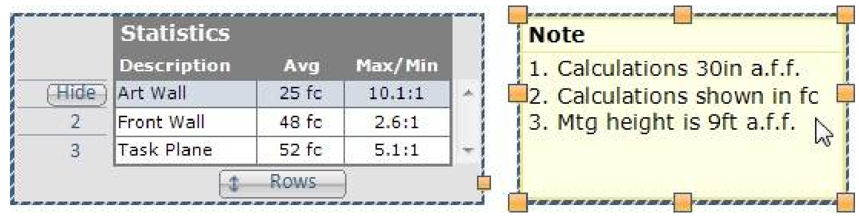
Once placed, objects can be moved, scaled, and formatted with commands on the **Properties** *tab* of the **Print Editor Ribbonbar** specific to each object type.

11.2.4 Selecting Objects

Selecting objects in **Print Editor** is similar to doing so in the **Design Environment**.

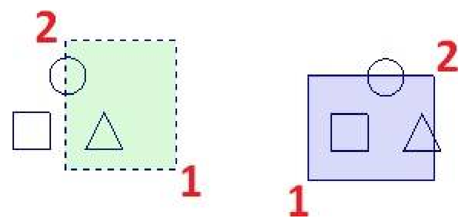
Left-clicking an object makes it the **Active Object**. This tells Visual to initiate the **Properties** *tab* in the **Print Editor** **[Ribbonbar]** for basic modifications and allows advanced modification in the **Properties** *tab* of the **[Sidebar]**.

The **Active Object** will be highlighted, a grey border with additional capability may be added, and ***Grips*** will be provided for resizing.



Grips (the yellow boxes on the perimeter of an object) allow for scaling as discussed in various sections of this chapter.

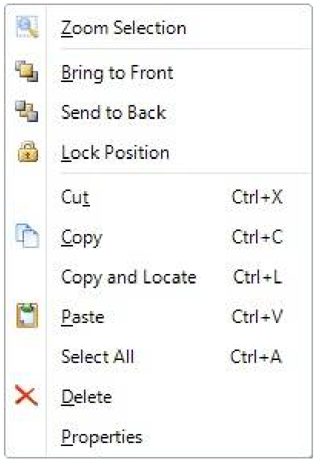
As in the **Design Environment**, the mouse can be used to window objects for selection. Should a left-click be issued when there are no objects within the *pick-box*, Visual will automatically assume that selection by **Window** and ***Fence*** is desired. A rectangle will be dynamically drawn starting at the location of the first left-click as the mouse is moved within the **Design Window**. The opposite corner of the rectangle is then chosen with a left-click to define the rectangular selection region. See Selecting Objects for a review of the methodology in the context of the **Design Environment**.



Once selected, **Print Editor** objects can be modified as detailed in the section 7.4 Modifying Pages and Objects as well as information provided in sections of 7.3 Print Editor Objects as necessary.

11.2.5 Context Sensitive Menus

Right-clicking the mouse on objects initiates a ***Context-Sensitive*** **Menu** that can be useful.



Zoom Selection - zoom to fill the screen with a specified window

Bring to Front - place the object in front of all other objects

Send to Back - place the object behind all other objects

Lock Position - lock the current position such that it can't be moved with the mouse

Cut - remove the object and place it in the Visual clipboard

Copy - place the object in the Visual clipboard

Copy and Locate - copy the object and immediately attach it to the mouse cursor for placement (equivalent to **Copy** and **Paste** at the same time)

Paste - duplicate the last object from **Cut** or **Copy** by placing the new object at (0,0) on the *Page*

Select All - select all objects on the current ***Page***

Delete - remove the object without placing it in the Visual clipboard

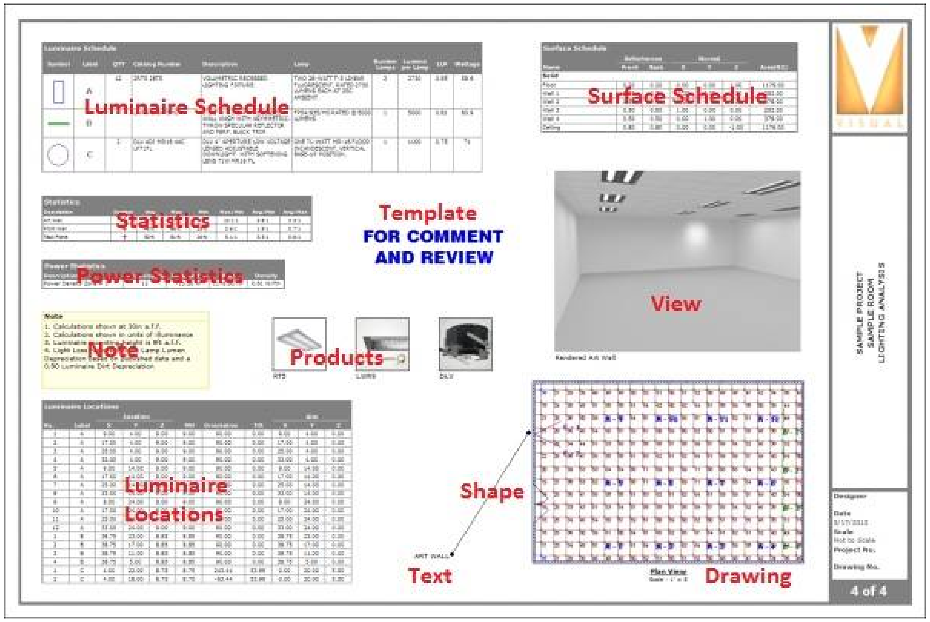
Properties - set focus to the **Properties** *tab* of the **Print Editor Sidebar** with the parameters of the object active

Right-clicking on tabular objects allows for multiple extra features and is discussed in Working With Tabular Objects.

Some functions in the ***Context-Sensitive*** **Menu** may be inactive or inapplicable in various cases. Right-clicking in some cases yields a reduced set of options.

11.3 Print Editor Objects

Many different objects can be placed on a ***Page*** to illustrate the lighting *model*.



Luminaire Schedule - describes the *luminaires*

Surface Schedule - details the surface properties

Statistics - summarizes lighting metrics for each **Calculation Zone**

Power Statistics - summarizes lighting power density

Template - pre-defined user-created elements used across multiple projects

View - any saved view from the **Design Environment**

Note - user-defined text describing the project or lighting *model*

Products - Graphics and/or specification sheets from any Acuity Brands product

Luminaire Locations - detailed information about placement and aiming

Text - simple alphanumeric information

Shape - a **Line** or **Callout** to connect elements

Drawing - any of the nine pre-defined views scaled as desired

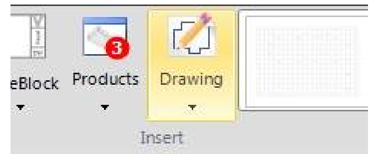
Title Block - text and graphic information describing the project and designer

The elements can be placed in any position, each element can be formatted to suit individual preference or project needs, and detailed formatting can be applied by advanced users to provide individuality as desired.

11.3.1 Drawings

Drawings show the lighting *model* in 2-dimensions to a specific scale.

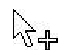
To place a ***Drawing*** on the ***Page***, click the ***Drawing*** button located on the **Insert** *tab* of the **Print Editor Ribbonbar**.



Visual will initiate the ***Drawing*** drop-down menu showing the nine basic views available. Left-click the desired view.

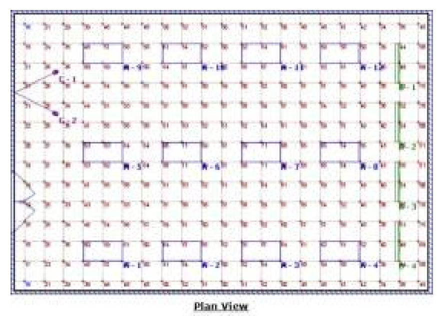
Once a view direction is selected, Visual will determine the appropriate scale to fit the ***Drawing***.

Drawings are placed by left-clicking the mouse in the desired location as described in [Placing Objects](#).



Visual automatically chooses a ***Drawing*** scale based on the ***Page*** size and commonly used scales. The scale of a *drawing* can be easily modified.

Modification of **Drawings** is discussed in [Modifying Drawings](#).

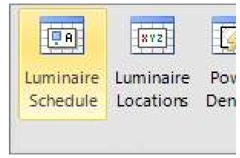


To place a view of the *model* that is not one of the nine standard viewing angles, a [View](#) must be inserted.

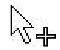
11.3.2 Luminaire Schedule

Luminaire Schedules provide detailed information about ***Luminaires*** used in a lighting *model*. The specific content of the **Luminaire Schedule** is modified in the **Design Environment**. Modifications discussed here are related to formatting.

To place a **Luminaire Schedule** on a ***Page***, click the **Luminaire Schedule** button on the **Insert** *tab* of the **Print Editor Ribbonbar**.



Luminaire Schedule is placed by left-clicking the mouse in the desired location as described in Placing Objects.



Luminaire Schedule									
Symbol	Label	QTY	Catalog Number	Description	Lamp	Number Lamps	Lumens per Lamp	LLF	Wattage
	A	12	2RTS 28TS	VOLUMETRIC RECESSED LIGHTING FIXTURE	(2) F28TS	2	2730	0.95	59.6
	B	4	LWR9-1-54T5HO	3 1/2"W X 3 3/4"H RECESSED WALL WASH WITH ASYMMETRIC-THROW SPECULAR REFLECTOR AND PERF BLACK TRIM	(1) F54T5HO	1	5000	0.81	60.9
	C	2	DLV ADJ MR16 4AC LP71FL	DLV 4" APERTURE LOW VOLTAGE LENSED ADJUSTABLE DOWNLIGHT WITH SOFTENING LENS 71W MR16 FL	(1) 70MR16FL	1	1100	0.75	71

See Working with Text-Based Objects for information on editing text content.

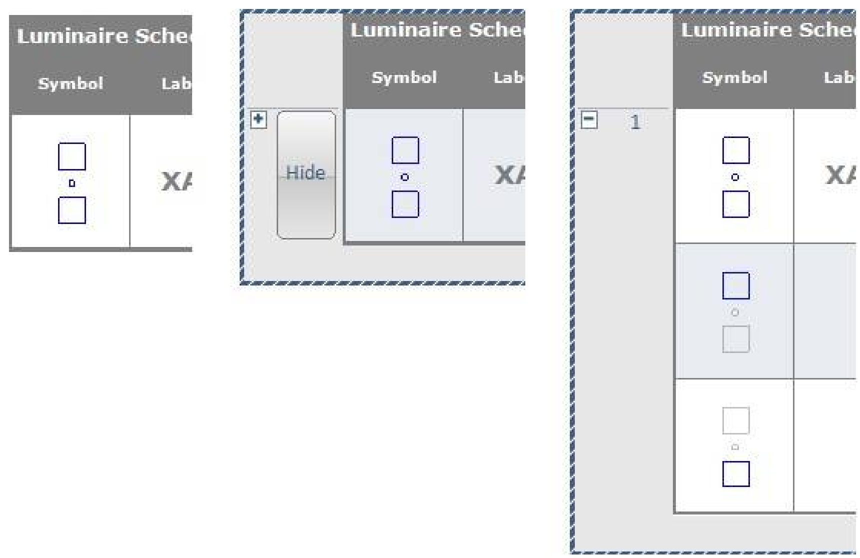
See Working With Tabular Objects for information on formatting tables as well as choosing columns to display.

When a multi-head **Luminaire Type** is present, the **Luminaire Schedule** in **Print Editor** behaves like that in the **Design Environment**.

A plus *symbol* is shown at the left edge of the row when it is the **Active Object**, and the multi-head **Luminaire Type** can be expanded to show information for individual heads by clicking the plus *symbol*.

This feature is useful in very complex projects, and is of little value when the heads are the same base **Luminaire** (IES file).

To collapse the **Luminaire Type**, click the minus *symbol*.



The available columns for a **Luminaire Schedule** are:

Symbol - The ***Symbol*** defined in the **Luminaire Schedule Editor**

Label - The text *label* defined in the **Luminaire Schedule Editor**

Image - The graphic assigned in the Acuity Brands database

QTY (Quantity) - The number of the **Luminaire Type** placed in the *model*

Manufacturer - Text from the [MANUFAC] field of the IES file or that edited in the **Luminaire Schedule Editor**

Catalog Number - Text from the [LUMCAT] field of the IES file or that edited in the **Luminaire Schedule Editor**

Description - Text from the [LUMINAIRE] field of the IES file or that edited in the **Luminaire Schedule Editor**

Lamp - Text from the [*LAMP*] field of the IES file or that edited in the **Luminaire Schedule Editor**

Number Of Lamps - Text from the IES file or that edited in the **Luminaire Schedule Editor**

Filename - The name of the IES files used as the base of the **Luminaire Type** definition

Lumens Per *Lamp* - Text from the IES file or that edited in the **Luminaire Schedule Editor**

LLF - The ***Light Loss Factor*** assigned in the **Luminaire Schedule Editor**

Wattage - Text from the IES file or that edited in the **Luminaire Schedule Editor**

Efficiency - The calculated *efficiency* from the information in the IES file

Distribution - The IES classification and spacing criterion (SC) across and along the lamps

Plot - A miniaturized *candlepower* graph in polar *coordinates* (otherwise called a polar plot or *candela* curve)

Notes - This is the only field NOT based on the **Luminaire Schedule Editor**. When this column is shown, it allows for insertion of additional text-based information using the editing method in Working with Text-Based Objects

Once placed, the object can be modified in many ways. See Working With Text-Based Objects for information about formatting headers.

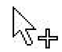
Visual has default settings of common content. The default may differ on any one computer based on user choices; see Saving Templates and Defaults.

11.3.3 Luminaire Locations

Luminaire Locations shows a table with data about position and aiming of each **Luminaire** in the *model*.

To place a **Luminaire Locations** table on a ***Page***, click the **Luminaire Locations** button on the **Insert** *tab* of the **Print Editor Ribbonbar**.

Luminaire Locations is placed by left-clicking the mouse in the desired location as described in Placing Objects.



See Working with Text-Based Objects for information on editing text content.

See Working With Tabular Objects for information on formatting tables as well as choosing columns to display.

The available columns for **Luminaire Locations** are:

Luminaire Locations

		Location						Aim		
No.	Label	X	Y	Z	MH	Orientation	Tilt	X	Y	Z
1	A	9.00	4.00	9.00	9.00	90.00	0.00	9.00	4.00	0.00
2	A	17.00	4.00	9.00	9.00	90.00	0.00	17.00	4.00	0.00
3	A	25.00	4.00	9.00	9.00	90.00	0.00	25.00	4.00	0.00

No. - The **Luminaire Number** based on the sort method chosen for **Luminaire Labels** in the **Design Environment**

Label - The **Luminaire Type *Label*** as assigned in the **Luminaire Schedule Editor**

Location (X, Y, Z) - The *Cartesian coordinates* of the **Luminaire**

MH - The *mounting height* of the **Luminaire**

Orientation - The orientation of the **Luminaire** based on 0° as defined in the **Luminaire Schedule Editor** for the **Symbol**

Tilt - The angle of tilt with 0° being straight down (in the negative Z-axis) of the **Luminaire**

Aim (X, Y, Z) - The *Cartesian coordinates* of the aiming point of the **Luminaire**

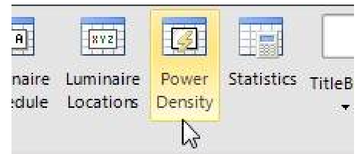
Once placed, the object can be modified in many ways. See Working With Text-Based Objects for information about formatting headers.

Visual has default settings of common content. The default may differ on any one computer based on user choices; see Saving Templates and Defaults.

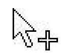
11.3.4 Power Density Statistics

Power Density Statistics shows a table with data about each zone relaying area, total power, and the resulting power density to justify or verify compliance to various requirements.

To place a **Power Density Statistics** table on a ***Page***, click the **Power Density Statistics** button on the **Insert** *tab* of the **Print Editor Ribbonbar**.



Power Density Statistics is placed by left-clicking the mouse in the desired location as described in Placing Objects.



See Working with Text-Based Objects for information on editing text content.

See Working With Tabular Objects for information on formatting tables as well as choosing columns to display.

Power Statistics				
Description	# Luminaires	Total Watts	Area	Density
Power Density Zone # 1	12	715.20 W	1176.00 ft²	0.61 W/ft²

The available columns for **Power Density Statistics** are:

Description - The name given to each **Power Density Zone** in the **Design Environment**

 # *Luminaires* - The number of ***Luminaires*** associated to the zone

Total Watts - The total number of Watts (power) associated to the zone, based on the defined Watts in the **Luminaire Schedule Editor**

Area - The area of the zone, based on the system units of feet or meters

Density - The resulting Watts per unit area (W/ft² or W/m²) for the zone equalling [Total Watts]/[Area]

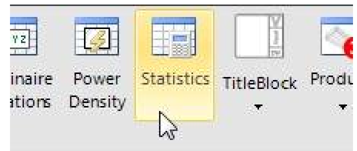
Once placed, the object can be modified in many ways. See Working With Text-Based Objects for information about formatting headers.

Visual has default settings of common content. The default may differ on any one computer based on user choices; see Saving Templates and Defaults.

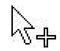
11.3.5 Statistics

Light Level Statistics (**Statistics**) summarize performance metrics for all **Calculation Zones** placed in the *model*. **Statistics** only applies to lighting metrics. **Lighting Power Density** is summarized in **Power Density Statistics** placed separately.

To place a **Statistics** table on a ***Page***, click the **Statistics** button on the **Insert** *tab* of the **Print Editor Ribbonbar**.



Statistics is placed by left-clicking the mouse in the desired location as described in Placing Objects.



See Working with Text-Based Objects for information on editing text content.

See Working With Tabular Objects for information on formatting tables as well as choosing columns to display.

The available columns for **Statistics** are:

Statistics								
Description	Symbol	Avg	Max	Min	Max/Min	Avg/Min	UG	CV
Art Wall	◇	25 fc	91 fc	9 fc	10.1:1	2.8:1	3.2	0.63
Front Wall	×	48 fc	66 fc	25 fc	2.6:1	1.9:1	1.8	0.24
Task Plane	+	52 fc	81 fc	16 fc	5.1:1	3.3:1	1.5	0.26

Description - The name given to each **Calculation Zone** in the **Design Environment**

Symbol - the graphical *symbol* associated to the zone

Avg - the average of all values in the zone

Max - the maximum value in the zone

Min - the minimum value in the zone

Max/Min - the maximum value in the zone divided by the minimum value in the zone

Avg/Min - the average of all the values in the zone divided by the minimum value in the zone

Avg/Max - deprecated; the average of all values in the zone divided by the maximum value in the zone

Min/Max - deprecated; the minimum value in the zone divided by the maximum value in the zone

Min/Avg - deprecated; the minimum value in the zone divided by the average of all values in the zone

Max/Avg - deprecated; the maximum value in the zone divided by the average of all values in the zone

UG - *Uniformity Gradient*, which is the highest value of all the local changes in lighting quantity between adjacent points in the grid

CV - *Coefficient of Variance*, which is an advanced statistical calculation defined as the standard deviation divided by the mean (average) of all points

NOTE: units will change as necessary depending on the **Calculation Type** chosen. Some statistics (e.g. UG and CV for a *luminance*-based zone) become nonsense in some cases.

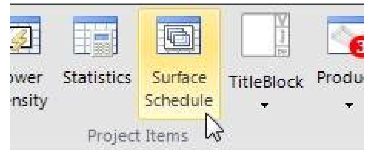
Once placed, the object can be modified in many ways. See Working With Text-Based Objects for information about formatting headers.

Visual has default settings of common content. The default may differ on any one computer based on user choices; see Saving Templates and Defaults.

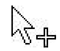
11.3.6 Surface Schedule

Surface Schedules summarize properties of all **Solid Objects** in the *model*.

To place a **Surface Schedule** table on a ***Page***, click the **Surface Schedule** button on the **Insert** *tab* of the **Print Editor Ribbonbar**.



Surface Schedule is placed by left-clicking the mouse in the desired location as described in [Placing Objects].



See [Working with Text-Based Objects] for information on editing text content.

See [Working With Tabular Objects] for information on formatting tables as well as choosing columns to display.

The available columns for **Surface Schedule** are:

Surface Schedule						
	Reflectances		Normal			
Name	Front	Back	X	Y	Z	Area(ft2)
Solid						
Floor	0.20	0.20	0.00	0.00	1.00	1176.00
Wall 1	0.50	0.50	-1.00	0.00	0.00	252.00
Wall 2	0.50	0.50	0.00	-1.00	0.00	378.00
Wall 3	0.50	0.50	1.00	0.00	0.00	252.00
Wall 4	0.50	0.50	0.00	1.00	0.00	378.00
Ceiling	0.80	0.80	0.00	0.00	-1.00	1176.00

Name - the name given to each **Solid Object** in the **Design Environment**

Reflectances - the "front" and "back" ***Reflectance*** assigned to each object

Normal (X, Y, Z) - the unit *vector* describing the normal of each object

Area - the square feet or meters of each object based on system units

Once placed, the object can be modified in many ways. See [Working With Text-Based Objects] for information about formatting headers.

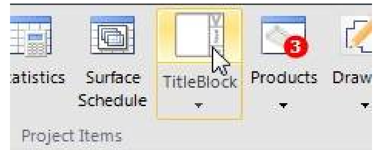
Visual has default settings of common content. The default may differ on any one computer based on user choices; see [Saving Templates and Defaults].

11.3.7 Title Block

A **Title Block** can be inserted on a ***Page*** to organize and illustrate project-related information.

To place a **Title Block** table on a ***Page***, click the **Title Block** button on the **Insert** *tab* of the **Print Editor Ribbonbar**. The top portion of the button places a **Title Block**.

Once the button is pressed, Visual inserts the **Title Block** based on the printable area and margins returned by the Windows system information.

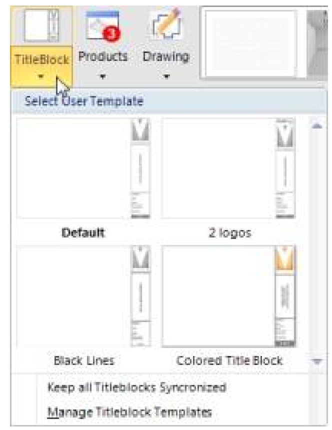


The **Title Block** button is dual function; the lower portion of the button initiates the **Title Block *Dialog*** that shows saved **Title Blocks** that can be inserted. Left-click the desired thumbnail image and Visual inserts the **Title Block** based on the printable area and margins returned by the Windows system information.

Note that, once placed, the **Title Block** cannot be moved or resized like other objects.

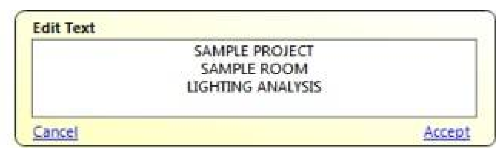
Today's date will be placed in the **Title Block**. This can be edited if necessary.

Borders are formatted as described in [Working With Tabular Objects](#).



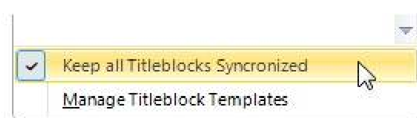
Editing text-based sub-objects in a **Title Block** is similar to the method for other text-based objects; the first left-click places focus on the object, and the second left-click tells Visual to modify the text contents of the object. See [Working With Text-Based Objects](#) for detailed information.

Editing the main **Title Block** text is slightly different in that a small editor appears to edit the text without it being rotated. Multiple lines can be input. Click *Accept* to close the editor and apply the changes.

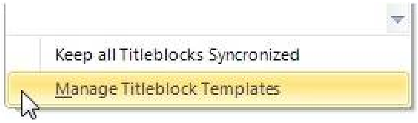


The image in the upper-right can be modified as described in [Images](#) to present a company logo or any graphical element.

Using the **Title Block *Dialog***, the user can select *Keep All Titleblocks Synchronized* to make each text field the same on all sheets; i.e. "Designer" (or whatever the user chooses for that field) is the same on all **Pages**. This feature also removes automatic ***Page*** numbering.



Using the **Title Block *Dialog***, the user can select *Manage Titleblock Templates* that initiates a *dialog* to delete and rename saved **Title Blocks**. See [Saving Templates and Defaults](#).

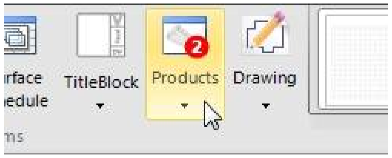


Visual has default settings of common content. The default may differ on any one computer based on user choices; see [Saving Templates and Defaults](#).

11.3.8 Products

Products provide a way to describe products in a detailed fashion using graphical and specification sheet information from the Acuity Brands Product Database. Consequently, this only applies to Acuity products. "**Product**" refers to one of the elements related to a **Luminaire Type**, and can vary depending on the context. It could be a graphic (JPG, BMP, PNG, etc) or a PDF. Or, by the time we get around to updating the manual, it could be a QR code or something to tie in your Google Glass or alert the NSA you're planning to sell LEDs to Iran. **Products** are a specific case of inserting **PDF** files.

To place a **Product** on a ***Page***, click the **Products** button on the **Insert** *tab* of the **Print Editor Ribbonbar**. The number in the red circle represents the number of **Products** available to insert.



The **Product** ***Dialog*** will initiate below the button. Each **Product** section contains a graphic and a specification sheet PDF; either of these may be blank indicating there is not an object of that type to place. As can be seen at right, the blue header is labeled with the IES file name.

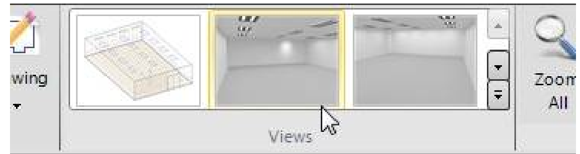
Left-click either object type to place it on a ***Page***.

Clicking a graphic tells Visual to place an **Image** as described in Images with the file (from the product database) pre-attached for placement.

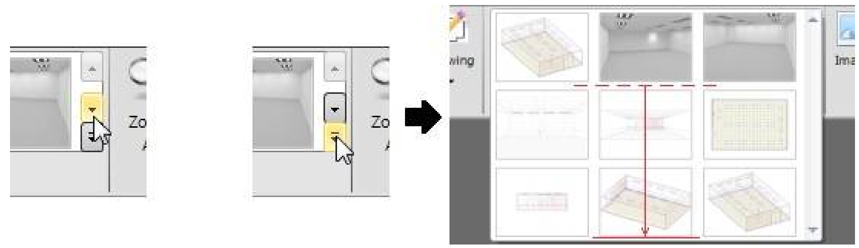
11.3.9 Views

Views are saved images from the **Design Environment** as described in Saving Views. **Views** are not **Drawings** and are not to a scale.

To place a **View** on the ***Page***, left-click one of the **Views** shown in the **Views** *panel* on the **Insert** *tab* of the **Print Editor Ribbonbar**.



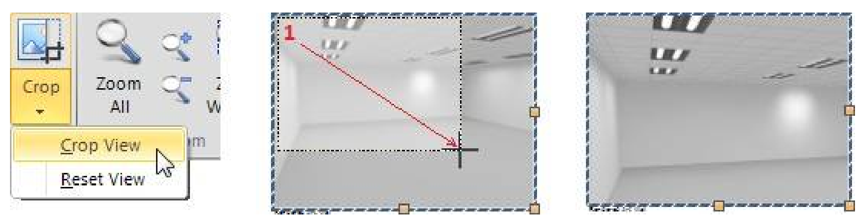
The first **View** (in the upper-left) is always the current **View** in the **Design Environment**. If the desired **View** is not shown, scroll using the scrollbar on the right or click the expand button to see all **Views**. Left-click the desired **View**.



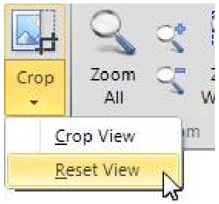
Clicking a **View** tells Visual to place an **Image** as described in Images with the related graphic file of the **View** pre-attached for placement.

Once placed, a **View** can be **Cropped** if desired. Select the **View** to be **Cropped**. Click the **Crop** button in the **Properties** *tab* of the **Print Editor Ribbonbar** and select **Crop View** from the drop down menu.

Left-click-drag a window that defines the area to remain after the **Crop**. Release the left mouse button and Visual automatically applies the changes and ends the command.



To **Reset** a **Cropped View**, click the **Crop** button in the **Properties** *tab* of the **Print Editor Ribbonbar** and select **Reset View** from the drop down menu. Visual will automatically restore the **View** to its original size.



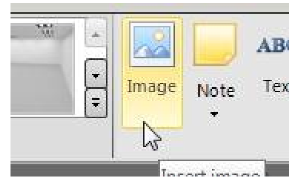
Note that **Views** are often saved in Visual at a larger size than they are placed and can be enlarged without pixelation.

To insert a scalable ***Drawing***, see Drawings.

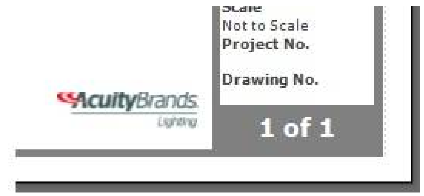
11.3.10 Images

Images can be placed on the ***Page*** to provide supporting information, logos, signatures, PE stamps, or other graphics. The **Images** functionality is also used by Visual when inserting some other objects. PNG, GIF, JPG, BMP, TIFF, and EMF files are valid for insertion.

To place an **Image** on a ***Page***, click the **Image** button on the **Insert** *tab* of the **Print Editor Ribbonbar**. The standard file selection *dialog* used in other Windows-based applications will be initiated. Select the desired file and click *Open*.



Once a file has been selected, Visual attaches it to the mouse cursor for placement. Left-clicking the mouse in the desired location places the graphic.

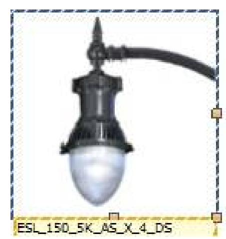


Modifications to borders are made in the **Format** *panel* of the **Properties** *tab* in the **Print Editor Ribbonbar**. See [Using the Format Panel](#).

Images are inserted with title text based on the filename. Editing this text is accomplished by clicking the title text after the **Image** has been selected. As with other text-based entities, Visual initiates an editing box highlighted in yellow.

Left-click the mouse in whitespace to apply changes.

Formatting of title text is done with items in the **Text** *panel* as described in [Working with Text-Based Objects](#)



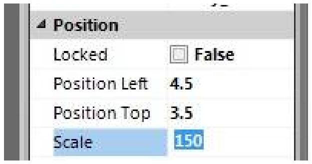
Once inserted, the **Image** can be modified using the **Image** button on the **Properties** *tab* of the **Print Editor Ribbonbar** that is initiated after left-clicking the **Image**.

Clicking the button has functions as discussed in [Using the Image Preview](#).

The scale of the **Image** may not be desirable. To change the scale of the **Image**, left-click the **Image** to select it, then two options are available:

1) Use the *grips* to left-click-drag: Left-click the mouse on a yellow grip, hold the mouse button, and drag until the desired size or scale is achieved. Visual displays the resulting scale factor in the upper-left corner.

2) Using the advanced **Properties** *tab* of the **Sidebar**, type the desired scale % (of original size) in the *text box* and press *Enter* to apply the change. The "%" *symbol* does not need to be entered.



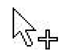
Images are used to insert Products, and Views as well as in the Title Block graphic.

11.3.11 Notes

Notes is a text-based element that allows for description of the lighting *model*.

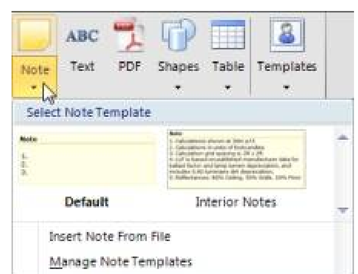
To insert a **Notes** entity, click the **Notes** button on the **Insert** *tab* of the **Print Editor Ribbonbar**. This selects the default **Notes** entity.

Notes is placed by left-clicking the mouse in the desired location as described in Placing Objects.

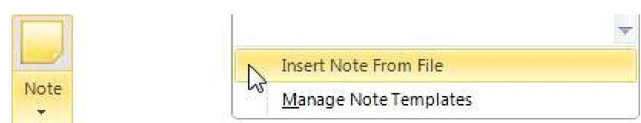


The **Notes** entity is a pre-formatted container that holds a large *text box*. To edit the content, simply left-click the object to make it active, and then left-click it to activate text editing.

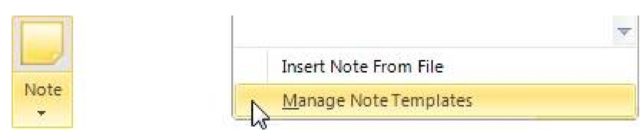
The **Notes** button is dual-function. clicking the lower portion initiates the **Notes** ***Dialog*** that shows saved **Notes** that can be inserted. Left-click the desired thumbnail image and Visual inserts the **Notes**.



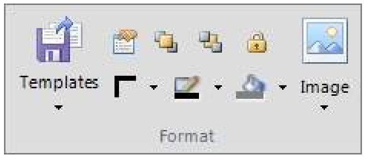
Using the **Notes** ***Dialog***, the user can select *Insert Note From File* that initiates a *dialog* to choose a text file to be used to populate the **Notes** content area.



Using the **Notes** ***Dialog***, the user can select *Manage Note Templates* that initiates a *dialog* to delete and rename saved **Notes**.



Notes borders can be formatted as described in Using the Format Panel



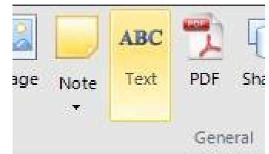
See Working With Text-Based Objects for information about formatting text.

See Saving Templates and Defaults for information on saving **Notes** entities for future use.

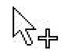
11.3.12 Text

Text can be inserted on a ***Page*** for various reasons. This section does not apply to editing text in other objects.

To insert **Text**, click the **Text** button on the **Insert** *tab* of the **Print Editor Ribbonbar**.



Text is placed by left-clicking the mouse in the desired location as described in [Placing Objects](#).



The **Text** entity is a pre-formatted container that holds a large *text box*. To edit the content, simply left-click the object to make it active, and then left-click it to activate text editing.

Click in "whitespace" to end editing and apply changes.

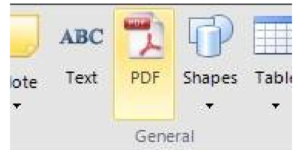
Text borders can be formatted as described in [Using the Format Panel](#). Unlike text in the **Design Environment**, **Text** can be formatted like most Windows-based applications allow.

See [Working with Text-Based Objects](#) for information on formatting **Text.**

11.3.13 PDF

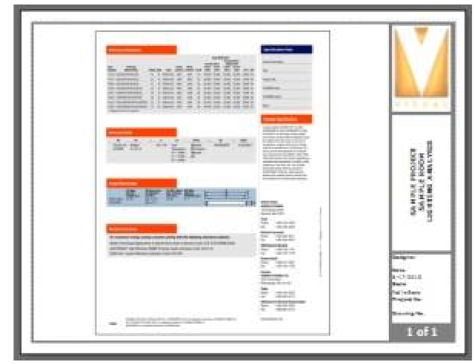
The **PDF** (function) allows for specification sheets not in the Acuity Product Database, *lamp* and ballast information, or other elements to be inserted in the **Print Editor**, just like PDF specification sheet **Products**. **PDFs** are placed one sheet at a time onto a **Page**.

To place a **PDF** page from a file, click the **PDF** button on the **Insert** *tab* of the **Print Editor Ribbonbar**. Clicking the button opens a file selection *dialog* standard to Windows-based applications. Select the desired file as normal.

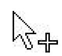


The **PDF** ***Dialog*** will be initiated, which allows for the selection of one of the pages contained in the PDF file. Multiple insertions can be executed to place all pages if necessary.

Click the *Next* and *Previous* buttons below the snapshot to display the desired page. Click *OK* to place the object. Click *Cancel* to close without changes.



PDFs are placed by left-clicking the mouse in the desired location as described in Placing Objects.



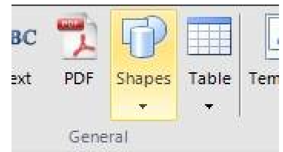
Once placed, **PDFs** behave like an **Image** in **Print Editor** and can be modified as described in Images.

PDF Page borders can be formatted as described in Using the Format Panel.

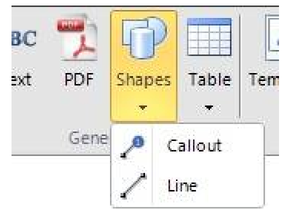
11.3.14 Shapes

Shapes provide basic elements to augment a ***Page***.

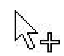
To insert a **Shape** on a ***Page***, click the **Shapes** button on the Insert *tab* of the **Print Editor Ribbonbar**.



Clicking the **Shapes** button initiates a sub-menu that allows for selection of one of the available elements. Left-click the desired element.

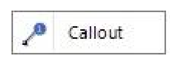


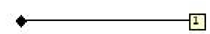
Shapes are placed by left-clicking the mouse in the desired location as described in [Placing Objects](#).



A **Line** provides a straight segment and two nodes.

A **Callout** provides a straight segment, a node, and a (by default) numbered textbox.





Lines and **Callouts** can be moved by left-click-dragging the object with the mouse.

Lines and **Callouts** can be changed in length and orientation by left-clicking the object to make it active, then performing a left-click-drag on one of the end *grips*.

Callout text can be edited by using the advanced **Properties** *tab* in the **Print Editor Sidebar**. Left-click the object to make it active and modify the text as necessary in the *text box* of the Content section.

Modifications to **Shapes** are made in the **Format** *panel* of the **Properties** *tab* in the **Print Editor Ribbonbar**. See [Using the Format Panel](#).

11.3.15 Table

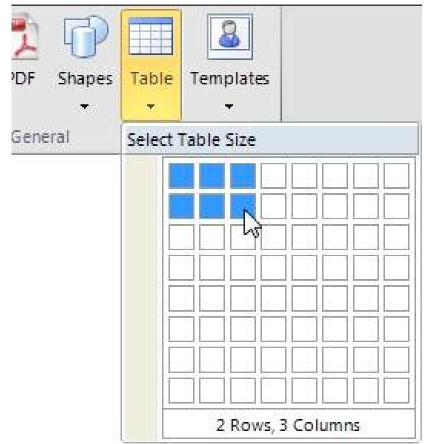
Tables allow for the inclusion of tabular data on a ***Page***.

To insert a **Table**, click the **Table** button on the **Insert** *tab* of the **Print Editor Ribbonbar**.

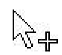
Clicking the button initiates the **Table** ***Dialog*** that allows for specification of **Table** size. Place the mouse over the location that yields the desired number of rows and columns.

Note that a **Table** title row and header row will be automatically inserted in addition to the number of rows chosen.

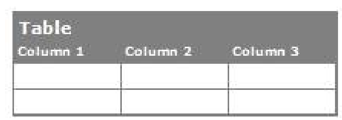
The example at right places two rows and 3 columns as shown below.



Tables are placed by left-clicking the mouse in the desired location as described in [Placing Objects](#).



Visual uses the default formatting for the new **Table** and provides placeholder text for the title and header row in addition to the chosen number of rows and columns. At right, the two rows and three columns shown in the selection from the **Table** ***Dialog*** above have been used to create a new **Table**.



See [Working With Text-Based Objects](#) for information about editing headers.

See [Working With Tabular Objects](#) for information on formatting; e.g. borders and shading.

Visual has default settings of common content. The default may differ on any one computer based on user choices; see [Saving Templates and Defaults](#).

11.3.16 Templates

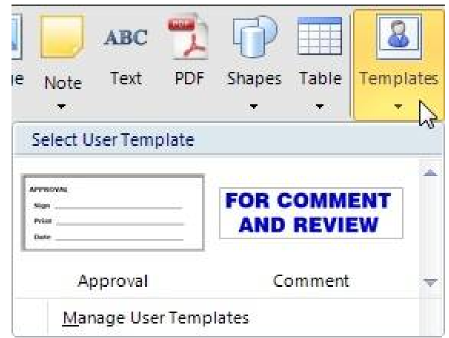
Templates are user-defined objects based on standard **Print Editor** objects.

To insert a ***Template*** object, click the ***Template*** button on the Insert *tab* of the **Print Editor Ribbonbar**.

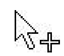
Clicking the button initiates the ***Template Dialog*** that allows for the choice of one of the pre-defined **Templates**.

Templates must first be created as described in [Saving Templates and Defaults]() to be displayed and therefore inserted with this *dialog*. **Templates** may not exist on a given computer; Visual does not include **Templates**.

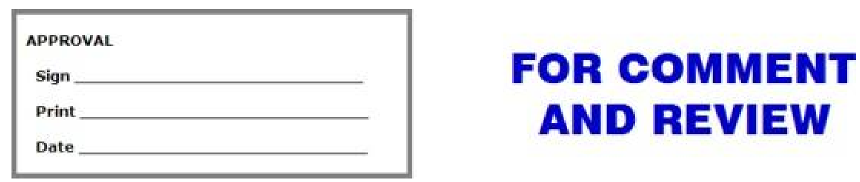
(Note that the *dialog* graphic at right has been modified for the purpose of this manual.)



Left-click the desired ***Template*** object from the *dialog*. **Templates** are placed by left-clicking the mouse in the desired location as described in [Placing Objects]().



Once placed, the object can be moved, edited, formatted or otherwise manipulated as normal. See the appropriate section in this chapter for information on any of the object types.

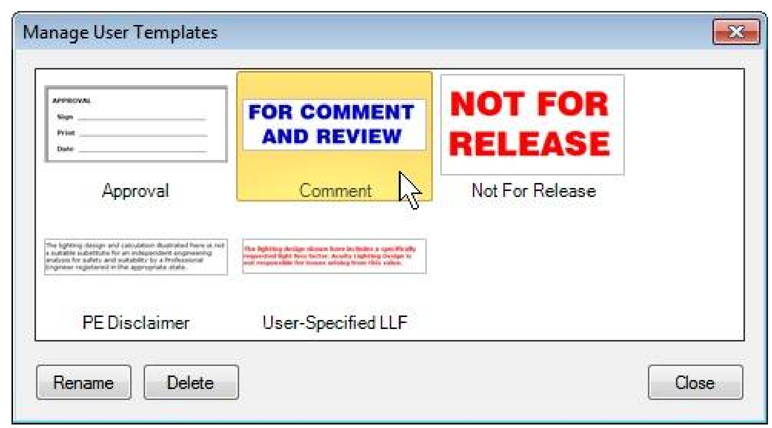


Using the *dialog*, clicking *Manage User Templates* initiates a *dialog* window that allows ***Template*** objects to be renamed and deleted.

To rename an object, left-click the desired object and click the *Rename* button at the bottom of the *dialog*. Visual will initiate a *dialog* to select a new name.

To delete an object, left-click the desired object and click the *Delete* button at the bottom of the *dialog*. Deletion cannot be undone.

(Note that the *dialog* graphic at right has been modified for the purpose of this manual.)



See [Manipulating Pages]() for information on saving ***Page*** **Templates**.

11.4 Modifying Pages

Pages and objects can be modified in various ways in the **Print Editor**.

Be sure to review Selecting Objects for information on choosing objects to modify.

11.4.1 Manipulating Pages

Whole **Pages** can be controlled in **Print Editor**.

Page Order

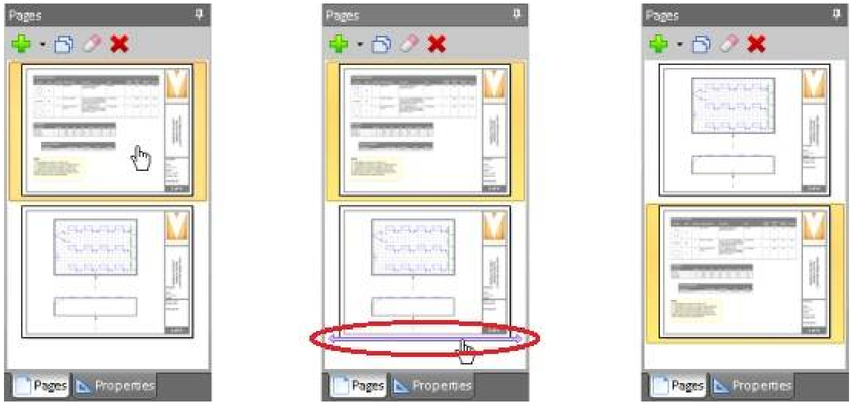
The order of **Pages** can be manipulated in the **Print Editor Sidebar**.

To change the order of **Pages**, left-click the **Pages** tab in the **Print Editor Sidebar** to make it active if it is not already active.

Select the desired ***Page*** by left-clicking.

Left-click-drag the desired ***Page*** to the new location; Visual indicates the new location with a blue line.

Release the mouse to move the ***Page***.

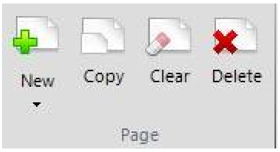


Modifying Whole Pages

The ***Page*** *panel* of the **Print Editor Ribbonbar** can be used to create or modify whole **Pages**.

The ***Page*** *panel* contains buttons to create **New Pages** as well as **Copy**, **Clear**, and **Delete** whole **Pages**. These buttons are duplicated (in a smaller fashion) at the top of the ***Page*** tab of the **Print Editor Sidebar**.

Commands operate on the **Active *Page***. To make a ***Page*** the **Active *Page***, left-click it in the **Pages** tab of the **Print Editor Sidebar**. The ***Page*** will be displayed in the ***Page*** **Layout Window**.



Clicking the upper portion of the **New** button creates a **New** ***Page*** based on the **Default** ***Page*** (as defined in the **New** ***Page Dialog***) in the last position in the **Pages** tab of the **Sidebar**.

Note that the **Default** ***Page*** may vary from that shown at right.

The **New** button is dual-function; clicking the lower portion initiates the **New** ***Page Dialog***.

Left-click the desired *page* and Visual will insert that *page* type in the last position in the **Pages** tab of the **Sidebar**.

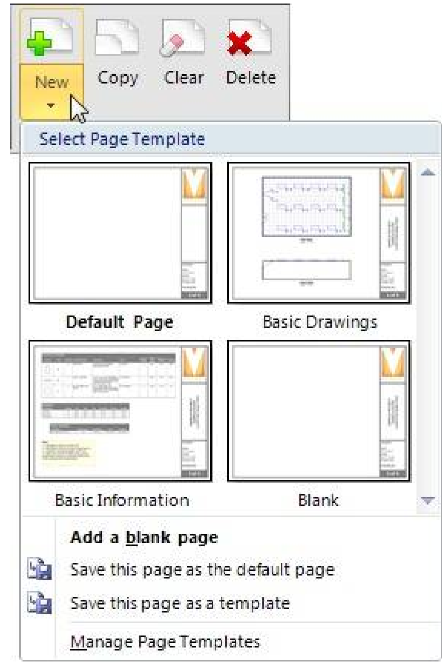
Add A Blank Page will insert a blank *page* with no objects in the last position in the **Pages** tab of the **Sidebar**.

Save this page as the default page saves the active *page* (displayed in the ***Page*** **Layout Window**) as the default to be used for all new **Pages**.

Save this page as a template saves the active *page* (displayed in the ***Page*** **Layout Window**) as a *template*. a *dialog* will be displayed to name the ***Page Template*** and it will be shown in the **New** ***Page Dialog***.

Manage Page Templates initiates a *dialog* discussed below.

(*Dialog* modified to fit in view at right.)

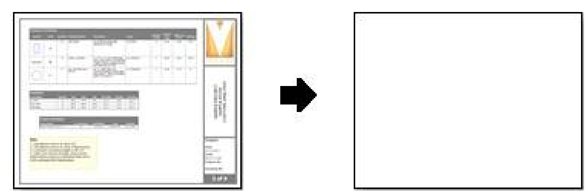


The **Copy** button duplicates the **Active** ***Page*** including all objects on the ***Page*** and places the ***Page*** copy in the last position in the **Pages** tab of the **Sidebar**.

To make a ***Page*** the **Active** ***Page***, left-click it in the **Pages** tab of the **Print Editor Sidebar**.

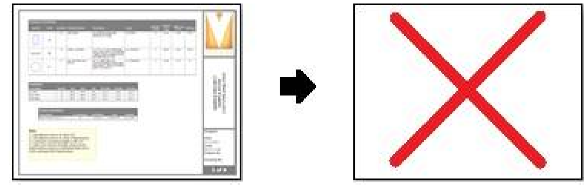
The **Clear** button removes all objects from the **Active** ***Page***.

To make a ***Page*** the **Active** ***Page***, left-click it in the **Pages** tab of the **Print Editor Sidebar**.



The **Delete** button removes the entire **Active *Page***, which of course includes all objects on the ***Page***.

To make a ***Page*** the **Active *Page***, left-click it in the **Pages** tab of the **Print Editor Sidebar**.

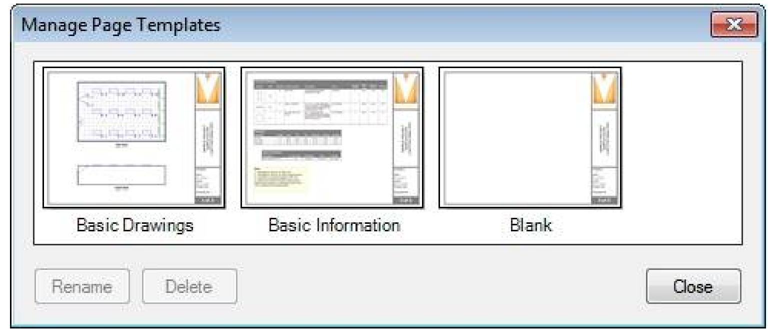


Using the *dialog*, clicking *Manage Page Templates* initiates a *dialog* window that allows ***Template* Pages** to be renamed and deleted.

To rename a ***Page***, left-click the desired ***Page*** and click the *Rename* button at the bottom of the *dialog*. Visual will initiate a *dialog* to select a new name.

To delete a ***Page***, left-click the desired ***Page*** and click the *Delete* button at the bottom of the *dialog*. Deletion cannot be undone.

(Note that the *dialog* graphic at right has been modified for the purpose of this manual.)

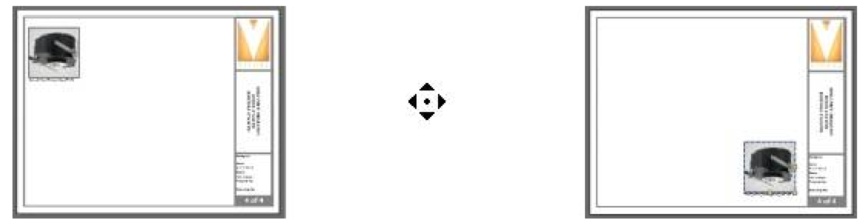


11.4.2 Editing the Page Layout

Object placement can be changed at any time once an object is placed.

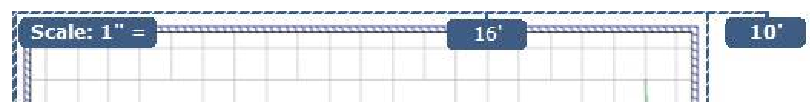
Objects are moved based on the **Snap** setting in the **Print Editor Status Bar**. A yellow highlight to the **Snap** button indicates objects will be placed on the **Snap Grid** as defined by the adjacent listbox. To change the **Snap Grid**, select the desired value from the choices in the sub-menu. The current value will have a yellow check to the left of the value.

To **Move** an object, left-click-drag the object to the desired position and release the mouse to change the placement. As the mouse is being held, the cursor will change to a 4-arrow *symbol* indicating a move is in progress. When the mouse is released, the object will still be the **Active Object** to aid in further modifications.



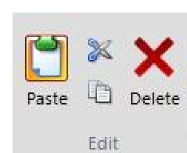
When the mouse cursor is over a **Grip** (yellow boxes on the perimeter of an object), a double-arrow will be displayed. Left-click any grip, hold, and move the mouse to change the size of the object. When the left-click is being held, the mouse cursor will be a pointing finger. Release the mouse to apply the change.

As the mouse is moved when scaling, Visual displays different scales at the top of a ***Drawing*** to aid in sizing to fit the ***Page***. The blue size tag that will be used as the scale when the mouse is released will have bold white text as in "10' " at right.



As the mouse is moved when scaling an **Image**, Visual displays different the resulting scale factor of the **Image** to aid in sizing to fit the ***Page***. The blue size tag shows the scale that will be used when the mouse is released.

Objects can be modified with **Cut**, **Copy**, and **Paste** as normal in Windows-based applications. **Delete** removes the object without placing it on the Visual Clipboard. Make the object the **Active Object** and select the appropriate button from the **Edit** *panel*. Alternately, the **Context-Sensitive Menu** can be used to access the commands.

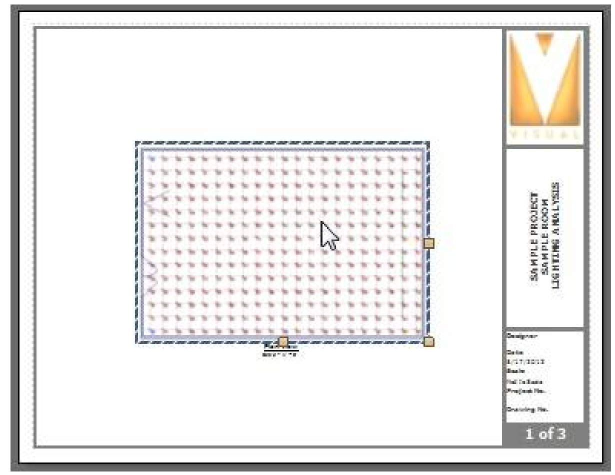


Note that objects can be placed on top of other objects, which may be useful when **Drawings** contain a good deal of whitespace. See Context Sensitive Menus for information on controlling which objects are in front of other objects with **Send to Back** and **Bring to Front**.

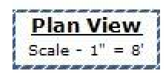
11.4.4 Modifying Drawings

Once placed, **Drawings** can be modified in many ways.

To modify a ***Drawing***, left-click the ***Drawing*** to be modified. Visual will highlight the ***Drawing*** with a dashed border and provide *grips*.

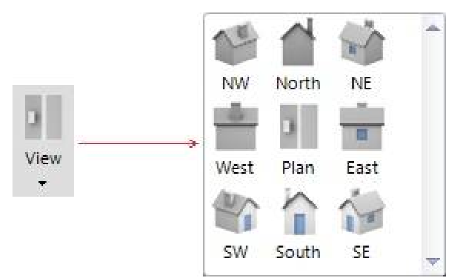


Drawings are by default given a name that is placed below the ***Drawing*** on the ***Page***. This name can be moved by left-clicking it separately, and moving it with a left-click-drag operation as should be expected. The text that appears (other than the scale text) can be modified by using the advanced **Properties** *tab* in the **Sidebar**; the **Text** field in the **Content** sub-section is where alternate text can be input. The name can be deleted by highlighting it individually and clicking the **Delete** button in the **Ribbonbar** or pressing the *Del* key.

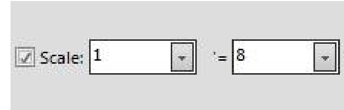


The **Properties** *tab* is displayed in the **Print Editor Ribbonbar**. The ***Drawing*** *panel* contains elements to modify the selected ***Drawing***.

The **View** button initiates the same drop-down graphical menu used at initial creation, and thus changes the view direction. Simply left-click the desired view direction and the change is applied.



The **Scale** checkbox tells Visual to apply a particular **Scale** to the ***Drawing***. The default for orthogonal views is to use a **Scale**. The default for isometric views is to not use a **Scale**. Make selections from the combo boxes, type custom values as desired, or use the *grips* as described below.



See http://en.wikipedia.org/wiki/Architect%27s_scale and http://en.wikipedia.org/wiki/Engineer%27s_scale for information on scaling drawings.

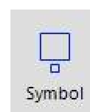
Contours is a *toggle button* that turns on or off the display of **Contour Lines**. This does not override the setting in the **Design Environment**; i.e. to display **Contour Lines** in **Print Editor**, they must be turned on in the **Design Environment**. The feature is on when the button is gold. See Setting and Displaying Contours for more information.

Labels is a *toggle button* that turns on or off the display of ***Luminaire*** **Labels**. This does not override the setting in the **Design Environment**; i.e. to display ***Luminaire*** **Labels** in **Print Editor**, they must be turned on in the **Design Environment**. The feature is on when the button is gold. See Luminaire Display Options for more information.

Masks is a *toggle button* that turns on or off the display of **Calculation Zone Mask** boundaries. This overrides the **Design Environment** setting if necessary. See Masking Calculation Zones for more information.

Templates is a *toggle button* that turns on or off the display of ***Luminaire*** **Templates**. This does not override the setting in the **Design Environment**; i.e. to display **Templates** in **Print Editor**, they must be defined and turned on in the ***Luminaire*** **Schedule** and **Design Environment**. The feature is on when the button is gold. See Luminaire Display Options and Luminaire Templates for more information.

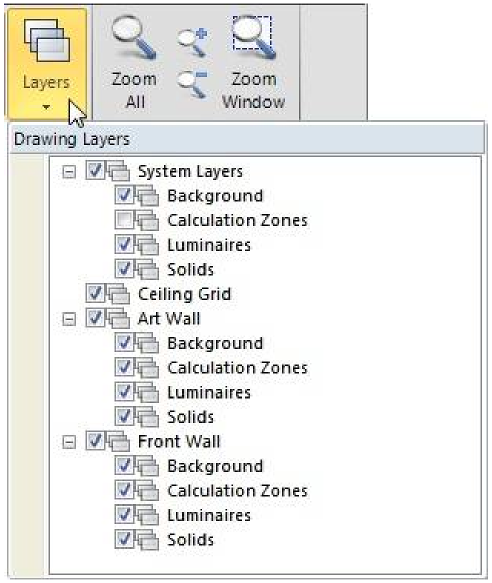
Symbol is a *toggle button* that turns on or off the solid fill shading of ***Luminaire*** **Symbols**. This can be useful in site lighting projects where the size of the project dwarfs the *luminaires* and they can be hard to see. Note that turning this feature on likely blocks the view of information "below" the *luminaires*; i.e. **Calculation Zone** point illuminances.



Web is a *toggle button* that turns on or off the display of ***Photometric*** **Webs** for all ***Luminaires***. This overrides the display setting in the **Design Environment** and will turn on ***Photometric*** **Webs** even if they are turned off there. See Luminaire Display Options for information.

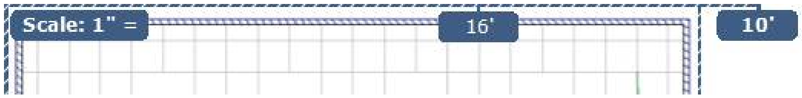
Clicking the **Layers** button initiates the ***Drawing*** **Layer** ***Dialog*** that allows for each **Layer** defined in the **Design Environment** to be turned on or off by placing a check in the related box (to turn a **Layer** on). This can be used to override Visibility settings in the Layer Manager.

Layers made **Invisible** in the **Design Environment** will be unchecked as is shown at right for the **Calculation Zones System Layer**.



When the mouse cursor is over a grip (yellow boxes on the perimeter of an object), a double-arrow will be displayed. Left-click any grip, hold, and move the mouse to change the size of the object. When the left-click is being held, the mouse cursor will be a pointing finger. Release the mouse to apply the change.

As the mouse is moved when scaling, Visual displays different scales at the top of a ***Drawing*** to aid in sizing to fit the ***Page***. The blue size tag that will be used as the scale when the mouse is released will have bold white text as in "10' " at right.



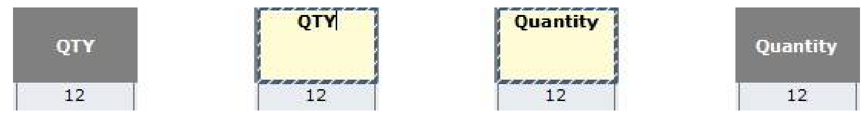
11.4.3 Working with Text-Based Objects

Regardless of where text occurs (**Text**, **Notes**, or text in part of an object), text is modified with the same methods.

To select text, left-click a **Text** object, a field in a table or **Title Block**, or text that is part of another object. The selected text is highlighted for identification.

Text fields connected to data in the **Design Environment** cannot be edited for content. For example, ***Luminaire Type*** information, **Calculation Zone** names, and **Calculation Zone** statistical values.

Text can be edited by left-clicking the object (or field) once it is the **Active Object** (or field). The mouse cursor changes to the standard I-bar used in Windows-based applications when editing text. To close text editing of the object, simply left-click anywhere in the **Page Layout** whitespace. For example, at right, a ***Luminaire*** **Schedule** column header is modified.



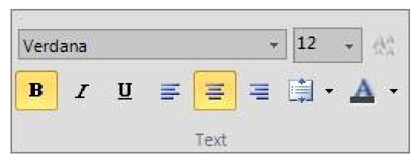
Note that in this manual, "text" refers to alphanumeric characters. "**Text**" (when seen in bold) refers to the **Text** object that can be inserted.

Text Panel

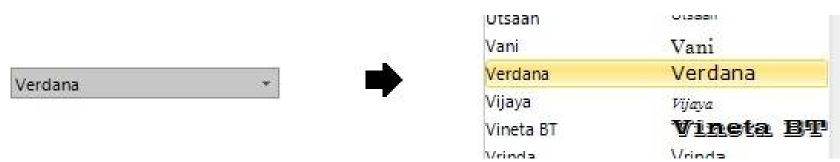
The **Text** *panel* is shown in the **Properties** *tab* of the **Ribbonbar** whenever the **Active Object** contains a text component that can be modified with these features.

The **Text** *panel* provides access to the available formatting options for text in Visual. Most functions and buttons are common to Windows-based applications.

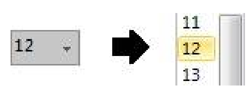
Yellow highlighted buttons indicate currently selected options.



Font shows the currently selected style by name. Clicking the button initiates a sub-menu showing the currently selected font and all available Windows system fonts.



Font Sizes shows the currently selected size. Clicking the button initiates a sub-menu showing the currently selected size in yellow and all available sizes.



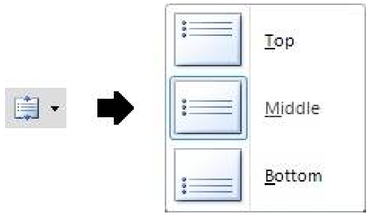
Bold makes all text in the selected object bold.

Italic makes all text in the selected object have italic formatting.

Underline makes all text in the selected object have an underline.

Horizontal Alignment changes the alignment of all text in the selected object. Left, center, and right alignment are available. A yellow highlighted button indicates the currently selected option.

Vertical Alignment changes the alignment of all text in the selected object. Clicking the button initiates a sub-menu with top, middle, and bottom alignment options.



Font Color initiates a condensed version of the **Color *Dialog***. See [Using the Color Dialog](). The currently selected color is shown in the **Color *Dialog*** with a yellow border.

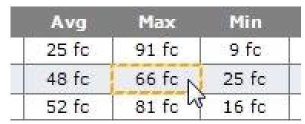
The colored bar below the "A" on the button shows the currently selected color when the *dialog* is collapsed. For example, red, green, and blue are shown at the far right.

11.4.5 Working With Tabular Objects

Tabular objects (tables) in **Visual Print Editor** have common modification capabilities. This applies to **Luminaire Schedule**, **Luminaire Locations**, **Statistics**, **Power Statistics**, **Surface Schedule**, and user-created **Tables**. Note that "tables" is the generic term used here, and **Tables** are the specific entity that can be inserted on a ***Page***.

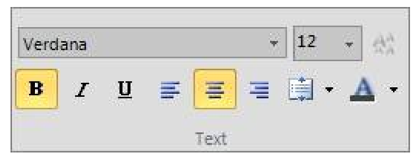
To modify a table, it must be made the **Active Object** by left-clicking it. The specific location the mouse is clicked will place focus on one of the sub-elements of the table. This may be one of the headers or a specific cell.

Left-clicking a particular field will put focus on that field for formatting. Visual highlights the cell that the mouse is over for easier selection. Focus can be placed on other fields by simply left-clicking them. This includes headers and table names.

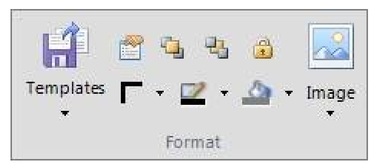


Avg	Max	Min
25 fc	91 fc	9 fc
48 fc	66 fc	25 fc
52 fc	81 fc	16 fc

The text in any cell can be formatted with the **Text** *panel* in the **Print Editor Ribbonbar**. See Working with Text-Based Objects for more information.

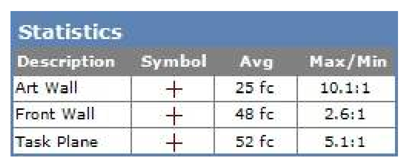


Cell and table formatting (border, fill, etc) is modified with the **Format** *panel*. See Using the Format Panel for more information.



Clicking the table name header will select the entire object for formatting. For example, **Border Color** can be changed to blue.

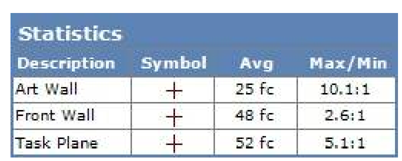
Note: to change the fill of the title cell, select the title text and apply the formatting desired, which has also been done in the example at right.



Statistics			
Description	Symbol	Avg	Max/Min
Art Wall	+	25 fc	10.1:1
Front Wall	+	48 fc	2.6:1
Task Plane	+	52 fc	5.1:1

Formatting a single header row cell applies formatting to the entire header row.

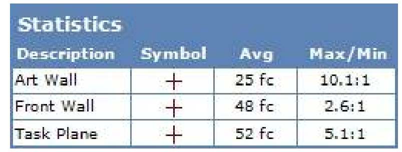
When focus is placed on a header cell, Visual initiates the content editing mode, which can be ignored and formatting can be applied as desired. At right the **Fill** for the header row has been changed to blue.



Statistics			
Description	Symbol	Avg	Max/Min
Art Wall	+	25 fc	10.1:1
Front Wall	+	48 fc	2.6:1
Task Plane	+	52 fc	5.1:1

To format the cell borders for the entire table, click any content cell (i.e. not a header or title cell) and apply formatting as desired.

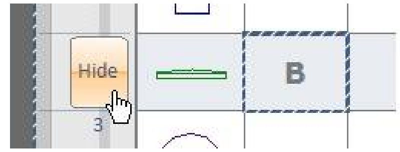
At right the **Border Color** for the data grid has been changed to blue.

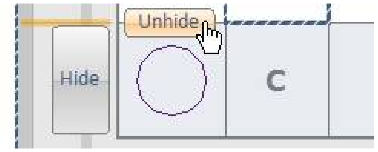


Statistics			
Description	Symbol	Avg	Max/Min
Art Wall	+	25 fc	10.1:1
Front Wall	+	48 fc	2.6:1
Task Plane	+	52 fc	5.1:1

Clicking the **Hide** button on the far left of a row will collapse the row and make it invisible.

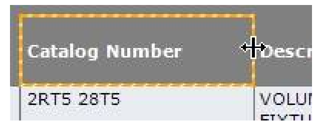
To make the row visible again, hover the mouse over one of the adjoining rows and click the **Unhide** button that will appear when rows are hidden. This function **Unhides** all rows.





Column widths can be changed individually by placing the mouse cursor in the header row at the junction between two columns. The mouse cursor will change to a double left-right arrow as is customary in Windows-based applications.

Row height cannot be edited as such; height is determined by the content.

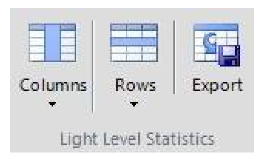


The number of rows displayed in a tabular object can be increased or decreased by using a left-click-drag operation to move the Rows button up or down. The mouse cursor changes to a double arrow as is customary in Windows-based applications.

Once a table is selected, the **Properties** *tab* is displayed in the **Print Editor Ribbonbar**.

The **Text** *panel* is displayed to modify text. See [Working with Text-Based Objects](#).

A table *panel* will be displayed at the far-right end of the Ribbonbar that will have a *label* equal to the object type selected.



Columns initiates a sub-menu that shows all available columns and the currently visible columns as indicated by blue checkmarks.

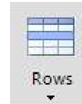
Left-click a column name to either make it visible or invisible depending on the current state as indicated by the checkmark.

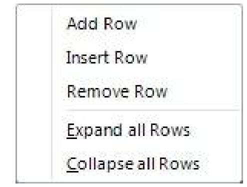
See the manual sections for particular objects for a listing of columns for each object type. At right, the sub-menu for a **Power Density Statistics** table is shown.

Rows initiates a sub-menu with options to manipulate entire rows. The impact of each choice is obvious based on the name.

When a standard tabular object is selected, some options are not valid. For example a ***Luminaire*** **Schedule** row could not be inserted without defining a new ***Luminaire*** **Type** in the **Design Environment**.

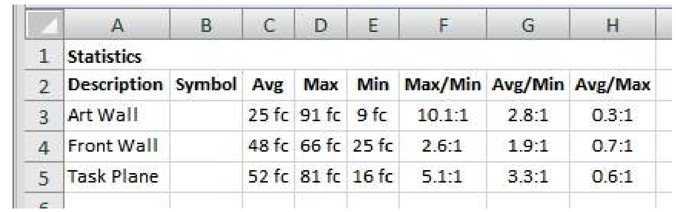
When a **Table** is selected, content is fully customizable, so Visual activates all options as seen at far right.





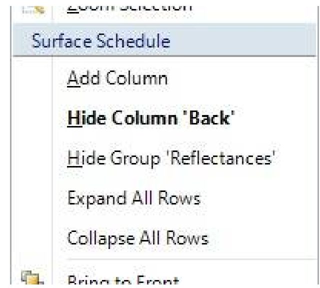
Export initiates the standard Windows *Save As Filename dialog* for specification of a filename and location to save a Microsoft Excel (*.XLS) format file of the content of the **Active Object**.

Depending on specific systems, Microsoft Excel may produce a warning message when the exported file is opened. It is fine to ignore this "trusted source" message.



	A	B	C	D	E	F	G	H
1	Statistics							
2	Description	Symbol	Avg	Max	Min	Max/Min	Avg/Min	Avg/Max
3	Art Wall		25 fc	91 fc	9 fc	10.1:1	2.8:1	0.3:1
4	Front Wall		48 fc	66 fc	25 fc	2.6:1	1.9:1	0.7:1
5	Task Plane		52 fc	81 fc	16 fc	5.1:1	3.3:1	0.6:1

When a right-click is issued on a tabular object, Visual adds a section near the top of the ***Context-Sensitive*** **Menu** specific to the manipulation of tables. At right, the example menu is related to a **Surface Schedule**; the blue bar will indicate which type of object was clicked.



Add Column - add an unnamed column related to where the mouse was clicked

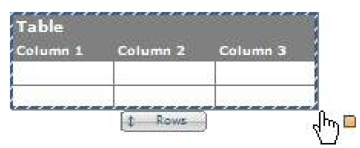
Hide Column [*column name***]** - hide the current column; [*column name*] will change depending on the column selected.

Hide Group [*group name***]** - hide the entire group of columns of which the currently selected column is part; [*group name*] will change depending on the object type and column selected.

Expand All Rows - expand all rows that have been **Hidden** or opens sub-*luminaire* definitions for a multi-head ***Luminaire*** **Type** when a ***Luminaire*** **Schedule** has been clicked; See Luminaire Schedule.

Collapse All Rows - collapse all sub-*luminaire* definitions for a multi-head ***Luminaire*** **Type** when a ***Luminaire*** **Schedule** has been clicked; See Luminaire Schedule.

To scale a tabular object (which linearly increases or decreases content including font size, use the *grips* to left-click-drag: Left-click the mouse on a yellow grip, hold the mouse button, and drag until the desired size or scale is achieved.



11.4.6 Using the Image Preview

The **Image Preview** provides an interface to modify some properties of an **Image**.

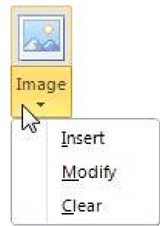
Once inserted, an **Image** can be modified using the **Image** button on the **Properties** *tab* of the **Print Editor Ribbonbar** that is initiated after left-clicking the **Image**.

The **Image** button is dual-function. Left-clicking the lower portion initiates a sub-menu with three choices:

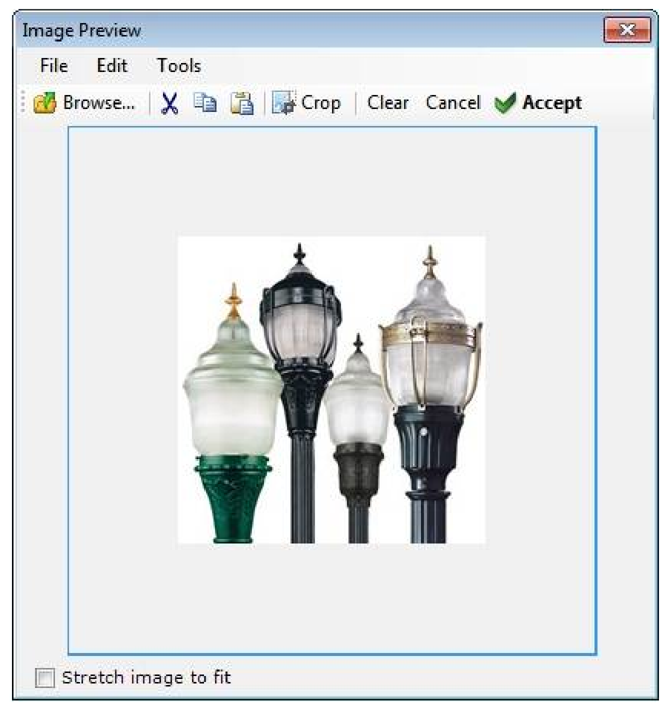
Insert - initiates a file selection *dialog* to choose a file or to change the file associated to the **Image.**

Modify - initiates the **Image Preview *Dialog***; the same as clicking the upper half of the button.

Clear - removes the associated **Image** file. Note that the title text will remain unchanged.



Clicking the upper portion of the button initiates the **Image Preview *Dialog***.



Browse - initiates a file selection *dialog* to change the file associated to the **Image.**

Crop - reduces the **Image** to a previously selected area. First left-click to start defining a window and then left-click a second time to complete the window. Visual shows the selected area with a dashed border. Click the **Crop** button to apply the command.

Cancel - exits the *dialog* without any changes.

Accept - exits the *dialog* and applies changes.

File Menu - contains **Open** and **SaveAs** commands. This can be useful to save **Product Images** from the Acuity Brands Database.

Edit Menu - contains **Cut**, **Copy**, **Paste**, and **Clear** (same as the button) commands.

Tools Menu - contains **Rotate**, **Crop** (same as the button), and ***Reflection*** **Effect** commands. The ***Reflection*** **Effect** provides augmentation with a horizontal mirror line and an image modification that mimics a *reflection*.

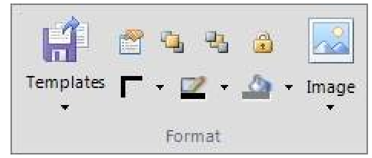
Stretch Image to Fit - enlarges the image without changing aspect ratio.

Other parameters can be modified in the **Format Panel**.

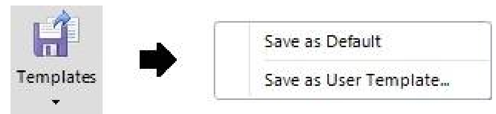
11.4.7 Using the Format Panel

The **Format** *panel* is shown in the **Properties** *tab* of the **Ribbonbar** whenever an object has been selected in the ***Page*** **Layout**. See [7.2.4 Selecting Objects](#) for information on making an object the **Active Object**.

The **Format** *panel* provides access to the available formatting options for objects in Visual. Most functions and buttons are common to Windows-based applications.



Templates initiates a sub-menu that allows the **Active Object** to be saved as the default to be used for that object type or simply as a ***Template*** as discussed in [7.6 Saving Templates and Defaults](#).



Properties launches the **Properties** bar on the right of the screen.

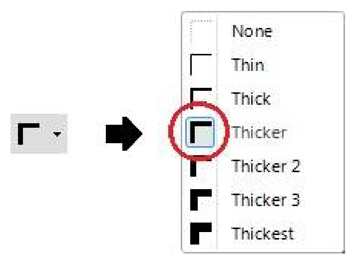
Bring To Front moves the **Active Object** in front of all other objects on a ***Page***.

Send To Back moves the **Active Object** behind all other objects.

Lock constrains the position of the **Active Object** so it cannot be moved. This button is a *toggle button* in that when selected it will be highlighted in yellow and is then on. Clicking the button again will turn off the feature. Locked objects will have a lock *symbol* in the upper-left corner when they are made the **Active Object**.

Border Thickness initiates a sub-menu that provides various thickness options. Thickness increases by one pixel per choice. The currently selected option is shown with a blue highlight.

The button graphic shows the currently selected **Border Thickness**. Color does not change.



Border Color initiates a condensed version of the **Color *Dialog***. See [Using the Color Dialog](). The currently selected color is shown in the **Color *Dialog*** with a yellow border.

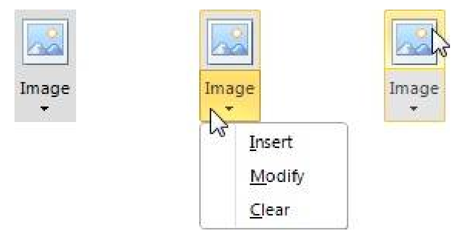
The colored bar on the button shows the currently selected color when the *dialog* is collapsed. For example, red, green, and blue are shown at the far right.

Fill initiates a condensed version of the **Color *Dialog***. See [Using the Color Dialog](). The currently selected color is shown in the **Color *Dialog*** with a yellow border.

The colored bar on the button shows the currently selected color when the *dialog* is collapsed. For example, red, green, and blue are shown at the far right.

Image is a dual-function button that initiates a sub-menu or launches the **Image Preview**.

Complete functionality is described in [7.4.5 Using the Image Preview]()

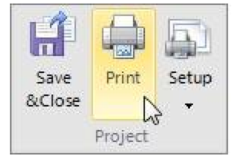


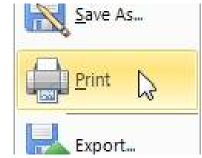
Some **Format** *panel* buttons will not be active for certain object types: **Fill** is not valid for an **Image** and is inactive, **Image** is not valid for a tabular object and is inactive, etc.

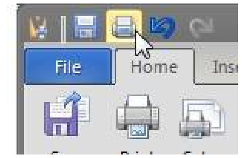
11.5 Printing

Once **Pages** include all desired objects and have been appropriately organized and formatted, **Print** completes the process by making paper or PDF versions of the **Pages**.

The **Print** command is accessed from the **Home** *tab* of the **Print Editor Ribbonbar**. Additionally, the command can be found on the **File** menu and in the **Quick Access Toolbar**.

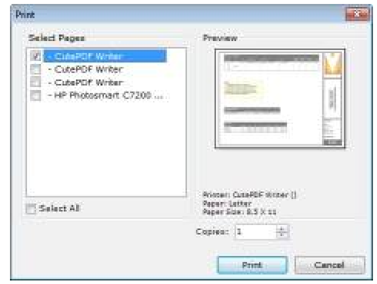






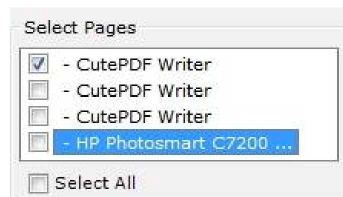
Clicking the **Print** button initiates the **Print** ***Dialog***.

The current ***Page*** (shown in the ***Page*** **Layout Window**) will automatically be selected as the sole ***Page*** for printing.



The **Select Pages** pane shows all **Pages** and the printer associated to it. Left-click the box next to a ***Page*** to select it for printing.

Alternately, click **Select All** to choose all **Pages**.



Clicking the ***Page*** name places a preview in the **Preview Pane**.

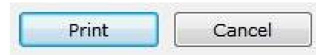
The bottom of the **Preview Pane** includes text describing the selected printer, paper size name, and paper size numerically.

At right, two previews are shown for two different [**Setup**]() scenarios.

The **Copies** textbox allows for the increase and decrease of the number of copies

with the up and down arrows respectively. Alternately, a numeric value may be input to the textbox.

Click **Print** to execute the command. Click **Cancel** to exit without printing.



See Creating a Page for information on changing printer associations and settings.

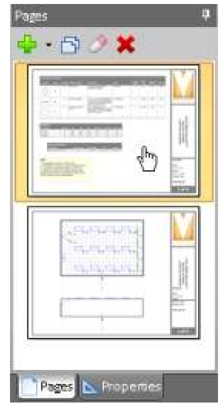
11.6 Saving Templates and Defaults

Objects can be saved as the default object to be used for the related object type and can be saved as named **Templates** for use in common scenarios. "Default" means that the ***Page*** or object will be used to define new insertions. "Template" means that the definition is saved to be used later if desired. The process for saving defaults and **Templates** is similar for **Pages** and objects; the process is discussed individually below..

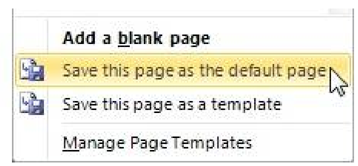
Page Templates and Defaults

To save a complete ***Page***, as a default or **Template**, the ***Page*** must be the **Active Page** in the **Page Layout Window**. Select the ***Page*** from the **Print Editor Sidebar**.

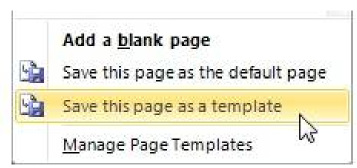
See Sidebar for information on selecting specific **Pages**.

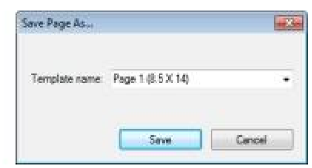


To save a complete ***Page*** as the default, select *Save this page as the default page* from the bottom of the *dialog* that results from clicking the **New Page** button on the **Page** *panel* of the **Print Editor Ribbonbar** or the **New Page** button in the **Sidebar**.



To save a complete ***Page*** as a template, select *Save this page as a template* from the bottom of the *dialog* that results from clicking the **New Page** button on the **Page** *panel* of the **Print Editor Ribbonbar** or the **New Page** button in the **Sidebar**. A *dialog* will be initiated to allow for naming of the **Template**.





See Manipulating Pages for information on using and managing ***Page*** **Templates**.

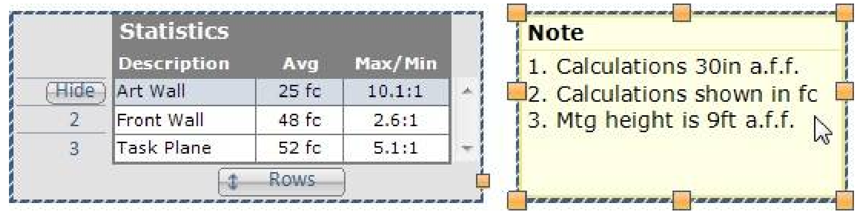
Object Templates and Defaults

The Visual command reference is available in the program and on www.visual-3d.com.

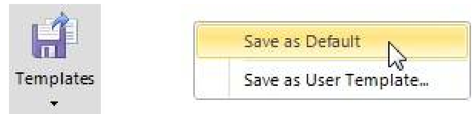
It has not been included here as a simple aid in reducing the page count if this PDF is printed.

To make an object (for example a ***Luminaire*** **Schedule** or **Note**) a default or a **Template**, it must be made the **Active Object**.

See [Selecting Objects]() for information on selecting objects.



To save any object as a default, select *Save as Default* from the sub-menu initiated after clicking the **Templates** button on the **Format** *panel* of the **Print Editor Ribbonbar**.



To save an object as a **Template**, select *Save as User Template* from the sub-menu initiated after clicking the **Templates** button on the **Format** *panel* of the **Print Editor Ribbonbar**. A *dialog* will be initiated to allow for naming of the **Template**.

See [Templates]() for information on using and managing object **Templates**.

Purge

Reduce file size by removing unused or unnecessary information

Instructions:

1. Select **Purge** from the **File Menu**
2. The **Purge File *Dialog*** will appear
3. Select any or all of the data types as described
4. Click OK

Command Keys:

None

Related Commands:

None

Related Help:

None

Related Videos:

None

Save

Save the current Visual file (*.VSL)

Instructions:

1. Select **Save** from the **File Menu**
2. If the current Visual file has not been previously saved the **File Selection** ***Dialog*** will appear so that a directory and filename may be specified
3. If the file has been previously saved, Visual will save the most recent information
4. The progress in the save process is shown in the **Status Bar**

Command Keys:

Ctrl+S

Related Commands:

Save As

Related Help:

Saving a Project

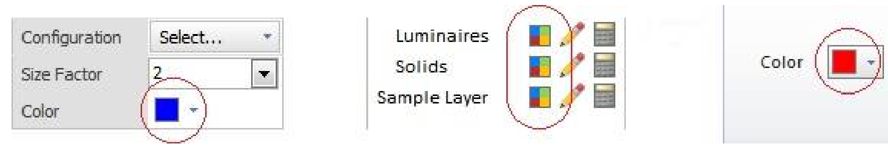
Related Videos:

None

13.1 Color

The **Color** ***Dialog*** is used in many instances in Visual to allow for **Color** selection.

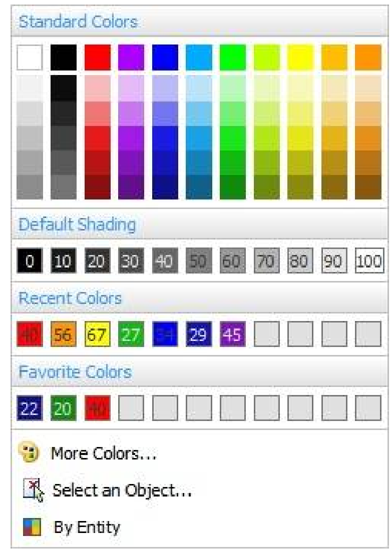
Depending on the context, there are different ways to initiate the **Color** ***Dialog***. The button is a color swatch and often has a small down-arrow next to it; the color of the swatch will vary based on default settings and user selection. Some examples of where the button appears are shown at right.



13.1.1 Color Dialog

The **Color** ***Dialog***> is used in the **Layer Manager** and the ***Luminaire*** **Editor**, as well as when constructing **Solid** and **Background** objects, **Calculation Zones**, and **Statistical Zones**. For specific information on how the **Color** ***Dialog*** relates to those commands, see the relevant sections in this manual.

The **Color** ***Dialog*** is a flyout composed of four *panels* and three commands.



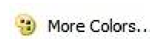
Standard Colors is a set of readily accessible choices covering a range large enough to allow for various objects to have different colors for easy reference.

Default Shading is a set of gray shades in 10% increments for ***Reflectance*** assignment when exact **Color** is not important.

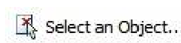
Recent Colors shows the last eleven **Colors** used. Each new **Color** chosen is amended to the left end of the row.

Favorite Colors are user-specified and saved as defaults to be used across multiple projects. To save a **Favorite Color** it must be in the **Recent Colors** *panel* (i.e. the **Color** must be previously selected for use). Right-click the mouse on the desired **Color** in the **Recent Colors** *panel* and select **Add to Favorites**. To delete colors, right-click the mouse on the desired color and select **Remove.**

The **More Colors** button initiates the **Color Selection** ***Dialog***. See [Using the Color Selection Dialog] for more information.

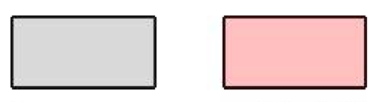


The **Select an Object…** command allows for the **Color** to be set by selecting an existing object.



The **By Entity** command appears in the **Color** ***Dialog*** when initiated from the **Layer Manager** and changes the assignment mode back to the default of **Color** being determined by entity properties if the **Layer** has been assigned a **Color**. See Layer Manager for more information.

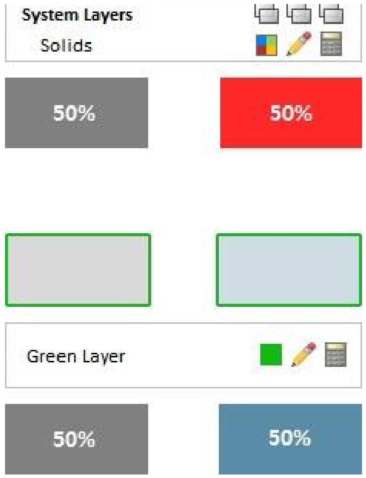
To select a **Color**, initiate the **Color** ***Dialog***, and then left-click the desired **Color**. The *dialog* will be closed and the **Color** assignment will be made.



The choice of a **Color** is only necessary if **Color Rendering** is a desired output from Visual. Grayscale choices yield the same numeric results as "colored" choices, assuming the ***Reflectance*** value is the same.

The Color and *Reflectance* chosen for **Solids** is independent of the **Layer Color**. The **Layer Color** is used to provide user feedback in the **Design Environment** and the **Color** and ***Reflectance*** is used for calculation.

On the right, the objects with a black border have different **Color** (and therefore ***Reflectance***) on the **Solids System Layer** (**Color** is **ByLayer**) and those with a green border are on a separate **Layer**, also with different **Color** (and ***Reflectance***). In **Shaded Display Mode** shown at the bottom, borders (drawn in the **Layer Color**) are not shown. The gray, red, and blue all yield the same calculational result because they are all 50% ***Reflectance*** .



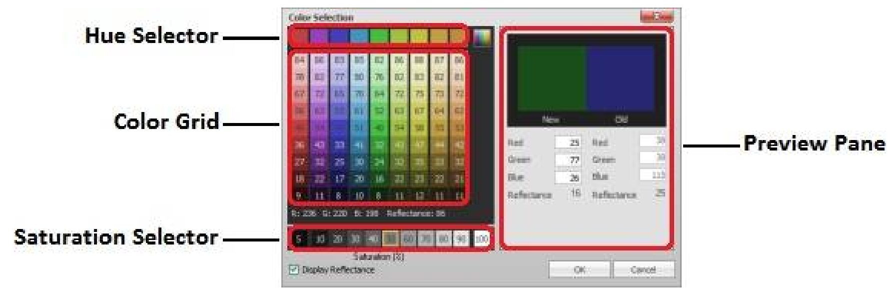
13.1.2 Using the Color Selection Dialog

The **Color Selection *Dialog*** is initiated with the **More Colors…** command in the **Color *Dialog***. This *dialog* is a hybrid 2-D implementation of the 3-D hue, saturation, and lightness (HSL) color *model* with red, green, and blue (RGB) inputs and information.

The *dialog* consists of a **Preview Pane**, a **Hue Selector**, a **Color Grid** containing **Color Swatches**, and the **Saturation Selector**.

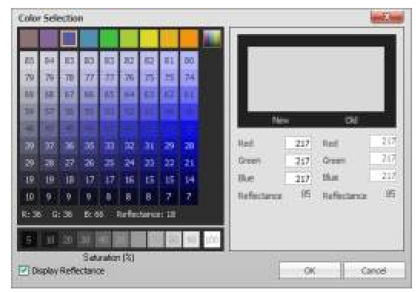
The **Display *Reflectance*** checkbox turns on or off the display of *reflectance* values in the **Color Grid**.

The **Preview Pane** shows larger swatches and more information. The Red, Green, and Blue (RGB) components are pre-loaded into text boxes for alternate modification via that color *model*. The aggregate ***Reflectance*** of the RGB values in the text boxes is shown below those fields. The currently assigned **Color** is shown as the "Old" **Color** in the **Preview Pane**.

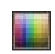


Clicking a button in the **Hue Selector** changes the grid to be (in effect) a more detailed set of hues of the chosen base color. Since saturation values are pre-set left-to-right (95% maximum on the right), the row of **Saturation Selector** buttons are disabled.

This process allows for each angular "lune" of hue (color) to be isolated in the HSL color *model*.



To reset the grid to display the original gamut of hues, click the multi-colored button at the upper right of the **Color Grid**.



Clicking a **Color Swatch** in the **Color Grid** places that **Color** in the **Preview Pane** for comparison and that **Color** will be applied if the **OK** button is clicked.

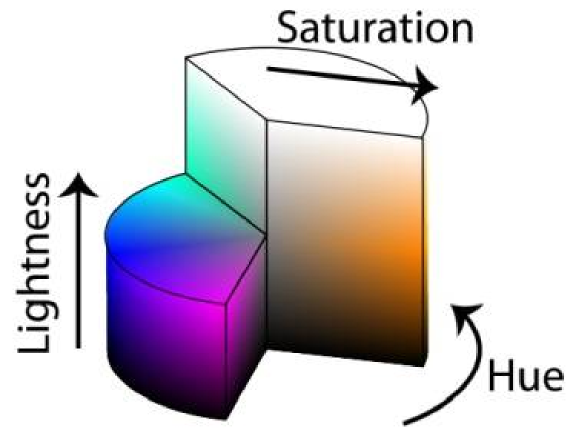
To close the *dialog* and apply the selected **Color** to the **Object** or **Layer**, click the **OK** button. Clicking the **Cancel** button closes the *dialog* without making changes.

Hue is what is most often referred to as "color" in English and this manual.

13.1.3 HSL Color Model

A brief discussion of the HSL color *model* is appropriate to understand how user input to the **Color Selection *Dialog*** impacts what is displayed.

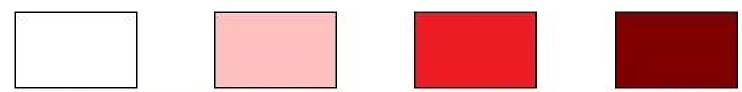
The HSL *model* is based upon traditional color mixing methods such as in mixing paint; brightly colored pigments are mixed with black or white to achieve lighter, darker, or in other words less colorful colors.



Hue is an attribute of visual sensation according to which an area appears to be similar to red, yellow, green, or blue, or a combination of any two of those colors. Hue is shown in the **Hue Selector** and the various columns in the **Color Grid**.

Saturation is the colorfulness of a stimulus relative to its own brightness. In Visual, this is a percentage value controlled by the **Saturation Selector** buttons at the bottom of the **Color Grid**. A saturation of 100% would yield the middle row in the **Color Grid** being the most colorful. For example, in RGB color space, this would be a “red” that was quantified as (255,0,0).

Lightness is the brightness relative to the brightness of a similarly illuminated white. Lightness varies with each row in the **Color Grid** with the middle row having a lightness of 0.5. Moving toward the top of the grid yields more mixture with white and moving toward the bottom of the grid yields more mixture with black. For example, this would respectively yield a “pink” and “burgundy” as shown at right.



RGB (255,255,255)	**RGB (128,0,0)**	**RGB (255,0,0)**	**RGB (255,191,191)**
HSL (0-360°,1,1)	**HSL (0,1,0.875)**	**HSL (0,1,0.5)**	**HSL (0,1,0.25)**

For more discussion of color *models* see http://en.wikipedia.org/wiki/HSL_and_HSV and http://en.wikipedia.org/wiki/Comparison_of_color_models_in_computer_graphics

13.2 Calculation Engine

This appendix contains discussion of the theory and methods used to generate calculations and renderings.

13.2.1 Introduction

Scope of calculations

The calculation engine used in Visual photometrically *models* the interaction of *luminaires*, sun, and sky in a user-specified environment that may consist of surfaces that absorb and reflect light which have arbitrary orientations and *planar* shapes. The detail and accuracy of the *photometric model* is sufficient to predict direct and *interreflected* illuminances at any array of points.

Geometric input

Surfaces that block, reflect, and/or transmit light can be *planar* polygons.

Photometric input

Luminaires

For electric lighting calculations, light sources are *luminaires* that have a specified luminous extent and an arbitrary luminous intensity distribution.

IES files, Elumet file, TM14 files

Luminaire data is assumed to be contained entirely within any of the three most commonly used data files for the transfer of *photometric* information. At a minimum, these files give the luminous extent, specify which of the standard *coordinate* systems is used to describe the luminous intensity distribution, list the angles of that *coordinate* system that are used, and list the luminous intensity values of the *luminaire* at those angles.

The Visual calculation engine assumes that *photometric* data files are in that form defined by IES/ANSI standard LM-63-02. The user interface to Visual converts any of the user-supplied *photometric* files to an equivalent LM-63-02 file and submits them to the Visual calculation engine.

Surfaces

Surfaces ("solids") specified by the user are single *planar* entities with a surface normal (perpendicular) derived from the order in which the user specifies the *vertices* of the *polygon* defining the shape and orientation of the surface. Single user surfaces are treated in the calculation engine as two surfaces, back-to-back, separated by an internally-determined incremental distance. They are assumed to have identical *photometric* properties.

Reflectance

Reflectance is assumed to be perfectly *diffuse* and can have values between 0.0 and 0. 999. *Reflectance* is specified in the Visual user interface in percentage form and any value specified as 100% is reduced to 0.999. Perfect diffusion permits the assumption that the amount and distribution of reflected light is independent of incidence direction.

Specular or so-called mixed *reflectance* cannot be modeled in Visual at this time.

Transmittance

Transmittance is assumed to be either perfectly *diffuse* or perfectly image preserving. *Transmittance* can have values between 0.0 and 1.0. *Transmittance* is specified in the Visual user interface in percentage form.

Perfectly diffuse transmittance permits the assumption that the amount and distribution of transmitted light is independent of incidence direction and that transmitted light has a *diffuse* distribution.

Perfectly image preserving *transmittance* preserves the direction of travel of the light, but reduces that amount. The value specified by the user is assumed to be that value of *transmittance* perpendicular to the surface. If the user-specified value of *transmittance* is less than 1.0 (100%), then it is assumed that glass is being used, and that the *transmittance* value depends on incident angle. In this case, the calculation engine automatically determines and uses the appropriate value of *transmittance* for the incidence angles involved.

Absorbtance

If the user-specified values of *reflectance* (ρ) and *transmittance* (τ) do not sum to 1.0, then the absorbtance of the surface is assumed to be $1\text{-}\rho\text{-}\tau$, and is the fraction of light lost by absorption in the surface.

Spectral reflectance and transmittance

The Visual calculation engine makes "the gray assumption"; that is, all reflectances, transmittances, and flux from light sources are assumed to be spectrally flat. That is, the *photometric* property is uniform throughout (and therefore independent of) visible wavelengths.

Although spectral uniformity is assumed, the values of *reflectance* and *transmittance* are not entirely uncoupled from a surface color specified by the user. The Visual user interface estimates a wide-band *reflectance* from the RGB values that define a user-specified color. If the user chooses to keep the color and the *reflectance* linked, notice is given if the specified color and *reflectance* are incompatible. For example, it is not possible for "brown" to have a high, wide-band *reflectance*.

Some surface colorizing effects can be generated in the renderings. See the section of Rendering.

13.2.2 Basic Calculation Procedure

Luminaires as light sources

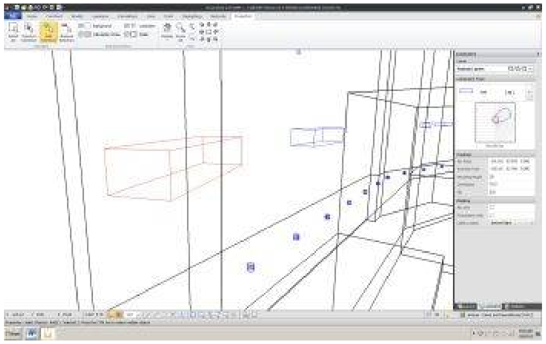
All *photometric* information about a *luminaire* is assumed to be contained in an IES/ANSI LM-63-02 formatted file. The luminous extent is specified with three local luminous dimensions: x, y, z. As defined in the standard, various combinations of zero, positive, and negative values are used to indicate various luminous forms. Regardless of the form indicated in the *photometric* data file, ALL *luminaires* are assumed to be luminous parallelepiped (rectangular boxes). The dimensions of the approximating luminous box are determined to best fit the values and shape provided in the *photometric* data file. These boxes are considered at luminous volumes in the Visual calculation engine.

Luminous volumes

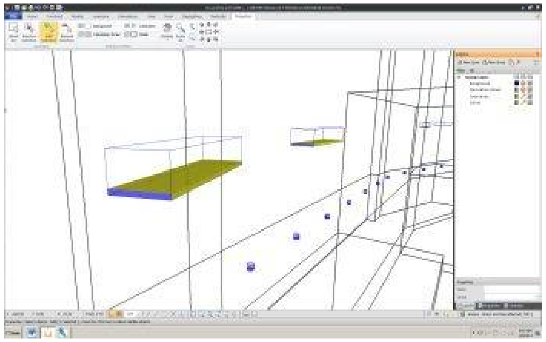
The luminous intensity distribution specified in the file is used to determine which of the six faces of the luminous volume are photometrically active. The "Luminous Volume" button in the "*Luminaire*" *tab* of the Visual user interface toggles these faces on and off. Faces colored yellow are those the calculation engine has made photometrically active, those in blue are inactive.

The total luminous radiant power of the *luminaire* (luminous flux) is distributed among the active surfaces, with the total being equal to that of the entire *luminaire*. Individual faces have individual distributions appropriate for their orientation and size. The sum of these distributions equals that of the entire *luminaire*.

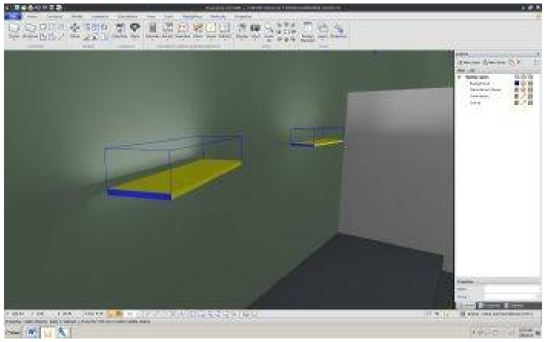
Examples are the following. A lensed *troffer* has only the local bottom surface photometrically active. A surface-mounted wraparound with have three faces active: the bottom and the two long sides. A sharp-cutoff highbay will have 5 surfaces photometrically active: the bottom and four sides.



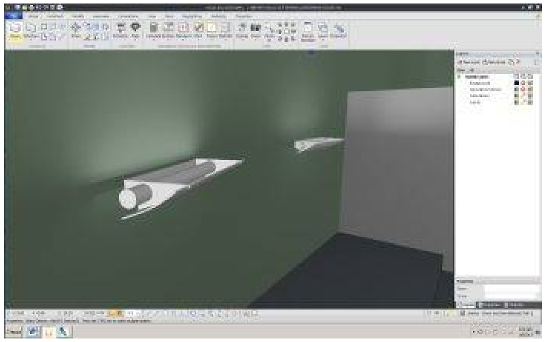
Wireframe view showing luminaire template



Wireframe view showing luminous volume



Rendered view showing luminous volume



Rendered view showing luminaire model

Luminaire photometric information and its extension

No form of commonly used *photometric* data file contains information about *luminaire* appearance or *luminaire* surface/opening *luminance* distribution. Therefore, the Visual calculation engine assumes that the luminous power of any active face of a luminous volume is homogeneous; that is, on any luminous face, the per unit luminous radiant power and distribution are everywhere the same. However, these values can and do differ from active face to active face.

Accounting for luminaire luminous areas (contour integration)

Advanced techniques are used to calculate either the *illuminance* at point or the incident flux on a surface produced by any one face of a *luminaire* luminous volume. These rely on the assumed homogeneity of each active surface, account for the area of the active face, and eliminate the need to discretize the face into assumed point sources. Additionally, they are computationally faster than the point discretization technique.

Illuminance at a point

The Visual calculation engine uses a procedure to calculate the *illuminance* at a point from a face of a *luminaire* luminous volume that was first discovered in 1994. A numerical contour integration is performed around the edges of the face. Details can be found in the technical paper: "*Non-Diffuse Radiative Transfer 1: Area Sources and Point Receivers*," D.L. DiLaura and J. Quinlan, Journal of the Illuminating Engineering Society, Summer 1995, Vol. 24, No. 2, pp. 102-113.

Flux onto a surface

The Visual calculation engine uses a procedure to calculate the flux onto another surface from a face of a *luminaire* luminous volume that was first discovered in 1996. A numerical double contour integration is performed around the edges of the face and the receiving surface. Details can be found in the technical paper: "*Non-Diffuse Radiative Transfer 4: General Procedure for Planar Area Sources and Area Receivers*," D.L. DiLaura and S.R. Santoro, Journal of the Illuminating Engineering Society, Winter 1997, Vol. 26, No. 1, pp. 188-200.

Illuminance at a point

The *illuminance* calculated at any user-specified point in a calculation zone can be of several types: Directional, TV, Maximum Spill, LEEDS Trespass, Spherical, and Constrained Maximum. These can be obtained from two types of basic *illuminance* calculations: with and without one or more *illuminance* normals. In the former, incident flux is weighted with the cosine of the angle between the incidence direction and *illuminance* normals. In the latter, the incident flux is not weighted. Spherical *Illuminance*, for example, uses no *illuminance* normal, Directional *Illuminance* uses one *illuminance* normal at each point oriented in a fixed user-specified direction, TV *Illuminance* uses an *illuminance* normal that changes orientation from point to point, and Maximum Sill use 6 *illuminance* normals, one in each of the *cardinal* directions.

Illuminance is determined in a two-step process. An *illuminance* is calculated using an appropriate method and assuming the light source has an unobstructed view of the illuminated point. Then, if potential occluding objects are detected (surfaces, other *luminaires*) an occlusion factor is calculated, ranging from 0.0 to 1.0, from full occlusion to no occlusion, and is used as a multiplier for the *illuminance*, reducing it if appropriate.

The occlusion factor is determined by ray-casting. An angularly uniform spray of rays is established between the illuminated point and the surface of the source. The angular separation is ½ degree. The number of rays intercepted by *luminaires* or surfaces is determined. If a ray is intercepted by an opaque or diffusely transmissive surface, the surviving ray count is reduced by one. If the only surface(s) involved have an image-preserving *transmittance*, the ray count is reduced by the *transmittance*. The occlusion factor is the ratio of the remaining ray count to the total number of rays.

Direct illuminance at a point

Direct *illuminance* is that produced by a *luminaire* and is calculated using the numerical contour integration method described above, assuming the light source has an unobstructed view of the illuminated point. If possible occluding surfaces are present, an occlusion factor is determined.

Interreflected illuminance at a point

Interreflected illuminance is produced by: 1) the light reflecting from surfaces that are illuminated by sources or other reflecting surfaces and, 2) light transmitted through a diffusely transmissive surface illuminated from the opposite side. In both cases, the source is assumed to be perfectly *diffuse* (either because it is diffusely reflective or diffusely transmissive) and has a uniform *exitance*.

The *illuminance* at a point with an *illuminance* normal is calculated from the equation:

$$E_i = M_i C_i \alpha_i$$

Where E_i is the *illuminance* at the point due to the i^{th} diffusely luminous surface, M_i is the uniform surface *exitance*, C_i is the unoccluded geometric configuration factor from the point to the luminous surface, and α_i is the occlusion factor. The total *interreflected illuminance* at the point is the summation of that produced by all the *diffuse* surfaces:

$$E = \sum_{i=1}^{N} M_i C_i \alpha_i$$

The configuration factors are purely geometric quantities and the standard equation is used for a point and a *planar polygon*. Details can be found in the IES Lighting Handbook, Chapter 10.

The *illuminance* at a point with no *illuminance* normal is calculated from the equation:

$$E_i = \frac{1}{\pi} M_i \omega_i \alpha_i$$

In this case, ω_i is the solid angle subtended at the point by the luminous surface. The total *illuminance* is the summation over all the *diffuse* surfaces.

Discrete Radiative Transfer (Radiosity)

Interreflected illuminance calculations require the *exitance* of diffusely reflecting and transmitting surfaces. The *exitance* of these surfaces originates from light incident directly from sources (referred to as initial light or initial flux) which is increased by the *interreflection* of light between surfaces. This is known as Radiative Transfer Analysis and is also referred to as Radiosity. The procedure is described, in outline in the IES Lighting Handbook, Chapter 10.

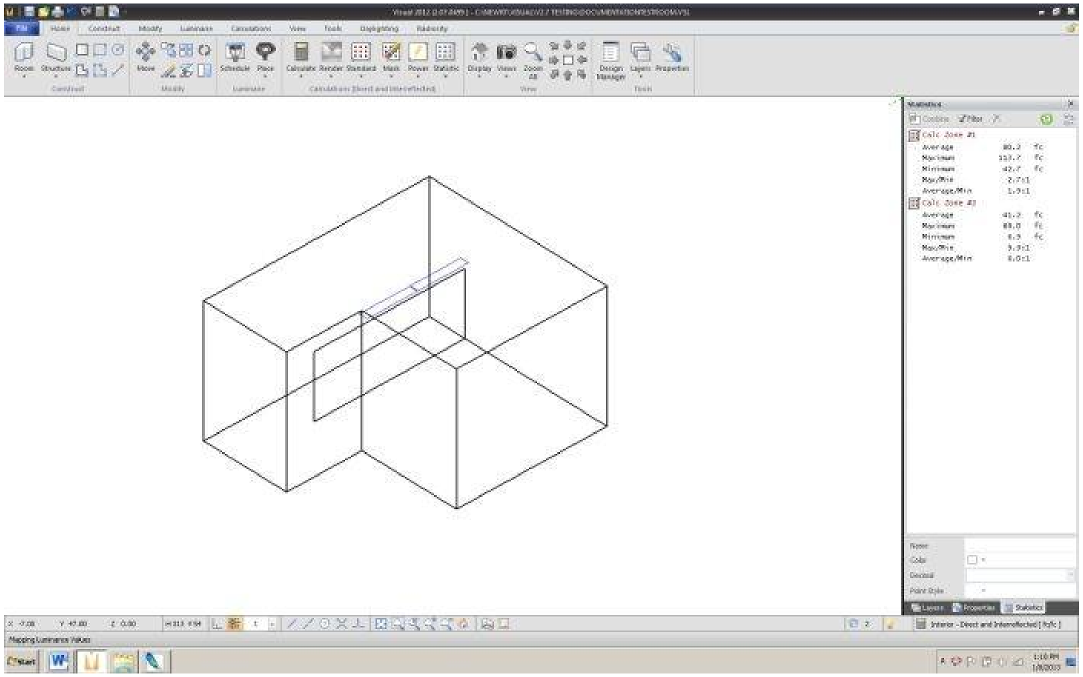
The computational procedure has two essential characteristics: otherwise continuous surfaces are broken up or discretized into small subsurfaces, and each subsurface is characterized by a single *exitance* produced by initial and *interreflected* light. How accurately the collection of uniform, individual exitances represent the actual *exitance* distribution across a large surface depends on the shape of the surface and its illumination conditions. The Visual calculation engine discretizes user-specified surfaces using several criteria and produces subsurfaces of sufficient number to balance necessary accuracy with computational time. This discretization process and the other aspects of the radiative transfer analysis used in the Visual calculation engine are described in the following sections.

13.2.3 Geometric and Photometric Analysis

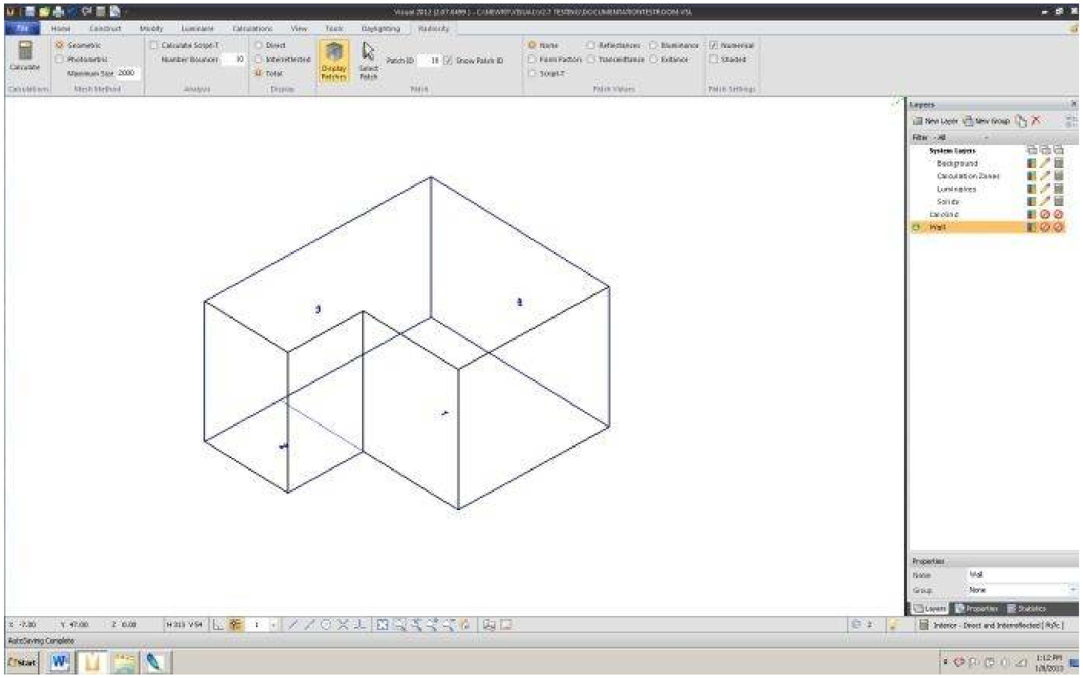
The first stage of user-specified surface discretization is purely geometric and involves two criteria: shape and proximity.

Discretization based on shape

All surfaces handled by the Visual calculation engine are assumed to have four *vertices*, that is, they are *planar* quadrilaterals. User specified surfaces with more than four *vertices* are analyzed with three discretization algorithms; the best discretization is a balance between subsurface shape and number.



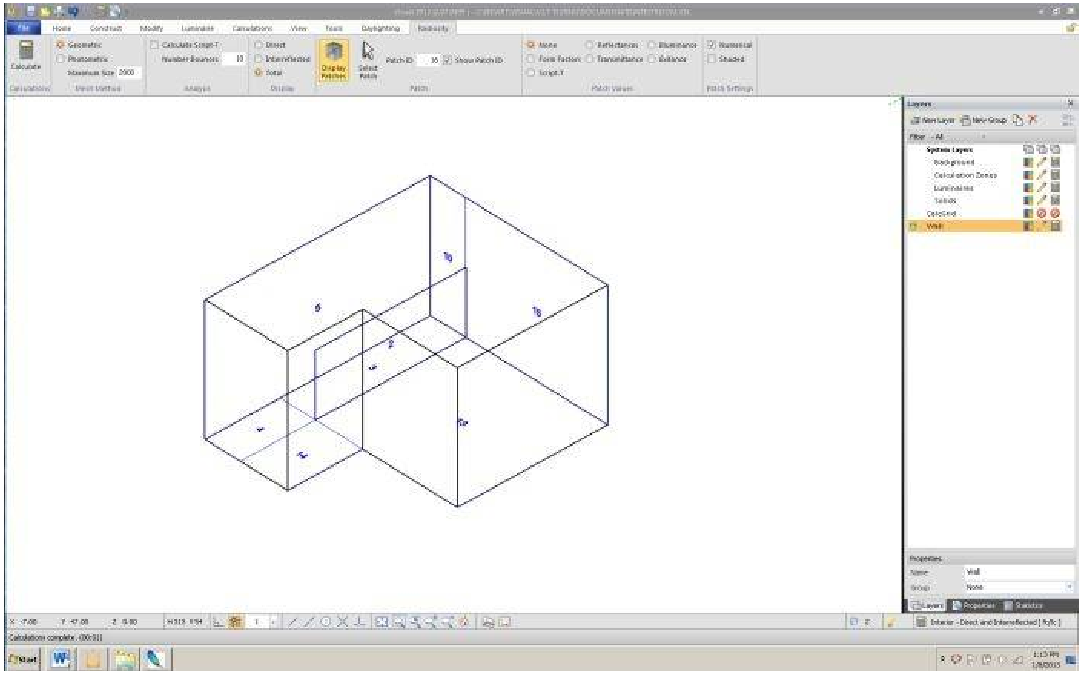
An L-shape room with a partition and two suspended *linear* direct *luminaires*



Shape discretization divides the floor and ceiling so that they are comprised of quadrilaterals.

Discretization based on proximity

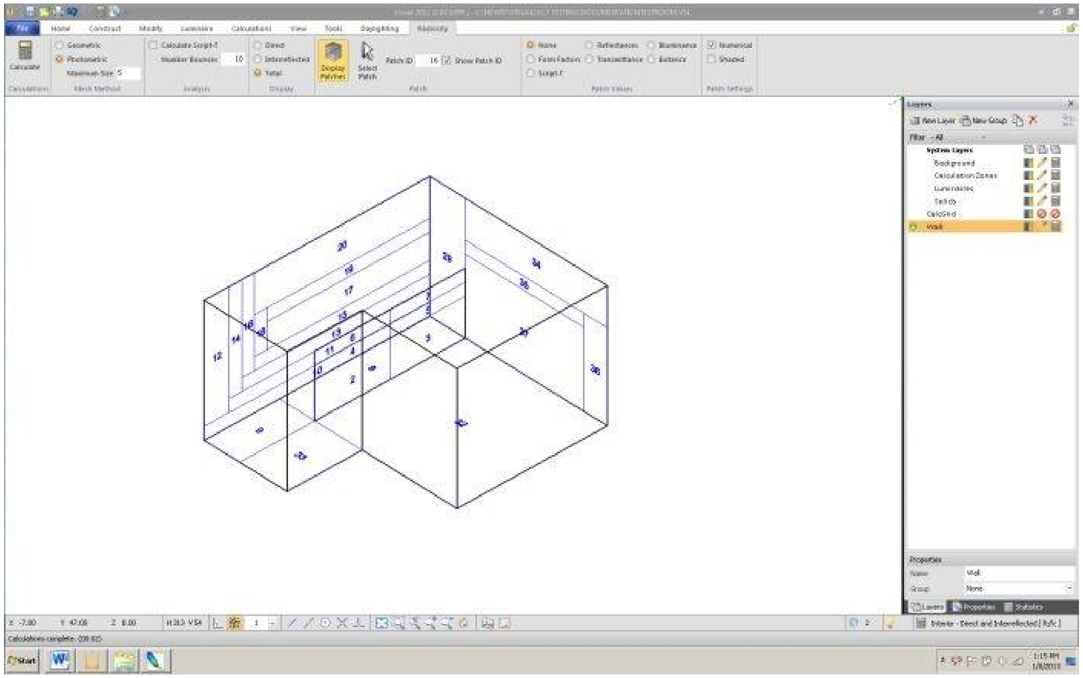
The proximity criteria for discretization accounts for the presence of neighboring or intersecting surfaces are like to produce large *exitance* differences across the intersected surface.



Proximity discretization further discretizes the floor and a wall since they are intersected by the partition.

Discretization based on illuminance gradient

After geometric and proximity, a third criterion is applied to further discretize subsurfaces: a discretization is made along any large *illuminance* gradients on a subsurface. An array of low-precision illuminances is calculated across a surface which consist of direct *illuminance* and *illuminance* produced by light reflected (only) once from other surfaces. Occlusion is accounted for. Neighboring illuminances are compared and if the ratio is greater than 3:1, the subsurface is further discretized there.



Photometric discretization finds large gradients in *illuminance* and further discretized subsurfaces. In this case, the walls contain gradients caused by both shadowing from the partition and the distribution of the *luminaires*.

Discretization of image-preserving or diffusely transmissive surfaces

These surfaces are a special case. Any user-specified surface with an image-preserving *transmittance* is not discretized for any reason.

Any user-specified surface with a diffuse transmittance is, like other surfaces, considered as two surfaces, back-to-back. In this case, the original coupling between the two is maintained throughout the entire computational process. If one surface of the pair is subjected to geometry or *photometric* discretization, that discretization is performed on its back-to-back partner. Thus, both surfaces are subject to discretization due to factors that affect either side. The result is a set of back-to-back subsurface pairs.

13.2.4 Occlusion

The three-part discretization process results in a set of subsurfaces used in the subsequent radiative transfer analysis. In most cases, any one subsurface of this system does not have an unobstructed view of all other subsurface. Subsurfaces may be facing away from each other or the line of sight between partially or fully occluded by other surfaces.

An array of occlusion factors is found that describes view that all subsurfaces have of all other subsurfaces. Ray-casting is used to find these factors. Somewhat like the occlusion process described above, an array of points is established on a subsurface; the density determined adaptively by the proximity of the other subsurface of the pair being considered. From each of these points, an angularly uniform spray of rays is established to the other subsurface. The fraction of all these rays that are not either fully occluded (by opaque surfaces) or partially occluded (by image-preserving transmissive surfaces) establishes the occlusion factor between the pair of subsurfaces.

13.2.5 Form Factors

The final determination of the *exitance* on each subsurface requires knowing the fraction of direct flux that the subsurface can radiatively exchange with all other subsurfaces. Since the surfaces are assumed to be perfectly *diffuse*, these surface exchange factors are purely geometric and are called Form Factors. They are determined in a two-step process: the unoccluded form factor for a pair of subsurfaces is determined and then modified by the occlusion factor for the pair.

Unlike configuration factors, there is no single, simple equation that can be used to calculate form factors. A numerical double contour integration process is used. See the technical article: "*Calculation of Occluded Radiative Exchange Form Factors*," DiLaura, D.L., LEUKOS, July 2006, Vol 3, No. 1, pp. 51-67.

13.2.6 Initial Flux

The final determination of the *exitance* on each subsurface requires knowing the total initial or direct flux onto each subsurface. These fluxes are determined in a two-step process: the unoccluded flux from a source onto a subsurface is determined and then modified by the occlusion factor for the source-subsurface pair.

The numerical double contour integration process described above is used to determine the unoccluded flux and the result multiplied by the appropriate occlusion factor. For flux accounting purposes, the flux arriving to each subsurface from each source in the system is recorded. If it is determined that a source is completely surrounded by subsurfaces, it is possible to check that the total flux involved for the source is correct. The total flux to all surfaces from that source should equal the known total emitted by the source (*luminaire* lumens). Any imbalance is corrected on each surface, the correction being weighted by the amount of flux onto the surface. In this way and in most cases, the flux from each source distributed to all subsurfaces exactly equals the total source emitted flux.

Using the initial flux and the subsurface area, the initial *illuminance* on each subsurface can be determined.

13.2.7 Final Illuminance

Determining the *exitance* at each subsurface after all interreflections (called the final *exitance*) involves solving a system of equations that contain the initial illuminances, *diffuse* reflectances, and radiative exchange form factors. Details are in the IES Lighting Handbook, Chapter 10.

If any of the subsurfaces are diffusely transmissive, the system of equations is expanded to include the flux that back-to-back diffusely transmissive subsurfaces exchange with each other, modeling the flux that is transmitted through the original transmissive surface.

The system of equations is solved iteratively and the result is the final *illuminance* on each subsurface, accounting for all interreflections. Multiplication by the *reflectance* gives the final *exitance*.

13.2.8 Processing Calculation Zones

When the radiative transfer analysis is complete, all information required to determine the direct and *interreflected illuminance* at points in a user-specified calculation zone is available. The process used to determine the illuminances is described in the section "*Illuminance* at a Point" above.

13.2.9 Rendering

The Visual calculation engine can produce most of the data required to display a photometrically accurate rendering of a project. The assumptions underlying the calculations are the same as those for the general radiative analysis of the project; the most important are diffuse reflectance and spectral flatness. Since all surfaces are *diffuse*, the calculations required for a rendering can be performed once and provide all the data required for any view of the project desired by the user. Thus, changing views or navigating through the project does not require recalculation, only a change of the subset of data which is displayed.

Basic procedure

The basic procedure used in the Visual calculation engine to generate renderings has three steps: 1) generate arrays of triangles that cover user-specified surfaces and have exitances that are photometrically accurate, 2) display these triangles in an appropriate geometric and screen-*luminance* manner, and 3) refine the rendering with multiple calculation passes to more accurately *model* surface *exitance* distributions.

Generating triangles and their exitances

Illuminance arrays on user surfaces

The determination of the necessary triangles begins with an array of illuminances calculated on a user-specified surface. At each point in this array, the possibly-occluded direct and *interreflected illuminance* is calculated. This is a double-pass process: after the illuminances at each grid point are determined, each 2-point x 2-point subsection of the grid is examined for high gradients. If a high gradient is present, that subsection is arrayed with additional, more tightly spaced points. Illuminances are calculated at each of the points in each such subgrid during a second pass. This brings out necessary detail in the *exitance* distribution on the surface while minimizing calculation time.

Contouring

Based on the project type, and the range and gradients of *illuminance* found in the array, points defining up to 256 iso-*illuminance* contour lines are determined. The points along a contour vary in spacing; small spacing where the line is highly curved, and large where the line is straight.

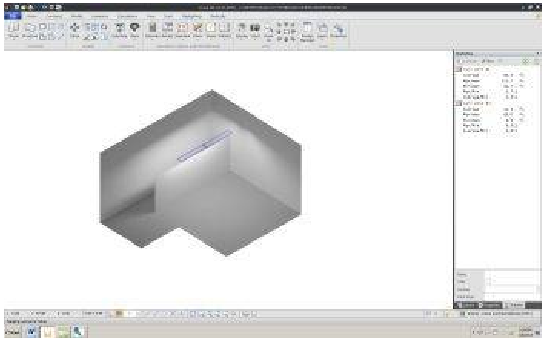
Added illuminance points

To provide for necessary detail, additional illuminances are calculated along the lines that form the boundary of the surface and along lines defined by the intersection of the surface with other surfaces in the project. These additional illuminances help define sharp shadows and accurately portray touching surfaces.

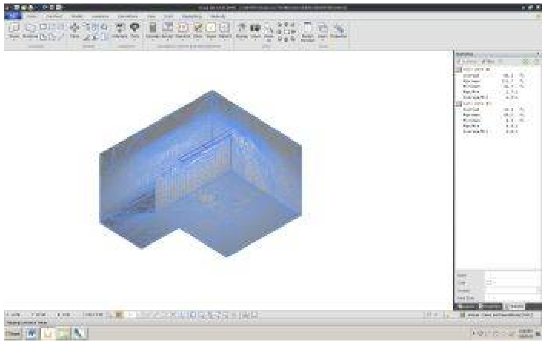
Triangularization

A collection of triangles is built from the points along the contour lines and the added *illuminance* points. Constrained Delaunay triangularization is used. The constraints are the edges formed by the sections of contour line, and the sections connecting the points along the additional lines of *illuminance*. The outline of resulting triangles can be toggled on and off in a rendering with the 7-key.

Displaying and scaling triangle exitances to screen gray scales



Rendering



Rendering showing component triangles

Multiple rendering passes

As each surface to be rendering in the project is processed, a record is kept of the number and extent of high gradients. If adaptively determined re-rendering criteria are met, the surface is flagged for an additional rendering calculation pass.

After all surfaces have been processed, the Visual user interface takes the triangle data provided by the calculation engine and generates the rendering display. Meanwhile, the calculation engine processes all surfaces that have been flagged for additional work. In this addition pass, the density of all *illuminance* points on the surface is incremented and the calculation-triangularization process outlined above is repeated. Not all surfaces may require additional calculation.

When the engine completes processing these flagged surfaces, the Visual user interface updates the data it has on all surfaces, replacing previous data for a surface with any that was generated during the addition rendering computation.

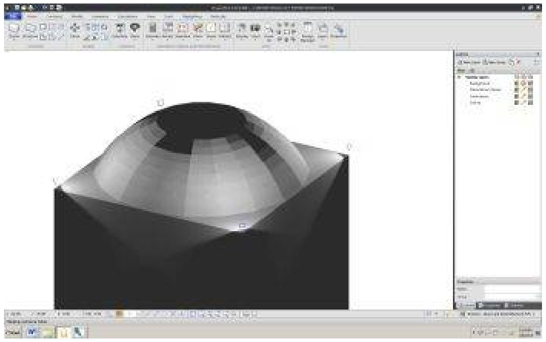
This entire process is repeated up to four times. Each time the rendering calculations are performed on a denser grid of points. It is usually the case that the list of surfaces that are recalculated and updated gets smaller with each pass.

Approximating the appearance of curved surfaces

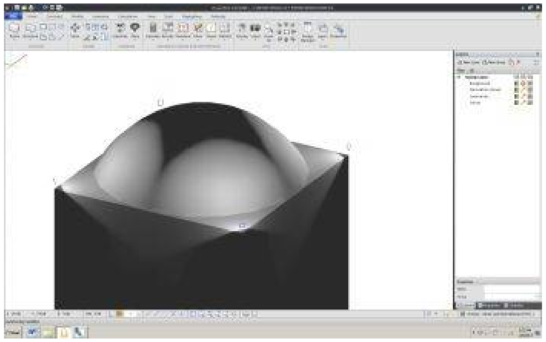
Surfaces handled in the Visual calculation engine are *planar*. In many cases any array of these approximates the surface of a dome, or a column, or a curved wall. To make renderings of such surfaces more realistic, special processing can be invoked, at the discretion of the user, to more faithfully render them by eliminating the abrupt change in *exitance* that is otherwise present on either side of an edge shared by surfaces that meet at even a slight angle.

If a user-specified surface meets another at an angle less than 20-degrees then the *illuminance* normals used in the surface *illuminance* calculation are modified. All edges of a surface are examined to see if the angle to the adjoining surface is less than 20-degrees. If so, the normal at the *vertices* involved are changed from that of the original *planar* surface (which is the default case) to an average formed with the normals of the original surface and those adjoining it at the required small angle. These new, interpolated normals can spread outward, defining a convex surface, or bend inward, defining a concave surface.

The position and orientation of the *vertex* normals are used to define a new, temporary convex or concave surface that passed through the original surface *vertices*. This temporary surface is used to define new calculation points and *illuminance* normals than produce illuminances for a local, curved surface. These points and illuminances are used in the manner described above to generate rendering triangles.



Rendering of a dome without curve approximation



Rendering of a dome with curve approximation

Colorized surfaces

Luminaire models

13.2.10 Daylighting

Visual can perform daylighting calculations and provide daylighting renderings in a single-instance mode; that is, for a particular place at a particular time. The basic calculation procedure is that same as that described for electric lighting; with the sky and sun considered as additional light sources.

Additional data

To add the sky and sun as light sources, additional user data is required; used to find either the appropriate weather data from the Visual Weather Database, or to calibrate a CIE sky specified by the user. In addition, the diffuse reflectance of the surrounding ground *plane* must be specified, as well as glazing information.

Project location

Location is specified by Longitude and Latitude, specified in degrees. Positive and negative values of Latitude specify north and south the equator, respectively. Positive and negative values of Longitude specify east and west values from the Prime Meridian at Greenwich England. Longitude and Latitude are input by the user of come automatically from the Visual user interface Site Locator.

Project orientation

The default orientation of the Visual project site is that sky and sun North (geographic North) corresponds to +y in local Visual *coordinates*. A project orientation angle changes the relative angular position of the sky and sun with respect to the project. Positive values, in degrees, rotate the site clockwise when viewed from above. NB: this does NOT change the significance of the local Visual *coordinates* nor does it rotate the Visual *drawing*.

Date and time of analysis

Date and time are local civil time. If in effect, daylight saving time should be indicated.

Weather data

The Visual Weather Database is derived from all of the more than 2100 EnergyPlus data sets that cover most of the globe. For each location with a data set, only required radiometric or *photometric* data has been extracted from the hourly data. If only radiometric data is available at a particular site, *photometric* data is derived using a process devised by Perez. See: "*Modeling Daylight Availability and Irradiance Components from Direct and Global Irradiance*," R. Perez, P. Ineichen, R. Seals, J. Michalsky, and R. Stewart. Solar Energy. Vo. 44, No.5. pp 271-289.

In all cases, the primary *photometric* data that is extracted or generated for every available site are hourly values of direct solar *illuminance* and total horizontal sky *illuminance* for each data of the year. Data in the EnergyPlus weather file for a particular site are usually constructed from several years of measurements, aggregated together to establish a Typical Meteorological Year for that site.

Sun and Sky

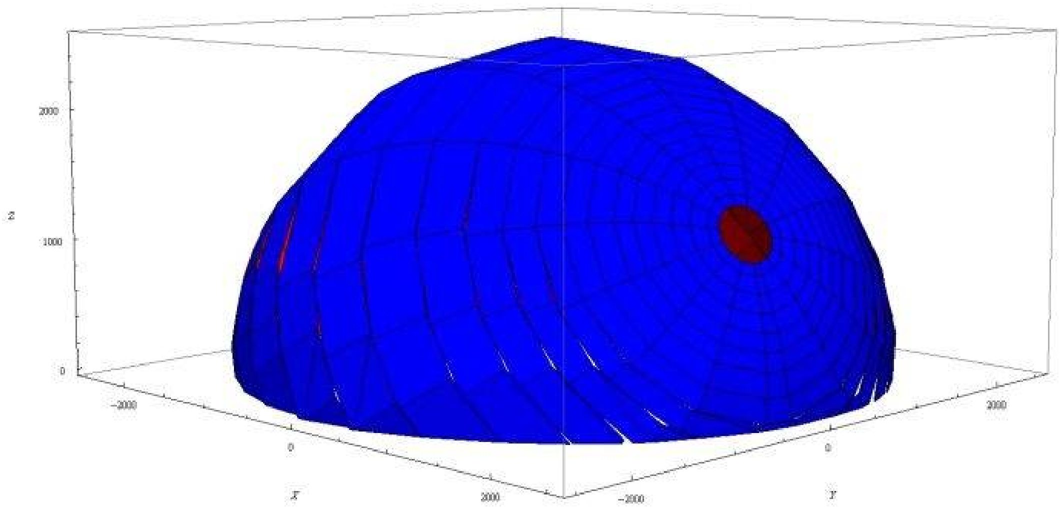
The fundamental luminous properties of sun and sky are the direct solar *illuminance* and the total horizontal *illuminance* produced by the sky. These are either: 1) derived from weather data, or 2) calculated using IES standard sun and sky parameters. See: IES Lighting Handbook, Chapter 7, Section 7.9 Formulary.

The sun is modeled as a luminous disc, ½-degree in diameter. Its luminous power is expressed as the direct, unoccluded *illuminance* produced on a surface with its normal pointed to the sun. Solar position is determined from the location and local time. See: IES Lighting Handbook, Chapter 7, Section 7.1.5 Solar Position.

The sky is modeled as a luminous dome, with a relative *luminance* distribution determined according to ISO/CIE Standard 15469, 2nd edition. The parameters that determine the distribution are either derived from the appropriate weather data or come directly from the standard set of parameters if the user specifies a specific CIE sky. See: "*All-weather Model for Sky Luminance Distribution – Preliminary Configuration and Validation*," R. Perez, R. Seals, and J. Michalsky, Solar Energy, Vol 50, No 3, pp 235-245.

NB: Standard weather data aggregates the *illuminance* from a circum-solar 5-degree circular patch of the sky with the direct *illuminance* from the sun. Therefore, the sky is modeled with a 5-degree hole centered on the sun.

The Visual calculation engine establishes a distance, based on the maximum extents of the project that defines the distance to the sun and the *radius* of the sky dome. The distance is such that that parallax error over the extent of the project to any point on the sky dome is less than ½-degree. The sky is discretized into *planar* rectangles, accounting for *luminance* gradient. Using the *luminance* distribution, element size, and sky dome *radius*, each discretized sky element is assigned a luminous power defined by the direct normal *illuminance* it produces at the center of the Visual project.



Sky dome approximated with planar rectangles, sized and distributed according to the luminance distribution of the sky. Notice the 5-degree hole left for the sun and its circum-solar component.

Ground

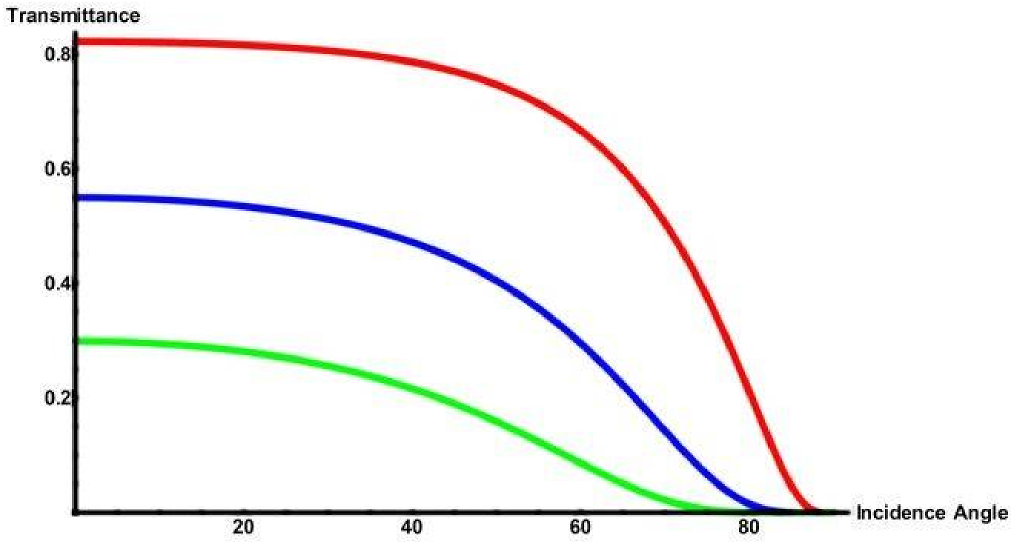
A ground *plane* is automatically established around the project and horizontally positioned at Visual local z=0.0. Its *reflectance* is user-specified. The *plane* is automatically discretized into elements that are truncated wedges surrounding the project.

Apertures, windows, and skylights

Skylight and sunlight illuminate any outward-facing user-specified surfaces and the elements of the ground *plane*. Occlusion by any other surfaces in taken into account. Skylight and sunlight illuminate any surface of an otherwise inward-facing or closed set of surfaces if admitted by an aperture, window or skylight. An aperture is a user-specified opening in an otherwise opaque surface. A window is an aperture into which a user has specified an image-preserving *transmittance* less than 100%. A skylight is an aperture into which a user has specified either an image-preserving or a diffuse transmittance.

Glass transmittance

The image-preserving *transmittance* specified by the user is assumed to be the perpendicular or normal *transmittance*. The Visual calculation engine accounts for the reduction from this value due to increased incident angles. The Fresnel Laws of *Reflectance* and Transmission are used to determine this *transmittance* value. This calculation is done automatically whenever flux is passing through a surface with an image-preserving *transmittance* and uses the normal *transmittance*, the incidence angle, the number of glazing layers, and the assumed index of refraction for glass of 1.5.



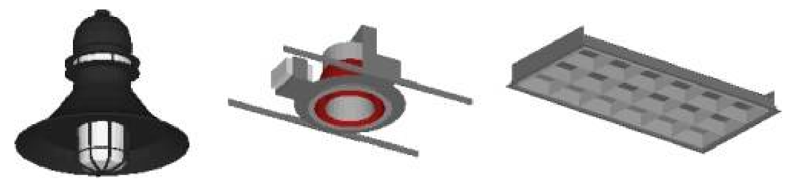
Example of transmittance as a function of incidence angle for single, double, and triple glazing.

13.3.1 Introduction

Visual includes the ability to display detailed **Solid** ***Models*** of ***Luminaires*** in **Rendered** and **Shaded Display** modes. This appendix describes the basics of building these *models* in Visual for use in the program when they are not present. At the outset, the user who attempts to create a **Solid** ***Model*** should have a strong drafting background and be expertly familiar with both software use and 3-D visualization and *drawing*.

Solid ***Models*** can be created in Visual or in any program capable of generating a *DWG* file.

Note that **Solid** ***Models*** are included in the product database for Acuity Brands Lighting products. The database is accessible when creating entries in the ***Luminaire*** **Schedule** and *model* data is automatically included in ***Luminaire Type*** definitions. See [3.2 The Luminaire Editor] for more information.

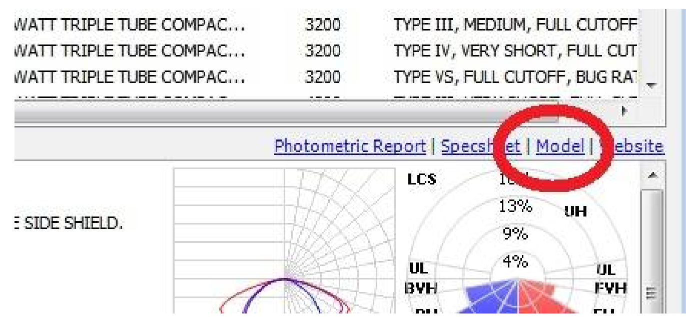


Luminaire **Solid** ***Models*** are representations of ***Luminaires*** with much more detail than the wireframe **Symbols** used in Visual, but yet less detail a solid *model* that might be used in the mechanical engineering of a *luminaire*. They are related to BIM files but are not interchangeable with those files.

Prior to constructing a **Solid** ***Model*** it is strongly suggested that *models* of similar products be examined in Visual.

To view existing **Solid** ***Models***, navigate to the desired product and click the ***Model*** link in the **Select a** ***Photometric File*** *dialog*. See [3.1.z Selecting a Photometric File] for more information.

Clicking the link will open the file in the Windows application associated to *DWG* files on the host computer.



Creating Solid *Models* is arguably the most advanced task in Visual and it should by no means be assumed that an advanced Visual user would be able to complete this process. The information is provided for completeness and for the more adventurous users with drafting skills and 3-D visualization aptitude.

VISUAL SUPPORT IS NOT AVAILABLE FOR CREATING *MODELS*.

Unless otherwise noted, terminology used in this chapter is related to creating *models* in Visual. The necessary steps to create *models* in other software should be discernible from the Visual-based text.

13.3.2 Drawing Input

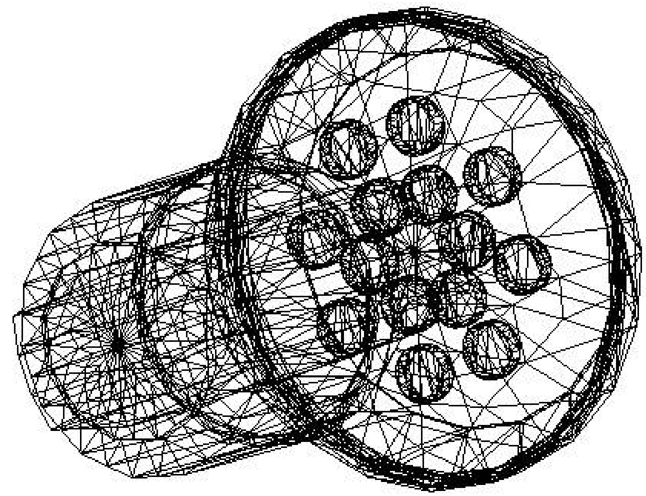
Creating a **Solid *Model*** will require dimensional information, and the source will vary depending on the *luminaire* manufacturer.

DWG files are often made available by *luminaire* manufacturers as part of their Building Information Modeling efforts.

These files are a valid basis for a Visual **Solid *Model***, but they will normally contain a large amount of extraneous information: internal details, small parts, material thickness, and other information that is excess baggage in Visual.

In most cases, BIM files have entirely more facets and segments than will be necessary.

Creating a Visual **Solid *Model*** from a BIM file involves redrawing the desired elements on top of the BIM information. It is *possible* to simply convert the existing closed *polygonal* surfaces to solids using that command in Visual, but this is not often *practical* as it will result in large files and some editing is still necessary to ensure proper *model* content.

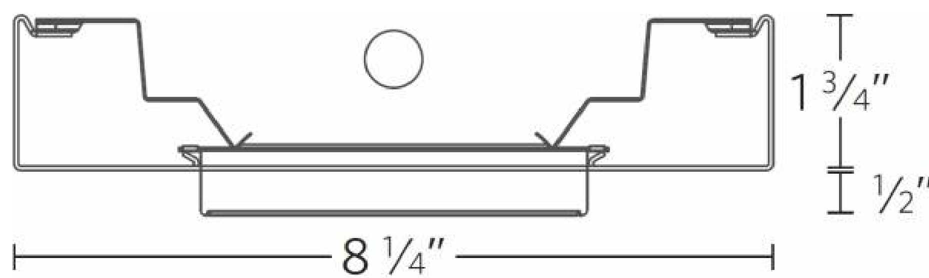


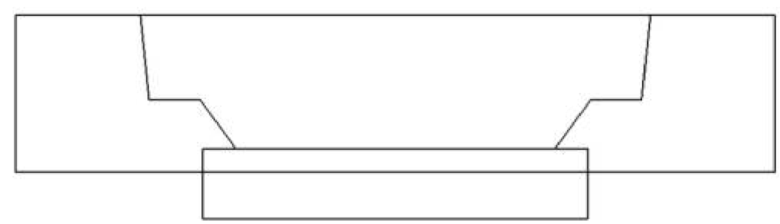
Manufacturer **Specification Sheets** include drawings that may not at the outset look like they contain enough information but realize that, in Visual, Solid *Models* only need to be the basic form and detail.

Most **Specification Sheets** are available in a PDF format that inherently has a detailed *drawing* (top right) that can easily be printed on paper. The basic form can be taken from this *drawing* and scaled using drafting techniques and duplicated in Visual (bottom right)

This 2-D information is then extruded and modified (often by making logical assumptions about product design) to achieve the desired result.

In a great deal of cases, assumptions will have to be made about louver spacing and details in the longitudinal direction that are rarely dimensioned on **Specification Sheets**. This can yield a more than acceptable *model*.





13.3.3 Drawing Layers

Luminaire **Solid *Models*** will have multiple **Layers** to which different components and materials will be assigned.

Any number of **Layers** can be created to properly define the *luminaire*. Each different material or component should be assigned to a different **Layer**.

For example, an outdoor decorative acorn *luminaire* would have the **Layers** shown at right. These are the basics of the *luminaire* with additional **Layers** included for available option components.

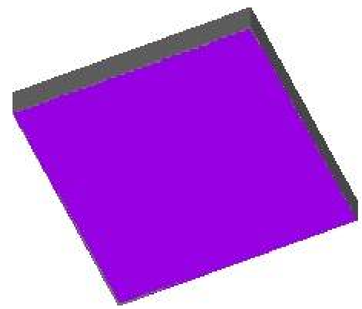
Note that internal detail not visible (i.e. reflectors behind lenses) do not need to be drawn.

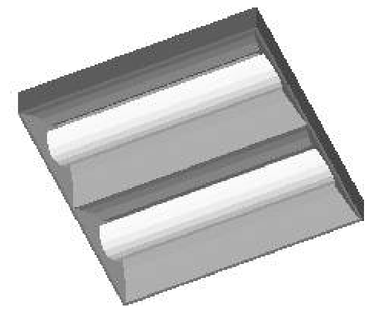
Layer creation outside of Visual is of course analogous.

CRITICAL:

For any *luminaire* that is recessed or semi-recessed, the CuttingPolygon **Layer** must be included and a solid must be constructed that indicates what portion of the surface in which the *luminaire* is mounted should be removed. This allows the **Solid *Model*** to be seen. The **Color** of this **Layer** is unimportant, but it is recommended that it be assigned the magenta **Color** to avoid confusion with other elements; this color will not likely be used for any realistic *luminaire model*.

This is basically the only requirement of a ***Luminaire*** **Solid *Model*.**





Layer Color is what is used to display the components. Any **Color** assigned "ByObject" (in Visual or *CAD* software) is ignored.

Recommended **Colors** for components are:

Lamp - White
Refractor - White
Reflector 90% Gray (or White if a *lamp* is not included)
Housing - 70% Gray

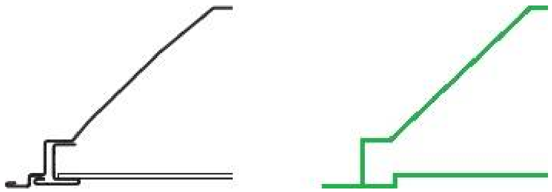
What **Layers** are necessary is based on user preference for what components are included.

13.3.4 Construction

How a ***Luminaire* Solid *Model*** is constructed is largely at the discretion of the creator but there are a few basic concepts to be used as a guide.

The amount of detail included should be logical. The rule of thumb would be to imagine what basic parts of the *luminaire* are visible in a normal usage scenario, and most importantly from normal viewing distances.

For example, a lensed *troffer* should certainly have a flange in the *model*, but it may not be desirable to draw a flange and a door frame in lieu of one element that *models* both components because the detail would not be seen in normal usage of Visual.



Models are drawn in units of inches, where "1" is one inch. In Visual, this is not the same as the normal one foot or one meter in the normal lighting design process in the Design Environment.

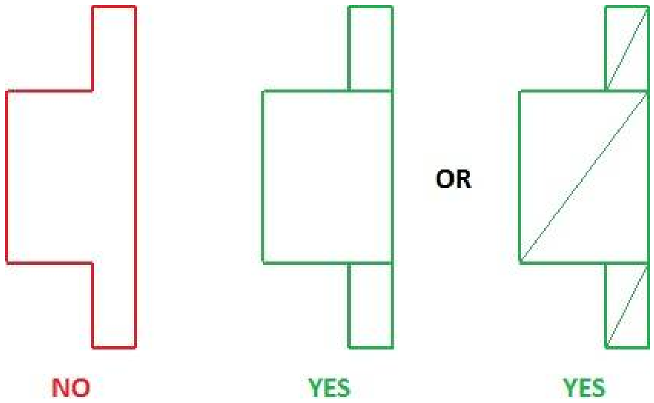
One Unit = 1"

Ideally, files should be less than 500KB in size. Very complex *models* have been created with a file size under 350KB.

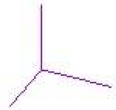
Each surface should be a "Solid" in Visual, or a 3DFace or Closed *Polyline* in other software.

Surfaces can be *polygonal* but CANNOT be concave in shape. Every *vertex* must be able to "see" all other *vertices* of the *polygon*.

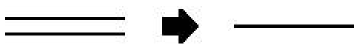
Visual breaks down all surfaces into "child" triangles, so there is no direct benefit to making high-*vertex*-count *polygonal* **Solids**. However, *drawing* nothing but triangles can also be unnecessary; at far right, the triangles are correct but perhaps more effort than logical. Construct what is convenient and logical.



Lines (Visual Background), XREFs, and blocks are ignored. This can be advantageous in that some reference markers can be left in the file for later use. It is useful to draw indicators of the X, Y, and Z axes on the CuttingPolygon **Layer**.



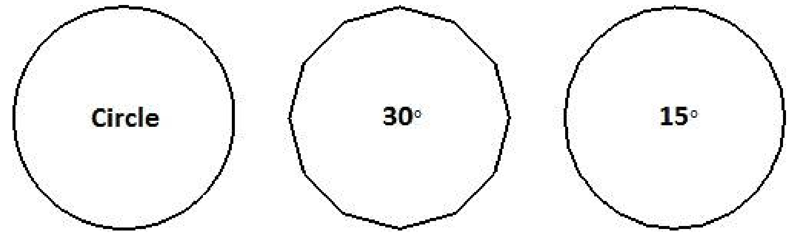
DO NOT *model* surfaces as having thickness. i.e. placing identical surfaces 0.060" apart for cold rolled steel. This will effectively double the file size for detail that can't possibly be seen in normal situations.



Do not use too many facets (*polygon* sides) to *model* curved objects. Generally 3-6 facets per 90 degrees of arc is sufficient. This yields facet angular extent of 30 degrees or 15 degrees.

As can be seen at right, at this zoom level, 15 degrees of facet extent is more than sufficient to approximate a circle. Zoomed out farther, 30 degrees would be acceptable.

Use fewer facets for small details and more facets for larger details like curved housings.

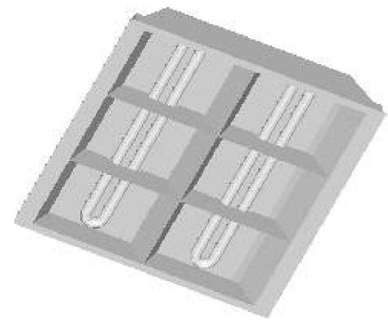


Do not include lamps if they aren't normally seen.

Striplights for example would include lamps. Metal halide highbays might include lamps if extra detail was desired. Lensed troffers certainly do not need lamps in the *model*.

There are numerous cases where lamps (or other details inside the *luminaire* might be seen in abnormal situations (i.e. an occupant looks up at the ceiling), and in these cases, it is up to the *model* creator to decide if the extra detail is of value.

LEDs can be modeled individually, but collectively they produce a "glowing *panel*" in most cases" and the recommendation is then to *model* an LED array as a single **Solid**.

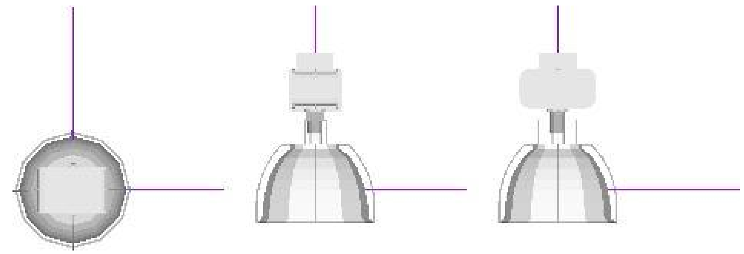


There is never a need to make a *model* look photo-realistic when it is filling the computer screen. There are remotely few situations where the *model* would ever be "seen" in Visual at that size.

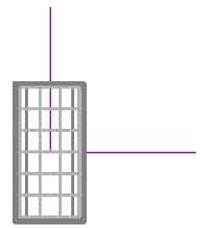
13.3.5 Alignment

The ***Luminaire* Solid *Model*** needs to be aligned properly so that the *model* and the ***Symbol** coordinate*.

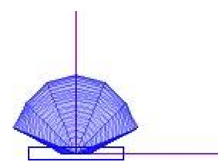
The origin (0,0,0) should be at the center of the luminous area in all three dimensions.



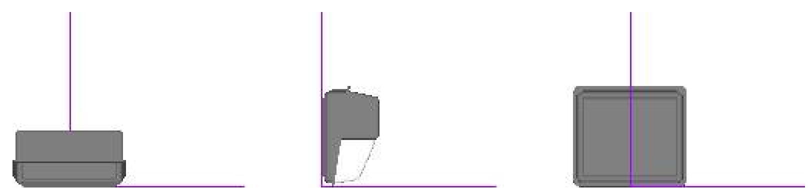
The *model* should have the *lamp* axis in line with the positive-y axis.



Luminaires with an asymmetric distribution should have the asymmetry ("punch") in the positive-y direction to agree with the *photometric* testing and reporting standards of IES LM-63. This may require in-depth knowledge of how *luminaire* optics function.



Wall-mounted *luminaires* are a bit more complex in that the origin needs to be positioned such that the **Solid *Model*** won't be stuck into a wall in **Shaded** or **Rendered Display Modes**. This means that the origin should be at the bottom and rear of the housing.



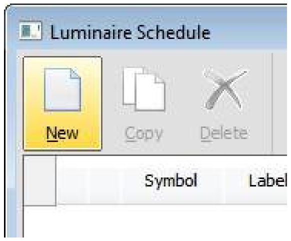
13.3.6 Verification in Visual

A **Solid** ***Model*** should of course look correct when it is being built and **Shaded Display Mode** is active. It is however sometimes not obvious how *luminaires* are oriented in IES files.

Export the proposed **Solid** ***Model*** to a *DWG* file from Visual or other *CAD* software.

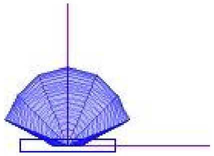
To verify *photometric* alignment while constructing a *model* in Visual:

Create a new ***Luminaire Type*** in the ***Luminaire*** **Schedule**.

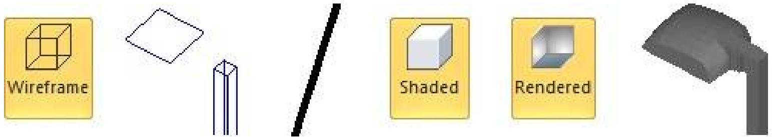


Import the *DWG model* file into the ***Luminaire*** **Type** definition in the ***Model*** *tab* of the ***Luminaire*** **Editor**.

Insert a ***Luminaire*** in the **Design Window** with the **Place** command. Make sure the ***Photometric*** **Web** is on.



Activate **Shaded Display Mode** and verify that the ***Luminaire*** and its distribution are aligned properly. Switch between **Wireframe** and **Shaded Display Modes** if necessary.



13.4 UVGI Calculations

Under construction. Contact Visual Support.

Visual 2012 Help – Glossary

Absolute coordinates

Location information referenced to the global origin of (0,0,0).

Active Plane

The current Cardinal Plane which is the basis for coordinate information and actions. This is the plane of movement of the mouse pointer crosshairs. Working planes are restricted to the three cardinal orientation planes (X-Y, Y-Z, X-Z) in Visual. The working plane sequentially toggles through the three possibilities whenever the Tab key is pressed. The working plane may be moved incrementally in a perpendicular fashion using the up and down arrow keys and the Home key may be used to return the working plane to X-Y at Z=0 (grade level) at any time.

Avg/Min

The ratio of the average value divided by the minimum value of illuminance found within a statistical or calculation zone. Typically used as an indicator of lighting uniformity in area lighting projects.

Ballast factor

The flux of a fluorescent lamp operated on a ballast as a fraction of the flux when operated on the standard (reference) ballast specified for rating lamp lumens. Usually applied to Light Loss Factors.

Base Point

Coordinate location (X,Y,Z) used to define a starting location or direction (the base or basis) from where an object will then be placed afterward. Typically a Base Point is selected as part of an object such as the corner of a Wall or the center of a Luminaire.

Boilerplate

A standardized set of text that can be used repeatedly without being changed. For example, a specifier may use the same Luminaire Schedule or specification from project-to-project.

Bulge vector

A line that is drawn from a point to establish the tangency of an Arc segment passing through that point.

CAD
An acronym for Computer Aided Design, this term generally refers to graphical software used for drafting and solid modeling. Most commonly used in Visual to refer to imported or exported DWG and DXF files.

Candela
The unit of luminous intensity.

Candlepower
The luminous intensity of a Luminaire expressed in candelas.

Cardinal
Any of the fundamental directions defined by the Cartesian coordinate system (X,Y, or Z). The cardinal directions are orthogonal, or perpendicular in nature.

Cartesian
Referring to positive or negative numerical values used to define position in three-dimensional space based on the three orthogonal axes (X, Y, and Z) and an origin (0,0,0). Synonymous in Visual with "cardinal".

CFL
Compact fluorescent lamp: A low-pressure mercury electric-discharge lamp in which a fluorescing coating transforms some of the UV energy generated by the discharge into light. Usually shaped with two, four, or six bent tubes.

Coefficient of variance
A statistic that reports the ratio of the standard deviation divided by the mean value for a Calculation or Statistical Zone.

Combo box
An interface tool that couples a text box with a menu of choices.

Context-sensitive
Meaning that the referenced object may change based on different situations.

Coordinate
Location information usually provided in terms of (X,Y) or (X,Y,Z) components along Cartesian axes.

Coordinates
Location information usually provided in terms of (X,Y) or (X,Y,Z) components along Cartesian axes.

Crosshairs
Two thin, intersecting, orthogonal lines affiliated with the mouse pointer in the Design Environment. The crosshairs are used to pinpoint locations in the Design Environment and provide a
visual cue to the plane in which the mouse pointer is moving via color.

Destination point
Coordinate location (X,Y,Z) used to define a relative location or direction where an object is to be placed.

Dialog
A window initiated on top of the main program.

Diffuse
Having hte properties of diffuse reflection or diffuse refraction.

Direct component
The portion of light from a Luminaire that arrives at a Calculation Zone without being reflected by any room surfaces.

Downlight
A small direct lighting Luminaire that is normally recessed into a ceiling.

Drawing
A graphical representation of a view of the Design Environment placed on a Page in the Print Editor.

Drop-down menu
A menu option revealed by left-clicking the mouse on an arrow shown on certain toolbar buttons. In Visual, the arrow is usually at the bottom of the button.

DWG
A file format commonly used in CAD software to store drawing information. Files of this type have .DWG as their file name extension and may be imported into Visual.

DXF
A file format used primarily in CAD software to transfer information from one program to another. Files of this type have .DXF as their file name extension and may be imported into Visual.

Efficiency
The ratio of lumens emitted by a Luminaire to that emitted by the lamp(s) used therein.

Exitance
The area density of the luminous flux leaving a surface.

Fence
A selection technique whereby objects are added to the selection set based upon their inclusion within a drawn rectangular (fence) region. Objects lying at least partially within the fence are added to the selection set.

Floodlighting
A system designed for lighting a large area in most cases.

Footcandle
A unit of illuminance. Equal to one lumen per square foot, or 10.76 lux.

Grips
Yellow boxes at the edges and corners of object in Print Editor that can be "grabbed" by left-click-dragging the mouse.

Hotkey
A keyboard link to a common command.

Icon
Any graphical symbol used as a means of communication in the computer interface.

Illuminance
The area density of the luminous flux incident on a surface.

Interreflected
The portion of the luminous flux from a luminaire arriving at the workplane after being reflected one or more times from room surfaces.

Interreflection
The multiple reflection of light by the various room surfaces before it reaches the workplane or other specified surfaces of a room.

Iso-candela line
A curve plotted on any appropriate set of coordinates to show the distances in various directions in space, about a source of light at which the intensity is the same.

Iterative
Repetitious or cyclical.

Label
An alphanumeric designation used to establish a unique correspondence between Luminaire Symbols and their associated Luminaire Type entries in the Luminaire Schedule

Lamp
A generic term for an artificial source of light. Often incorrectly called a "light bulb".

Lamp Lumen Depreciation factor
The fractional loss of lamp lumens at rated operation conditions that progressively occurs during lamp operation. A critical non-recoverable performance component of the Light Loss Factor.

Light Loss factor
A performance multiplier that is usually less than 1.0 accounting for recoverable and non-recoverable losses due to system degradation and other components. Typically composed of Lamp Lumen Depreciation, Ballast Factor, Luminaire Ambient Temperature Factor, and Luminaire Dirt Depreciation, but may also include numerous other factors.

Linear
Being along a line or straight path.

List box
An entry field with a down-arrow to the right indicating a finite list of options. Left Click on the down-arrow button to reveal and select from among the list of options.

Lumen
The unit of luminous flux.

Lumen Method
A lighting design procedure used for predetermining the relation between the number and types of lamps or Luminaires, the room characteristics, and the average illuminance on the workplane. It takes into account both direct and interreflected flux.

Luminaire
Any light emitting object, or configuration of light emitting objects, referenced within the Luminaire Schedule in Visual. Consists of photometric, graphical, and descriptive information.

Luminaire Ambient Temperature Factor
The performance multiplier accounting for temperature effects on the Luminaire. This is a non-recoverable factor and is critical for some Luminaires and some applications, for example, large freezers.

Luminaire Dirt Depreciation Factor
The fractional loss of task illuminance due to luminaire dirt accumulation over time.

Luminaire Type
See Luminaire.

Luminaires
Any light emitting object, or configuration of light emitting objects, referenced within the Luminaire Schedule in Visual. Consists of photometric, graphical, and descriptive information.

Luminance
The area density of the luminous flux leaving a surface through a given solid angle.

Lux
The metric standard unit of illuminance. One lux is equal to one lumen per square meter.

Masking
The process of removing calculation points from an existing Calculation Zone by selecting a polygonal exclusion region.

Max/Min
The ratio of the maximum value to the minimum value of illuminance found within a statistical or calculation zone. Typically used as an indicator of lighting uniformity in area lighting projects.

Model
The entire lighting system composed of Luminaires, Solid Objects (perhaps), and Calculation Zones.

Models
The entire lighting system composed of Luminaires, Solid Objects (perhaps), and Calculation Zones.

Mounting Height
The distance from the floor (or workplane if specified as such) to the light center of the luminaire. This may be the ceiling height in recessed cases.

Page
The electronic information representing what will be printed to make what is normally called a drawing.

Panel
Subdivision of the Ribbonbar menu system that group related commands using vertical dividers.

Panels
Subdivisions of the Ribbonbar menu system that group related commands using vertical dividers.

Pendant
A Luminaire suspended from the ceiling or other structure.

Photometric
Referring to a data file containing information related to the photometric distribution of lighting equipment. Valid files of this type typically have a .IES extension and adhere to the format outlined in IES LM-63.

Photometric file
A data file containing information related to the photometric distribution of lighting equipment. Valid files of this type typically have a .IES extension and adhere to the format outlined in IES LM-63.

Photometrics
Referring to a data file containing information related to the photometric distribution of lighting equipment. Valid files of this type typically have a .IES extension and adhere to the format outlined in IES LM-63.

Pick-box
A small square located at the center of the mouse pointer crosshairs when in selection mode. The size of the pick-box establishes the precision with which objects must be selected, it can be adjusted within the Options Form.

Planar
Two-dimensional in nature. All components lie within a single plane.

Plane
A two-dimensional and flat object.

Planes
Two-dimensional and flat objects.

Pole
A standard support generally used for area and site lighting projects.

Polygon
A closed planar figure composed of line segments with multiple angles and sides.

Polygonal
See Polygon.

Polyline
A graphical entity composed of one or more line segments continuously connected at the endpoints.

Radius
Related to arcs, circles, and spheres. The radius may be used to define the curvature by virtue of fact that all points on the object are equidistant from a center point. Any straight line from the center to a point on an arc, circle, or sphere.

Reflectance
The ratio of the flux actually reflected by a sample surface to that which would be reflected into the same reflected-beam geometry by an ideal, perfectly diffuse standard surface irradiated in exactly the same way as the sample.

Reflection
When light bounces off of a surface.

Register
A list of information kept in Visual.

Relative coordinates
Location information referenced to a Base Point. Usually used in commands to specify displacement.

Specular
A characteristic of a surface that reflects light in a directional fashion that is often image-preserving. Gloss finishes exhibit specular reflective characteristics as do mirrors and chrome.

Symbol
The graphic symbol associated with a Luminaire Type. Used to specify the location, orientation, and type of lighting equipment in drawings.

Tab
A user interface object found in the Ribbonbar or Sidebar comprised of graphic and text buttons grouped based on function.

Tabs
A user interface object found in the Ribbonbar or Sidebar comprised of graphic and text buttons grouped based on function.

Tangent
Related to a point on a curve, the tangent is given by the direction of a line passing through the point with an orientation perpendicular to the radius at that point. The tangent intersects the curve at only that location.

Template
A graphical representation of the illuminance produced by a single luminaire object. Lines are used to represent all points of a given illuminance level similar to elevation contours on a topographical map. Iso-illuminance templates are useful in determining the spacing and orientation of lighting equipment prior to system analysis.

Text box
An entry field that anticipates text entry via the keyboard. Text boxes are activated with a left-click of the mouse and present an "I-beam" cursor for text editing.

Toggle button
A button that turns a feature on when highlighted in yellow and off when not highlighted. Successive left-clicks of the mouse cycle the on/off state.

Transmittance

Transmission is when light passes through a material.

Troffer

A recessed lighting unit, usually long and installed with the opening flush with the ceiling. "2x4"

Uniformity gradient

A statistic that measures the rate of change of illuminance over a Calculation or Statistical Zone expressed as a ratio between the illuminance level of adjacent calculation points.

Vector

A linear entity having both length and directional properties.

Vertex

The intersection of two lines or the corner of a Solid Object.

Vertices

The plural of vertex.

Window

A selection technique whereby objects are added to the selection set based upon their inclusion within a drawn rectangular (window) region. Objects lying entirely within the window are added to the selection set.

Workplane

The plane at which work is usually done, and on which the illuminance is specified and measured.

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