# 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.
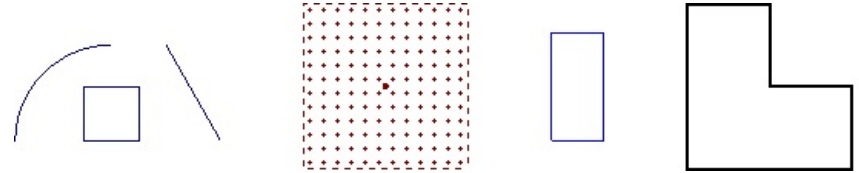
3.1 Background Objects

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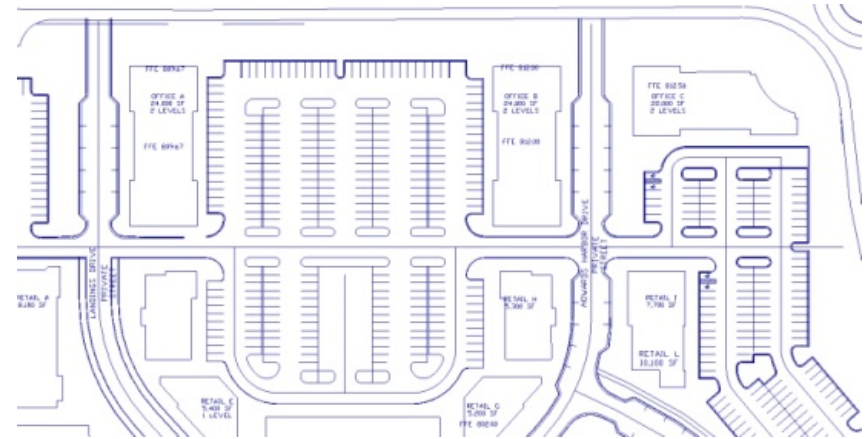
Background Objects do not affect lighting calculations in any way nor do they change with changes in **Display Mode**. See Display Modes for more information.

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.

General				
Name		Floor		
Area		100.000		
Normal	Flip	0.000	0.000	1.000
Reflectance (%)		20	▣ ■	▾
Transmittance (%)		0	Diffuse	▾

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.

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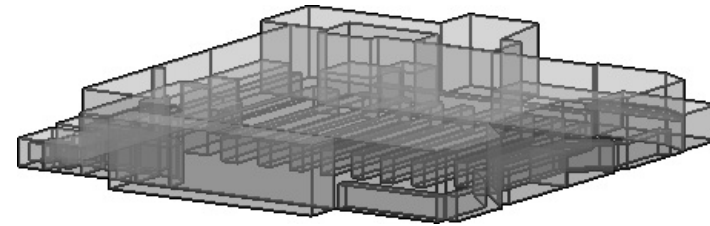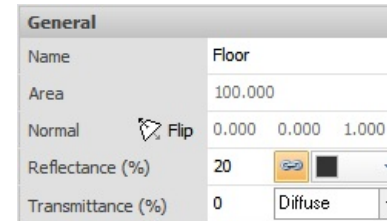
Note that **Solids** are shown in this manual as they appear in **Transparent Display Mode** and are therefore shaded/filled.

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 | 5 | GOTHAM ARCHITECTURAL LIGHTING | AFV 3ZTRT 6AR | 6" SEMI-SPECULAR OPEN VERTICAL DOWNLIGHT WITH 3ZTRT LAMP | (1) CF3ZTRT | AFV_3ZTRT_6AR.ies | 1 | 2400 | 0.77 | 33.1 |

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.

| | XA | 1 | HOLOPHANE | SMST400MH00XXPM | SOMERSET AREA LIGHT WITH 400W PULSE-START LAMP, QUAD ASSEMBLY | (4) MH400/PS | SMST400MH00XXPM.ies | 1 | 40000 | 0.75 | 1768.0 |

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** .

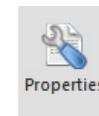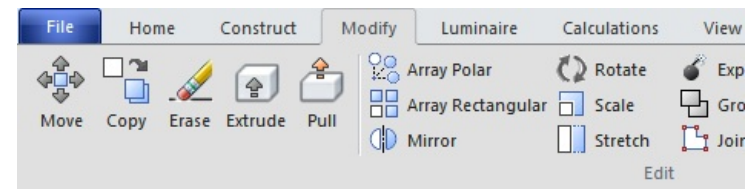**Luminaires** may be calculationally inactivated in the Layer Manager.

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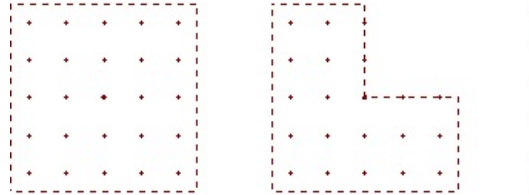
3.4 Calculation Zones

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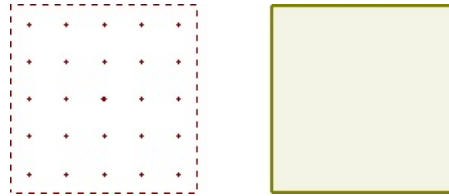
Lighting Calculation Zones can be defined by rectangular areas, areas bounded by a *polygon*, or can be locations along a *linear* path. **Calculation Zones** can also be placed directly on surfaces (**Solid Objects**).

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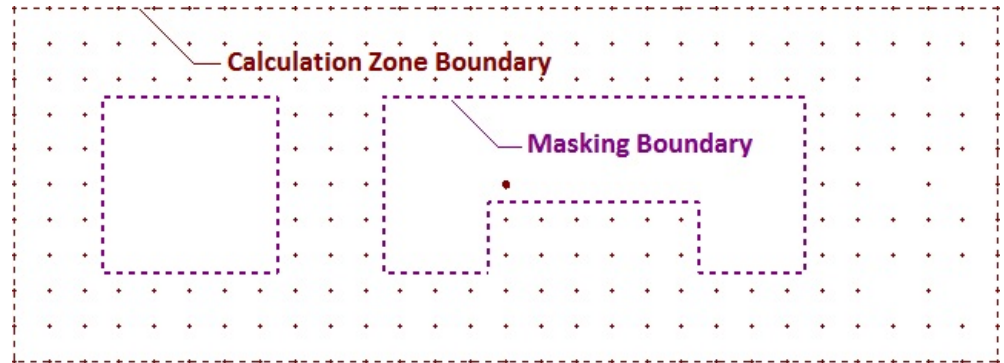
Statistical Zones can be created to report information about part of a **Lighting Calculation Zone**. **Statistical Zones** are displayed in the **Statistics** *tab* of the **Sidebar** separately from their parent zone.

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.


▦ All Points		
Average	3.5	fc
Maximum	9.1	fc
Minimum	0.6	fc
Max/Min	15.2:1	
Average/Min	5.8:1	

▦ Paved Area		
Average	3.4	fc
Maximum	9.1	fc
Minimum	0.6	fc
Max/Min	15.2:1	
Average/Min	5.7:1	

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**).
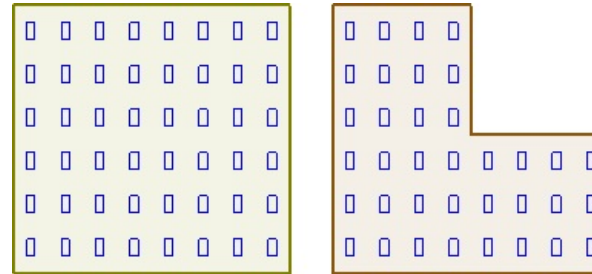
LPD Polygon		
Luminaires	36	
Total Power	2005.20	W
Area	3008.00	ft²
Power Density	0.67	W/ft²

LPD Rectangle		
Luminaires	48	
Total Power	2673.60	W
Area	3968.00	ft²
Power Density	0.67	W/ft²

Calculation Zones may be calculationally inactivated in the Layer Manager.

 Layer Manager
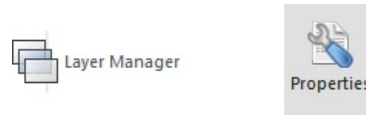
 Properties

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).