

6.2: LRP Technology and Product Design Tools





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- Sensor Placement and Orientation Tool-- SPOT
 - Software Tool analyzing photosensor placement in classroom spaces
 - Excel Interface, Radiance Engine
 - Input space design conditions
 - Output daylighting and electric lighting design performance

Sensor Placement and Orientation Tool-- Inputs

Geometry Input








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Spatial Characteristics

Dimensions:

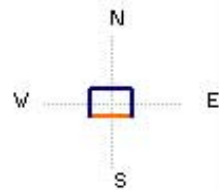
| | | |
|------------------|------|-----|
| Width | 20.0 | ft |
| Length | 30.0 | ft |
| Height | 12.0 | ft |
| Workplane Height | 2.50 | ft |
| Wall Thickness | 10.0 | in |
| Skylight Depth | 1.0 | ft |
| Orientation | 0.0 | deg |

Surface Reflectances:






| | | |
|--------------|-----|---|
| Floor | 20% |  |
| Walls | 60% |  |
| Ceiling | 80% |  |
| Ground | 25% |  |
| Mullions | 50% |  |
| Lightshelves | 80% |  |
| Overhangs | 80% |  |

Interactive Display - Overall Space

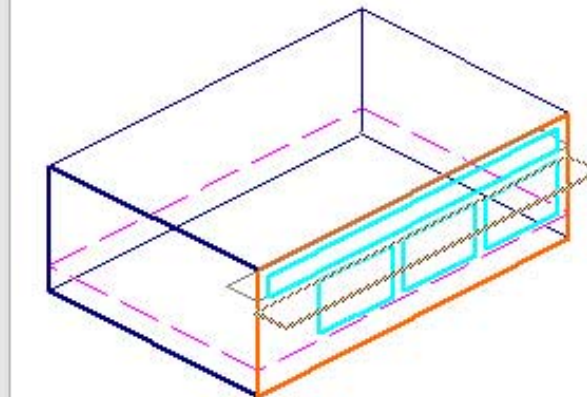
Compass



Legend

| | |
|----------------|--|
| Walls |  |
| South Wall |  |
| Workplane |  |
| Window |  |
| Active Element |  |

Space Isometric




- Numeric inputs in Excel create 3-D model of space

Sensor Placement and Orientation Tool-- Inputs

Electrical Lighting






Electric Lighting Layout


Zone # 

| | |
|---------------------|-------|
| Mounting Suspension | 3 ft |
| Row Start | 24 ft |
| Column Start | 4 ft |
| Number of Rows | 1 |
| Number of Columns | 7 |
| Row Spacing | 0 ft |
| Column Spacing | 4 ft |
| Orientation | 0 deg |

Interactive Display - Reflected Ceiling Plan

Legend

- Walls 
- South Wall 
- Zone 1 
- Zone 2 
- Zone 3 



- Numeric inputs and .ies files add electric lighting

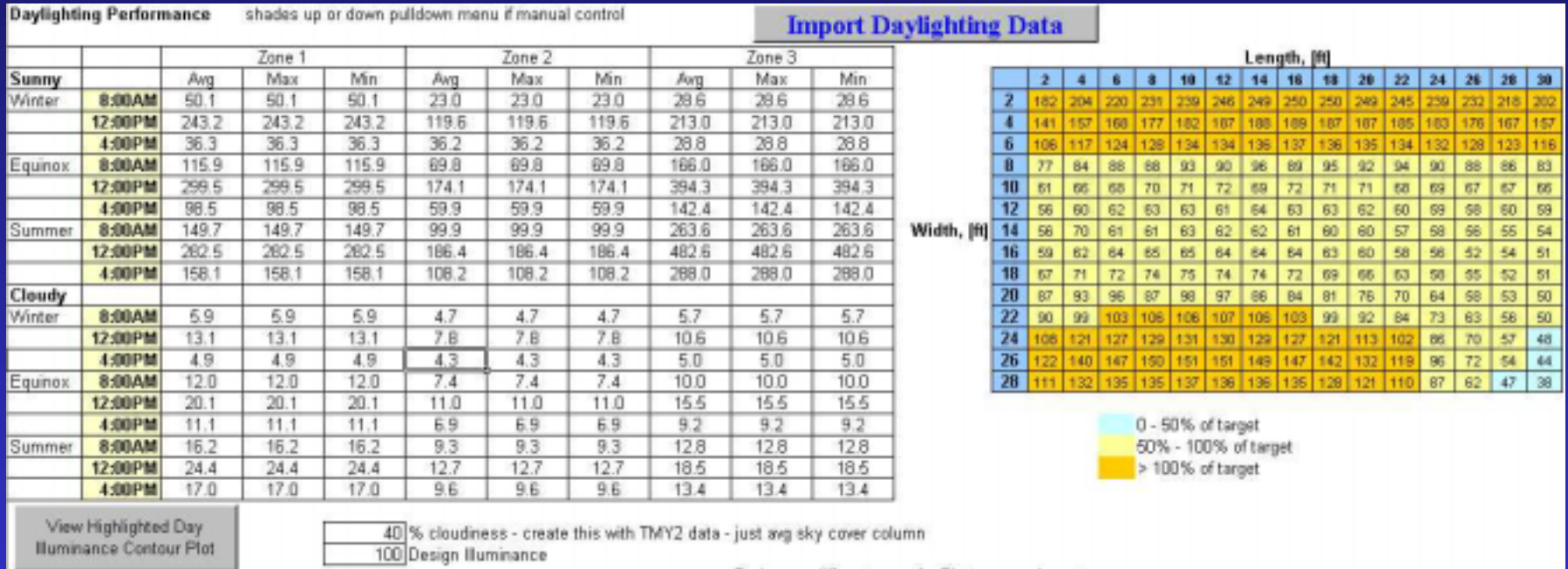
Sensor Placement and Orientation Tool-- Analysis



- Radiance creates model of the space

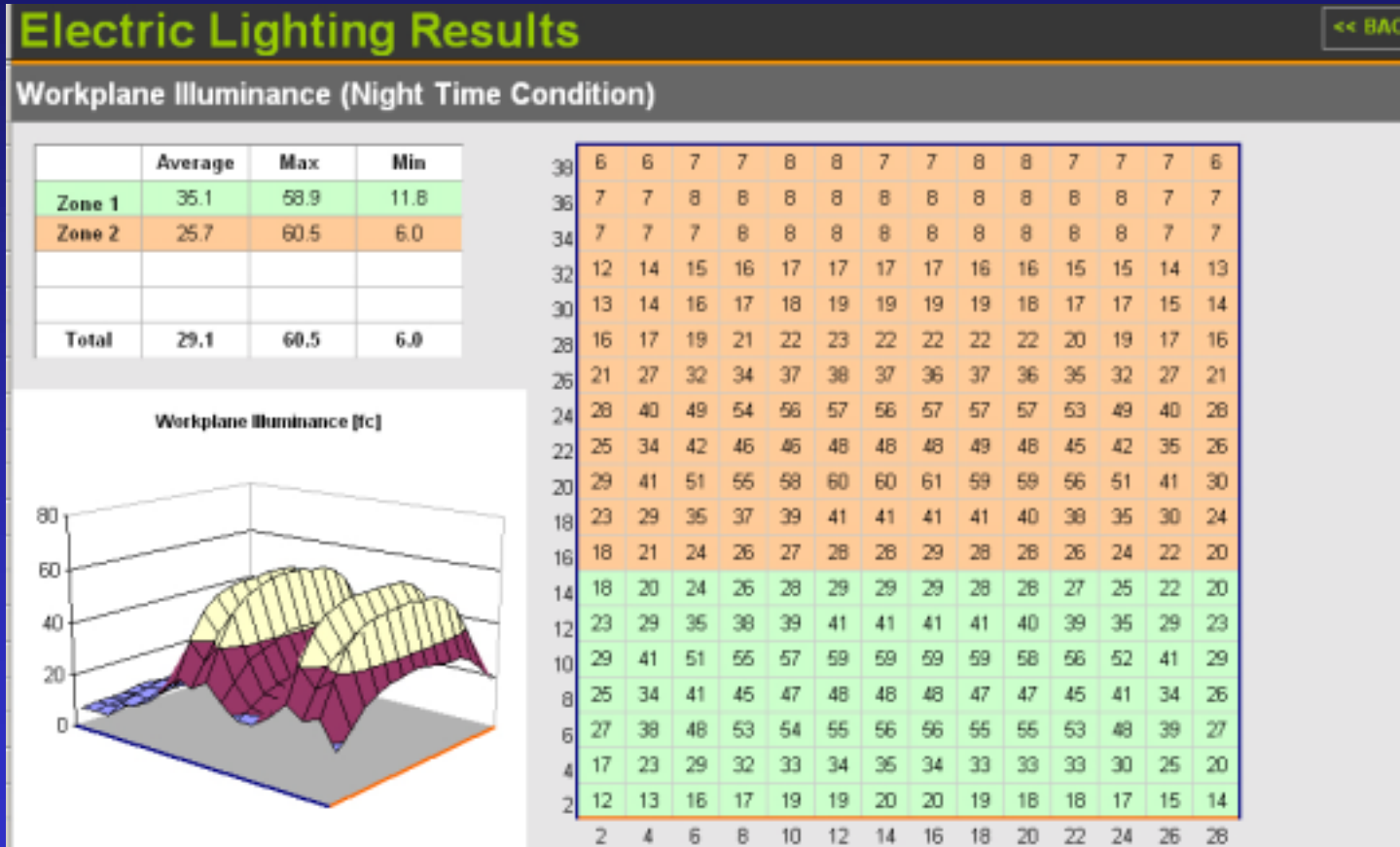


Sensor Placement and Orientation Tool-- Analysis



- SPOT analyzes daylight performance

Sensor Placement and Orientation Tool-- Analysis



- SPOT analyzes electric lighting performance

Sensor Placement and Orientation Tool-- Analysis

Design Tool - Photosensor Generator Generate Test Points

| Photosensor Name | Location | | | Aiming | Photosensor Type |
|------------------|----------|---|---|--------|------------------|
| | X | Y | Z | | |
| V1 | | | | Down | |
| V2 | | | | Down | |
| V3 | | | | Down | |

* pulldown menus with options up,down,north,east,south,west

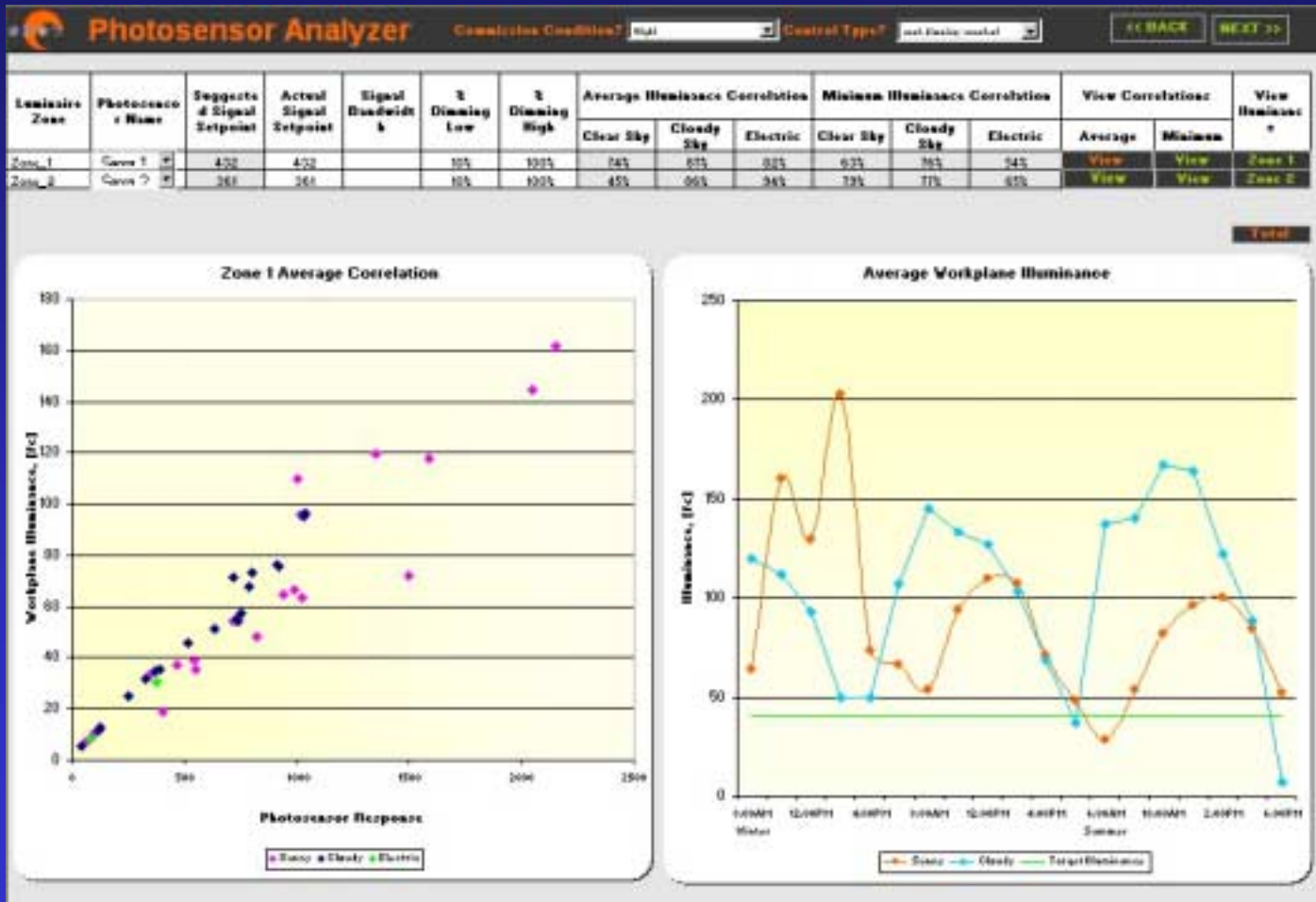
Next →

* will start sensor calc

- Photosensor generator recommends photosensor placement



Sensor Placement and Orientation Tool-- Analysis



- SPOT analyzes photosensor performance and correlation between electric lighting and daylight



Sensor Placement and Orientation Tool-- Output

Analysis Tool - Annual Analysis << BACK

| Annual Results | | | | | |
|----------------------------|-------|-------|-------|-------|-------|
| | Zone1 | Zone2 | Zone3 | Zone4 | Total |
| Average Light Output | 0.22 | 0.20 | | | 0.48 |
| Electric Savings, [kWh/yr] | 724 | 746 | | | 1470 |
| Heating Load, [kBtu/yr] | 743 | 775 | | | 1518 |
| Cooling Load, [kWh/yr] | 76 | 76 | | | 152 |
| Average Illuminance, [fc] | 119 | 164 | | | 148 |
| Minimum Illuminance, [fc] | 8 | 4 | | | 4 |
| Maximum Illuminance, [fc] | 2363 | 2117 | | | 2363 |

Building / Campus Information

Number of Similar Spaces:

Average Electricity Price: \$/kWh

Average Heating Price: \$/Therm

| Building Wide Results | | |
|-----------------------|----------|----------|
| | Building | Costs |
| Electric Savings, | 29392 | \$ 2,939 |
| Heating Load | 30359 | \$ 182 |
| Cooling Load | 3034 | \$ 303 |
| Total | | \$ 3,060 |

- SPOT provide results on daylighting harvesting and annual energy savings



Sensor Placement and Orientation Tool-- Market

Key Next Steps

- Wide-spread distribution of free-ware
- Education of user groups
- Validation of results through successful implementation
- Integration into standard practice of photosensor manufacturers and specifiers