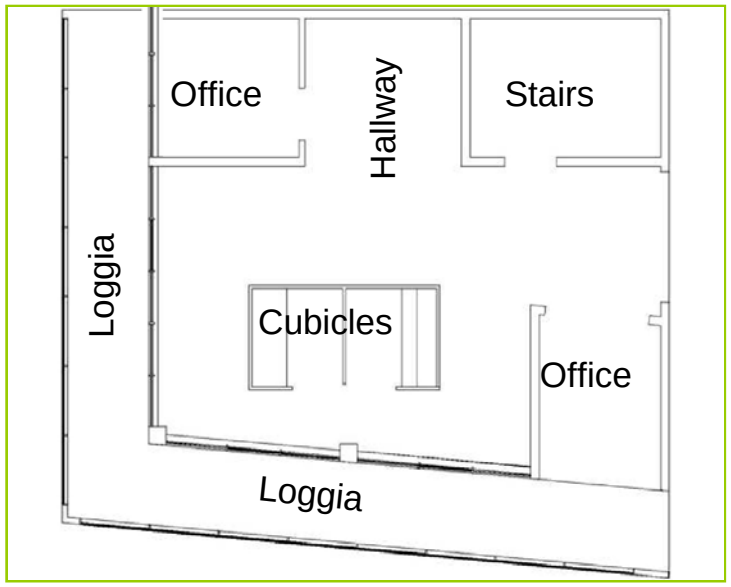
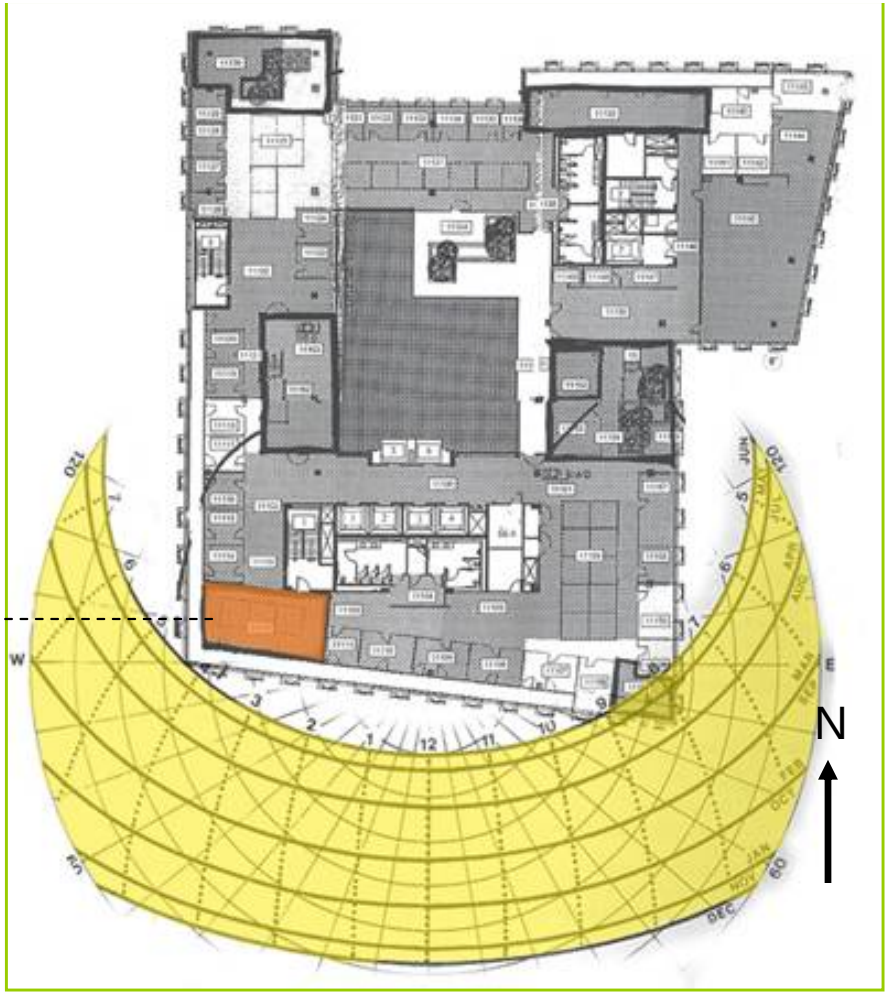
Genzyme Daylighting Proposal

Jeff Andersen, Manshi Low, Wendy Meguro

Existing Conditions: Site & Room



Room floor plan



11th floor plan

Site plan

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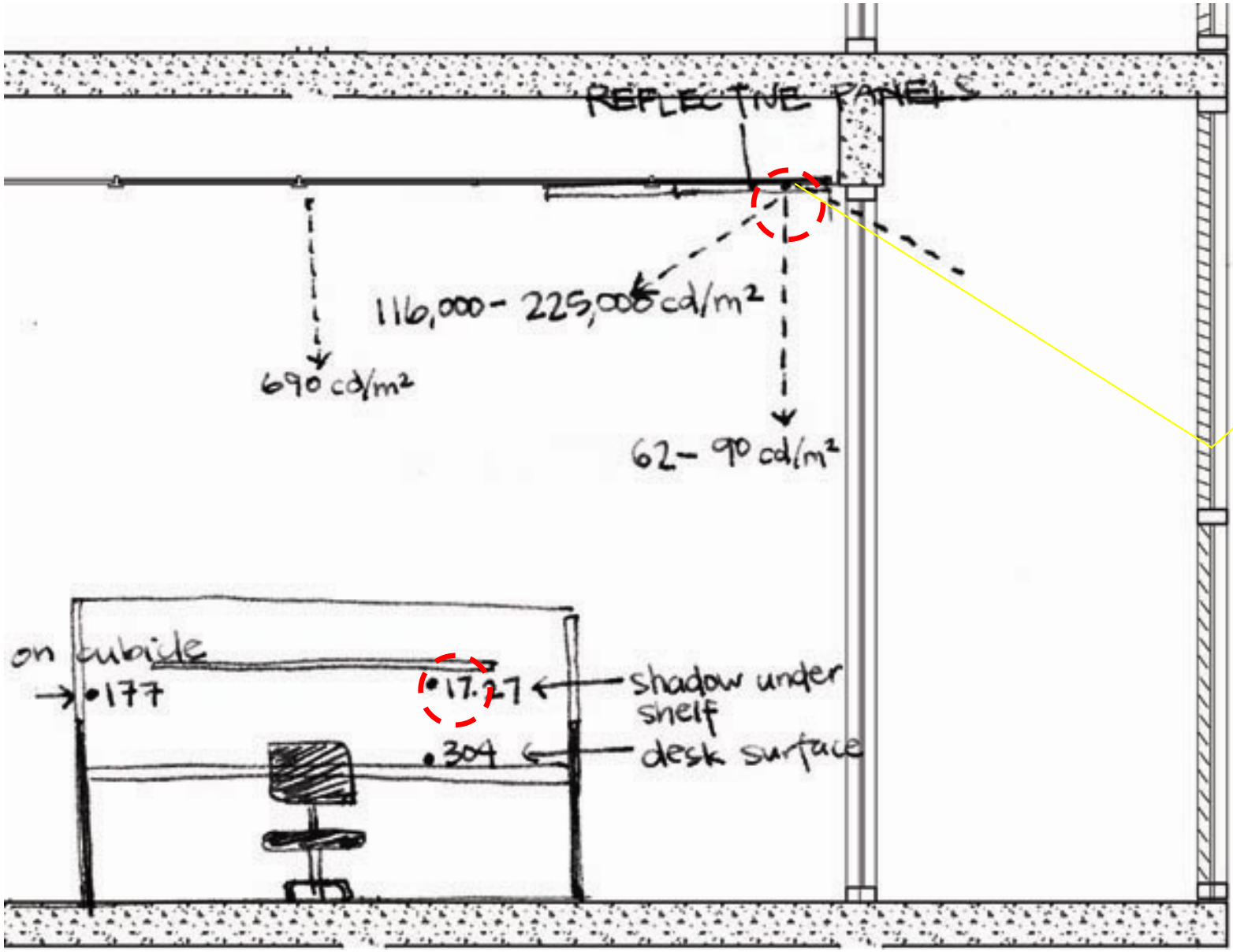
Existing Conditions: Luminance Readings

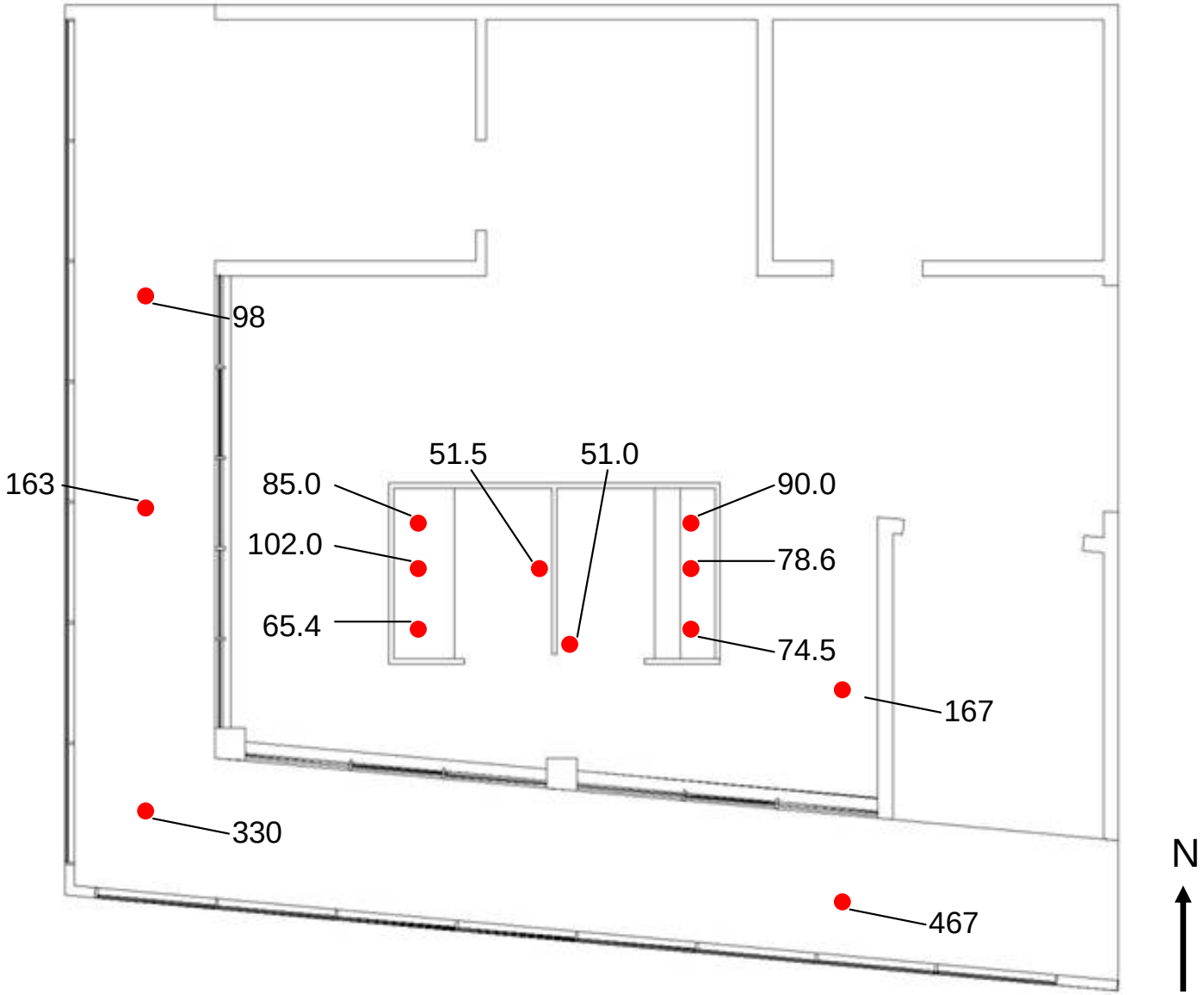


Range for luminance readings: 17 cd/m² – 225,000 cd/m²

Range of contrast [ratio]: 1:13,000

Existing Conditions: Diagnostic Readings

Illuminance Readings with the curtains open, top blinds open



Floor Plan

Range for illuminance readings: 51-467 lux

Existing Conditions: Diagnostic Readings

Visual Contrasts

Ideal	***Actual***
Paper task to computer monitor = 1:3 or 3:1	Given typical VDT luminance = 200 – 300 cd/m^2 Paper task to computer monitor = 516.8:250 = **2:1 (OK)**
Task to darker distant background surfaces = 10:1	Task to under shelf = 516.8:17.3 = **30:1 (TOO DARK)**
Task to lighter distant background surfaces = 1:10	Task to metal panel on ceiling = 516.8:170,500 = **1:330 (TOO BRIGHT)**
Between adjacent ceilings and wall zones = 8:1	Between adjacent ceilings and wall zones = 637:570 = **1:1 (OK)**

Visual comfort

To optimize VDT (Video Display Terminal) use by

1) Improving quality of light on work surfaces with a more uniform distribution of light and with minimal glare
2) Provide lighting at ideal luminance ratios

Paper task to computer monitor	1:3 or 3:1
Task to darker distant background surfaces	10:1
Task to lighter distant background surfaces	1:10
Between adjacent ceilings and wall zones	8:1

3) Optimizing reflectances of surfaces to ISNEA guidelines of 70:50:20 (ceilings:walls:floors)
4) Keeping in mind design considerations for furniture and equipment ergonomics for user control and flexibility

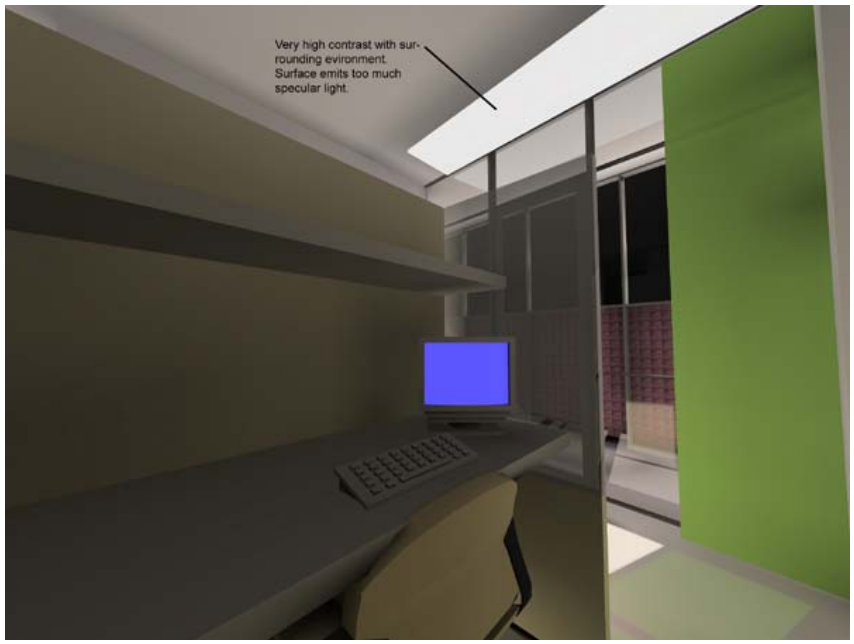
Optimize Façade by utilizing appropriate glazing for (1) the orientation and (2) the height in the wall. Consider the quality and quantity of light entering while minimizing solar heat gain during summer and heat loss in winter. Avoid direct sunlight on the desk surfaces. Patches of direct sunlight are acceptable on the floor of the loggia and circulation spaces.

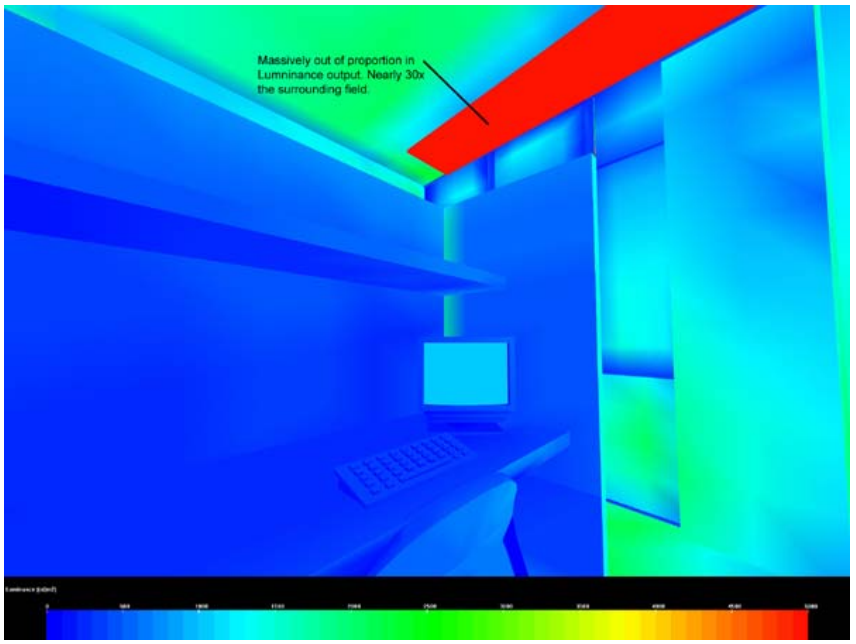
Design Solutions

1. Perforated Metal Screen
2. Façade Photovoltaics
3. New Artificial Lighting

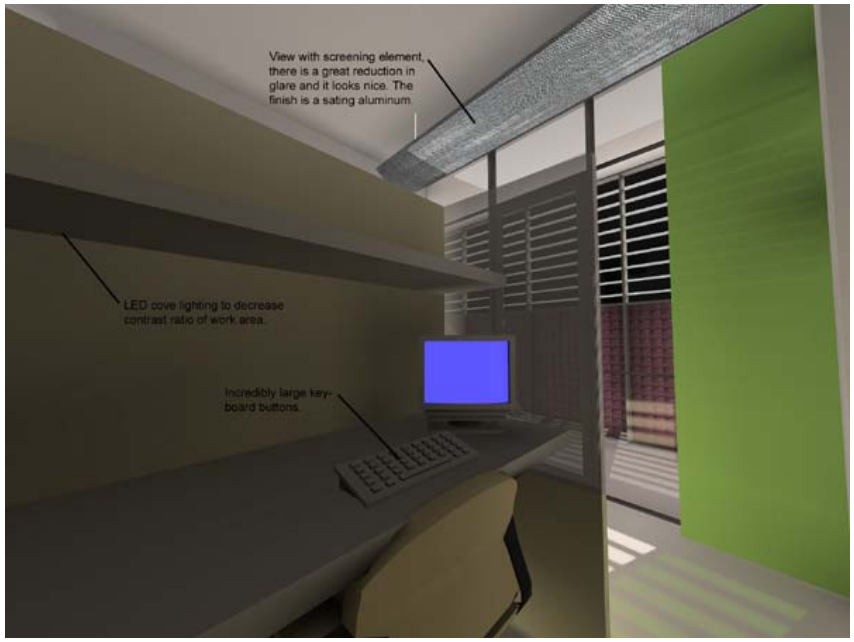
Design Solutions: Perforated Metal Screen Detail

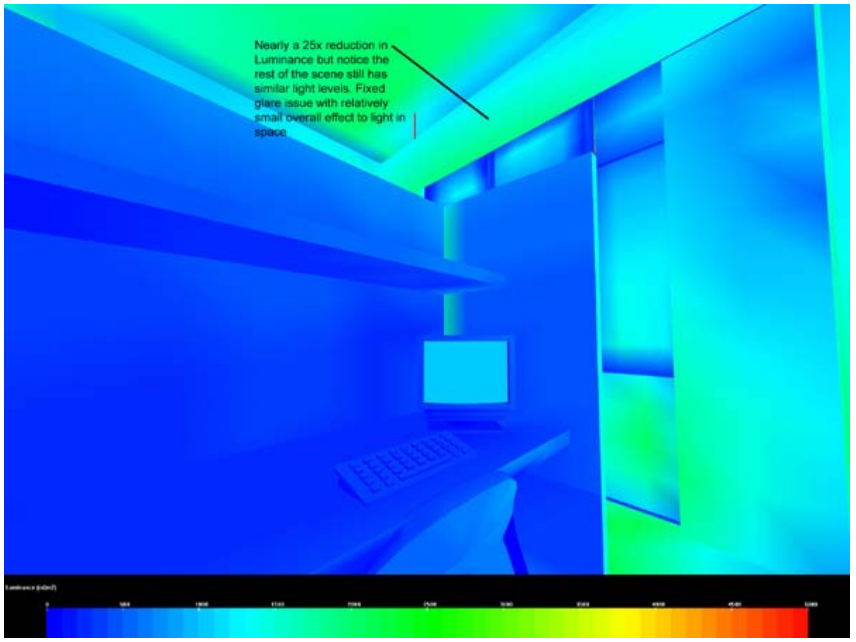
Existing Conditions: Glare





Proposed Condition





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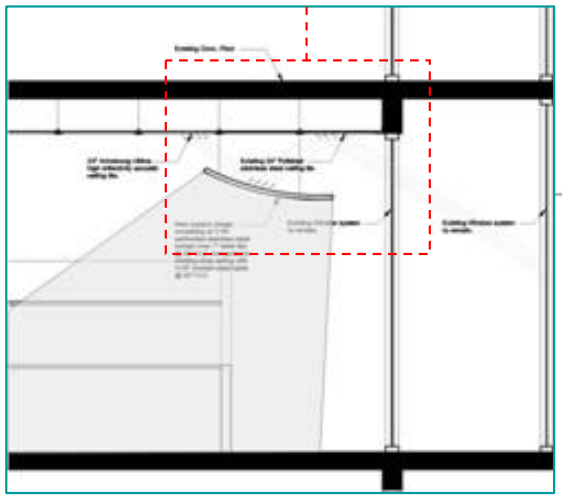
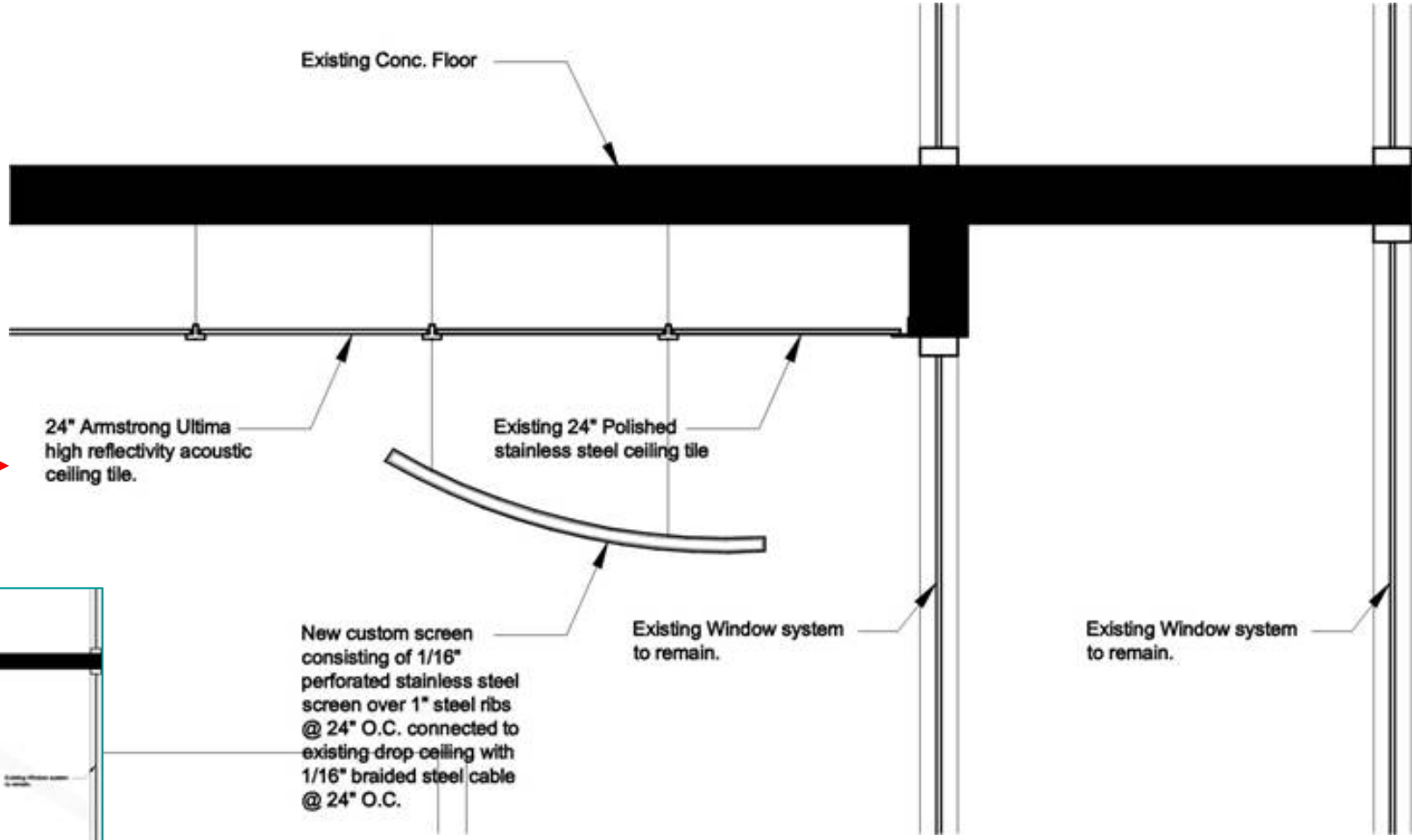
Design Solutions: Perforated Metal Screen Detail

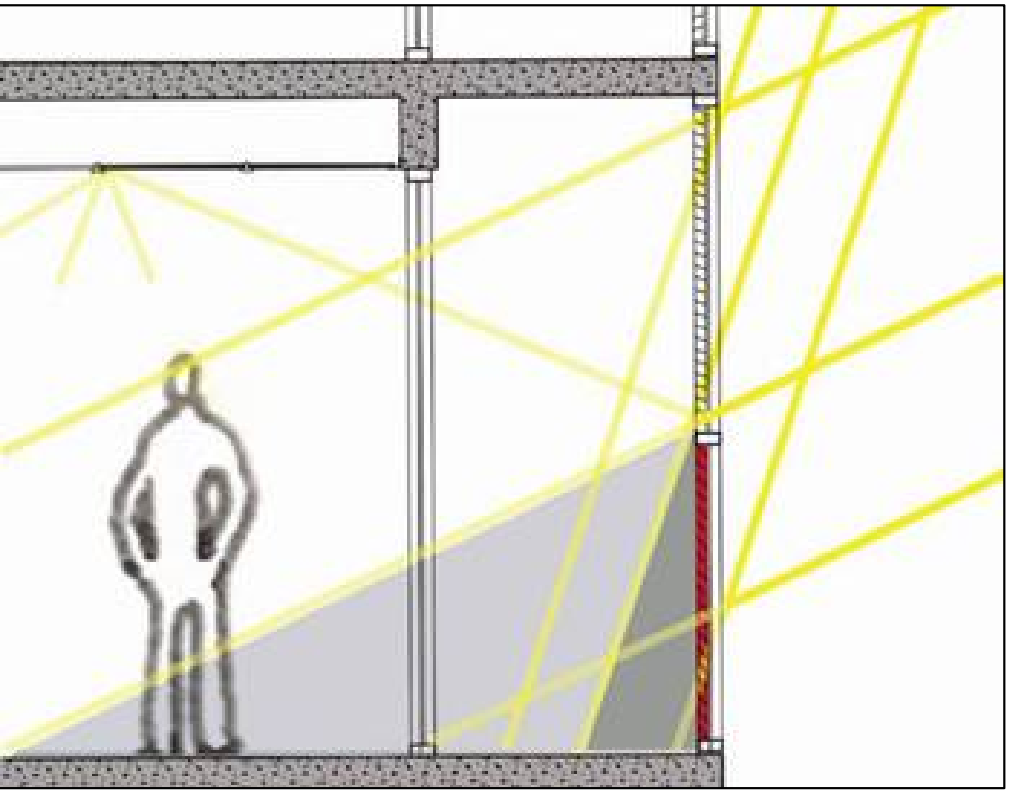
- Shades desk area from highly reflective ceiling plane while still allowing some light to come through
- Reduces the panorama contrast from roughly 330:1 down to about 5:1
- Lightscape shows a decrease in light on the task surface of about 5%



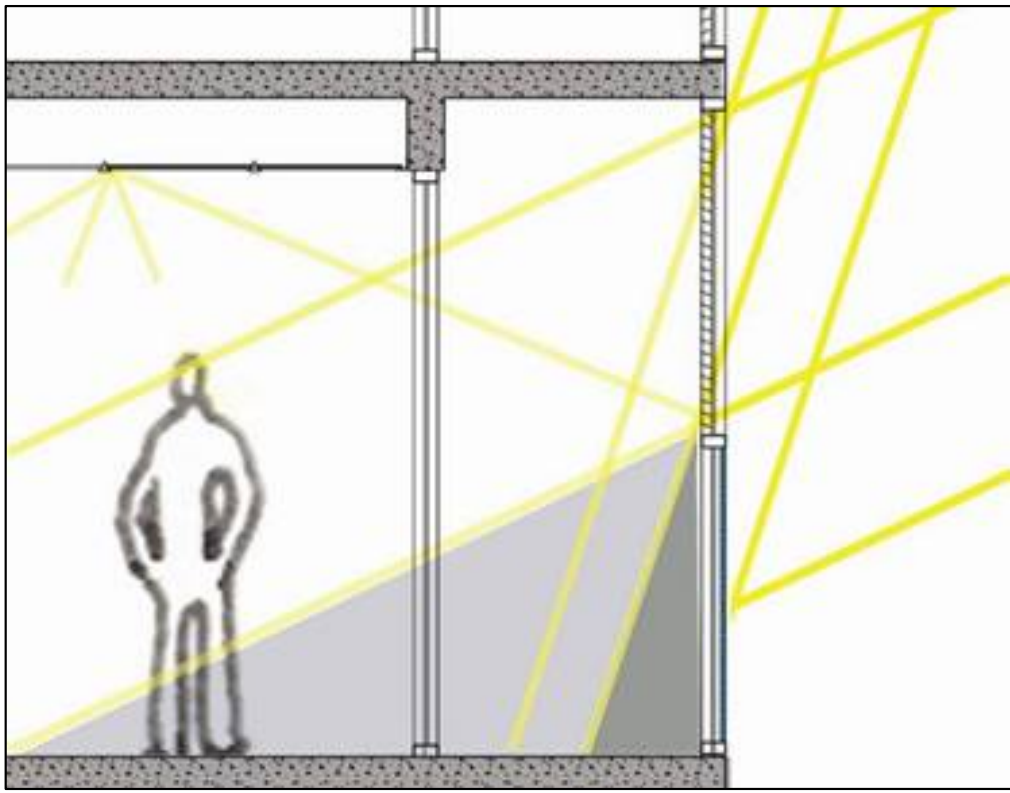
Section



Design Solutions: Façade Optimization: Integrate Photovoltaics

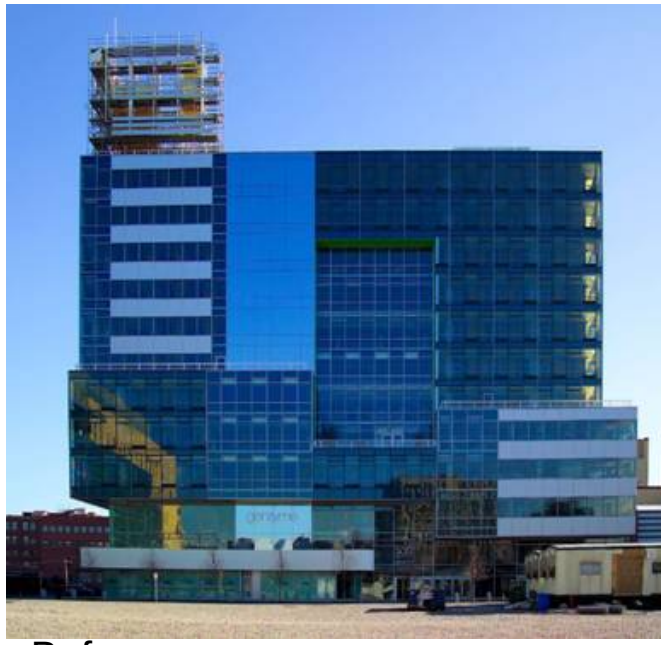


Façade with blinds

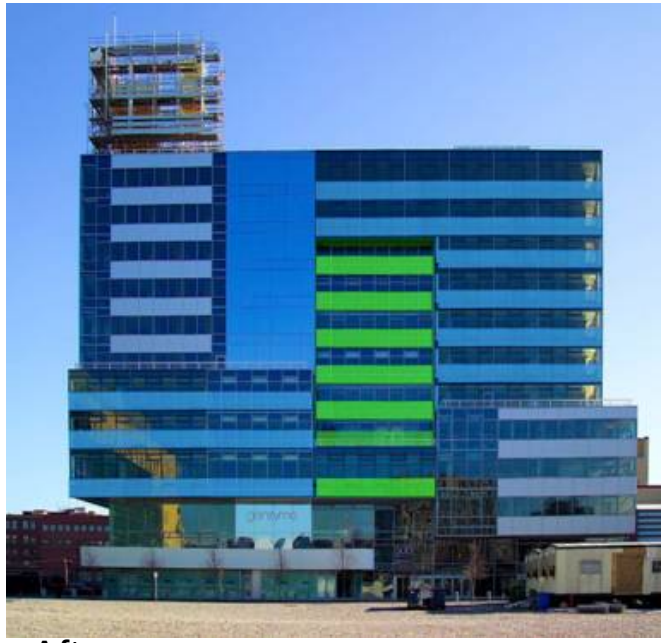


Façade with PV

Design Solutions: Façade Optimization: Photovoltaics



Before



After

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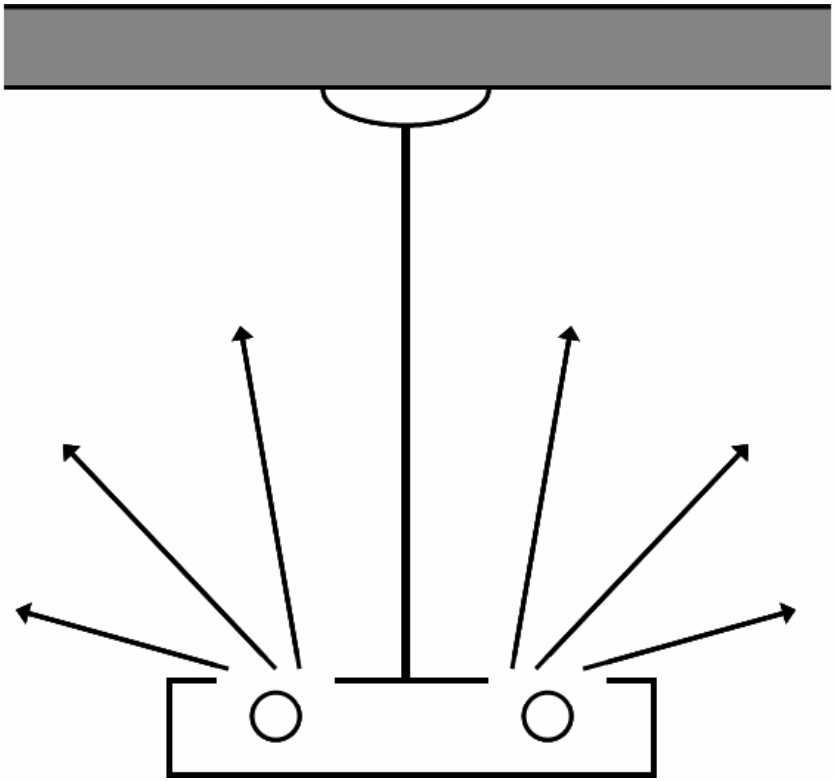
Sanyo PV Cell

Power Production
[125 kwh/ m²/year x 5 hrs of sun/day] x .70 = 87.5 kwh/ m²/year

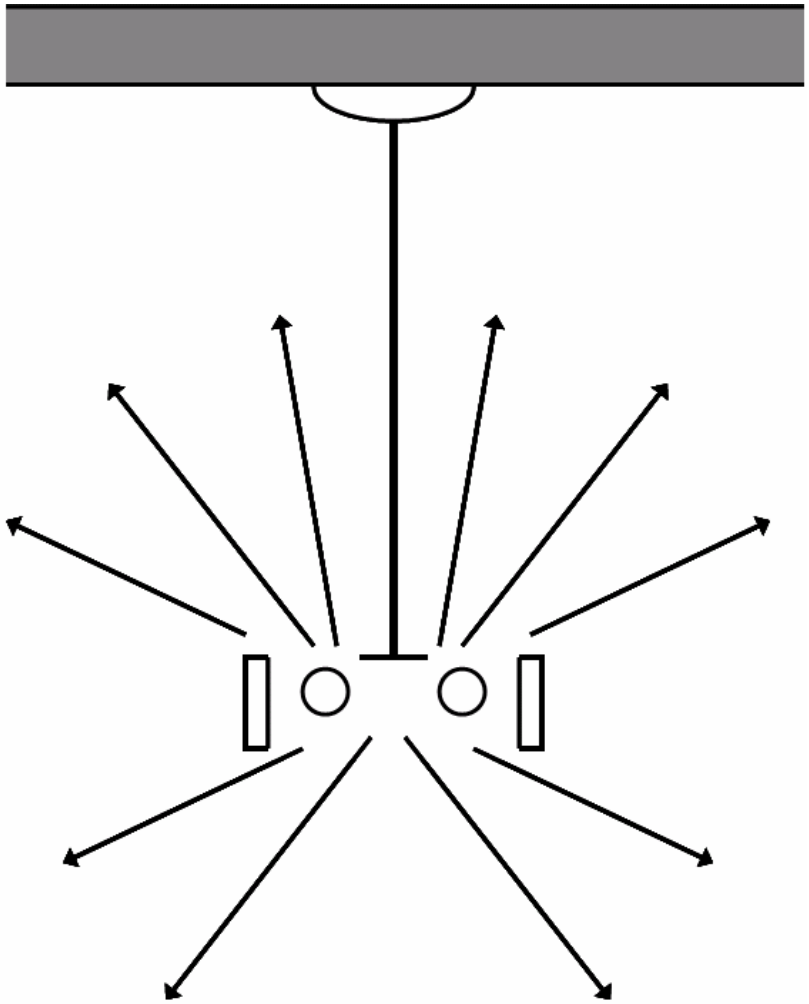
224 m² of panel x 87.5 kwh/ m²/year = 19,250 kwh/year + 1.925 million watts

What does this mean?
That is theoretically enough energy to power 250, 36-watt compact fluorescent bulbs for 8 hours a day for 240 days. That is roughly the number of working days at Genzyme per year (factoring in holiday and weekends).

Design Solutions: Artificial Lighting Improvements

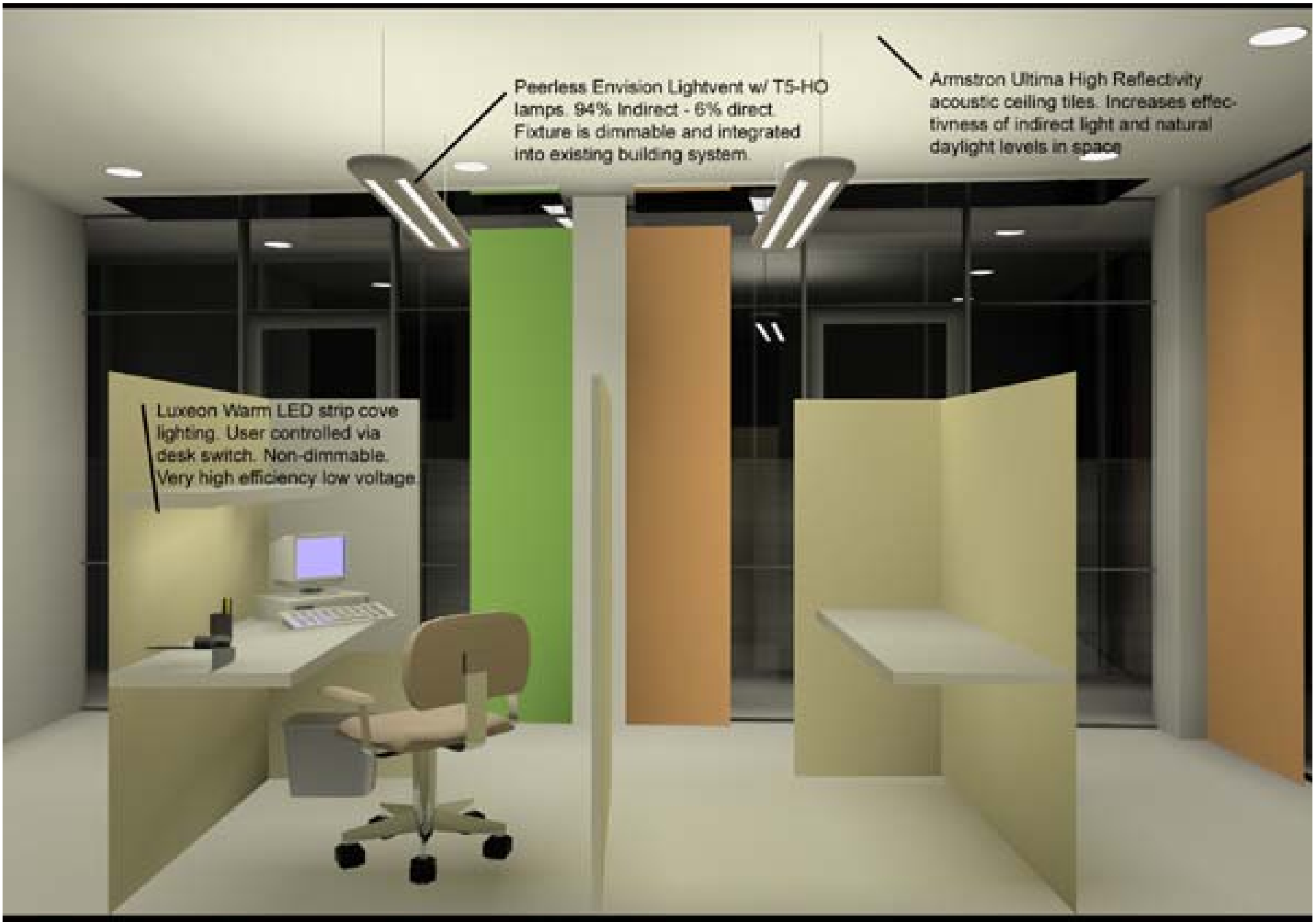


Existing: Indirect only

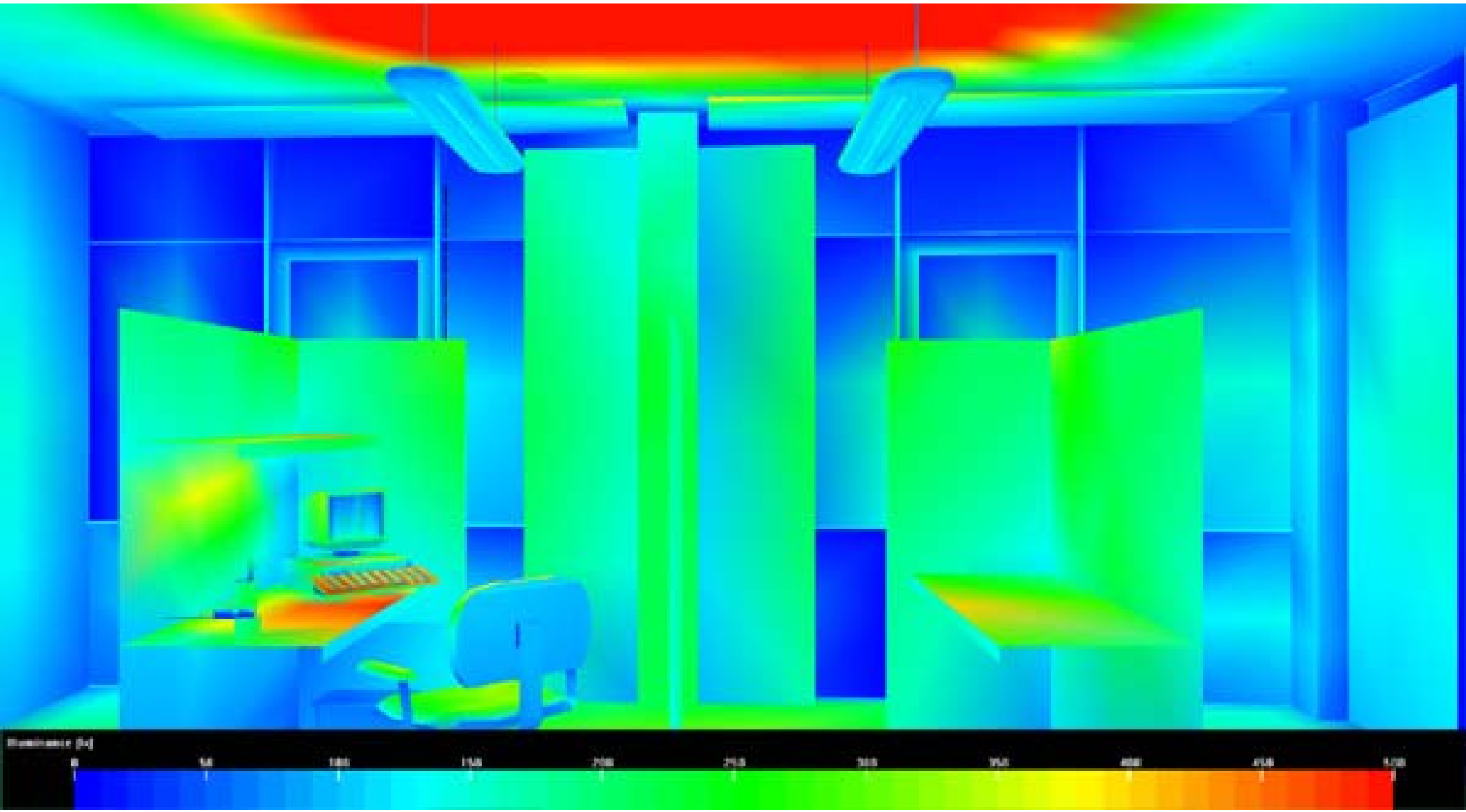


Proposed: Indirect + Direct

Design Solutions: Artificial Lighting Improvements



Design Solutions: Artificial Lighting Improvements



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Commentary on Daylighting Computer Analysis