

ENVIRONMENTAL ARCHITECTURE

DESIGN GROUP

## Mission Statement

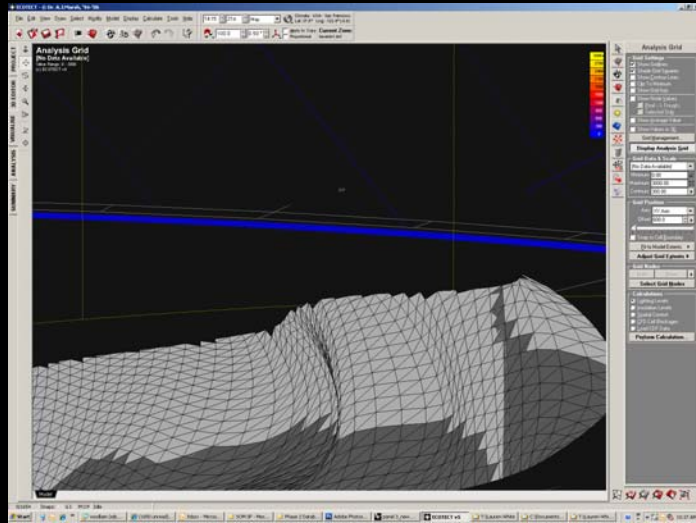
*Integration of computational parametric modeling  
into the building design process to inform  
environmentally responsive design decisions.*



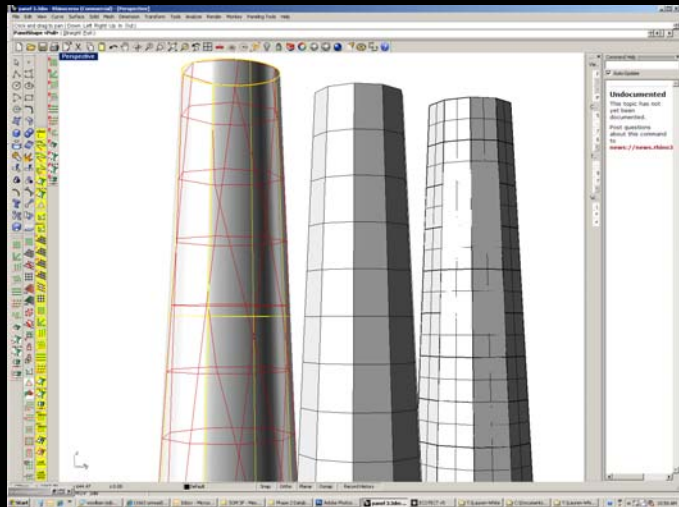
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# Who

- **Michael Fukutome**
  - LEED Certified
  - Manage team
  - Support team
- **Lauren White**
  - Comparative analysis report production
  - Database modeling, Access
  - Digital Project, Parametric Modeling
  - Rhino - Panelization Plug In
  - Grasshopper Panelization
  - Carbon Footprint Calculator
  - Ecotect / Rhino Relationship
- **Krista Raines**
  - Climate Analysis
  - Daylight Analysis
  - Shadow Analysis
  - Wind studies
  - View Calculations
  - Thermal Analysis
  - Sustainable Research
- **Emanuele Naboni**
  - Climate Analysis
  - Thermal Analysis
  - Shadow Analysis
  - Daylight Analysis
  - Sustainable Research



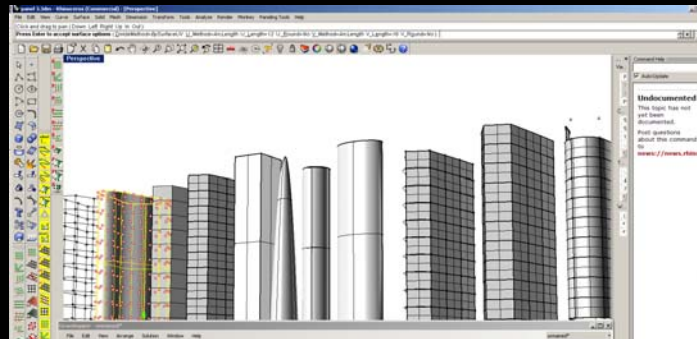
Tool: Ecotect From Rhino Panelization  
Study: Testing Panels For Shadows 1  
Project: Interoperability Study  
Goal: Find fast way to get shadow studies for Rhino forms

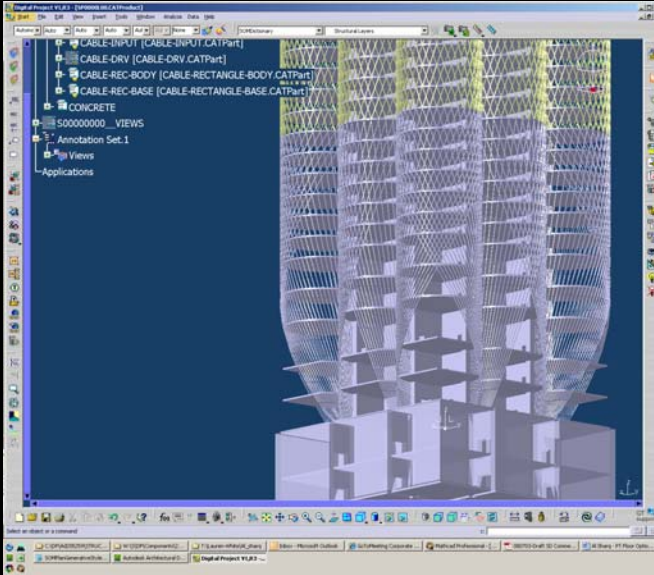


Tool: Rhino Panelization Plug In  
Study: Quick Panels Ecotect Prep  
Project: Interoperability Study  
Goal: Testing fast faceting tools for exploring form finding for eco tools.

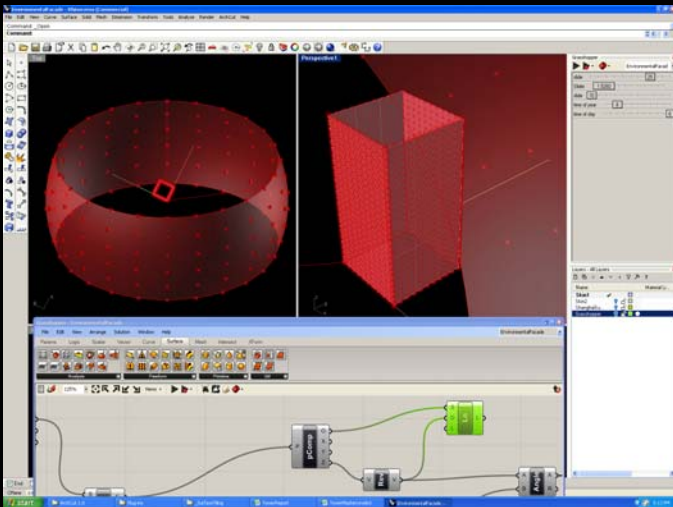
2

Lauren White - Studies





3  
Tool: Digital Project  
Study: Train structures to model coils  
Project: Al Sharq  
Goal: To determine best way to prep DP model for structural analysis



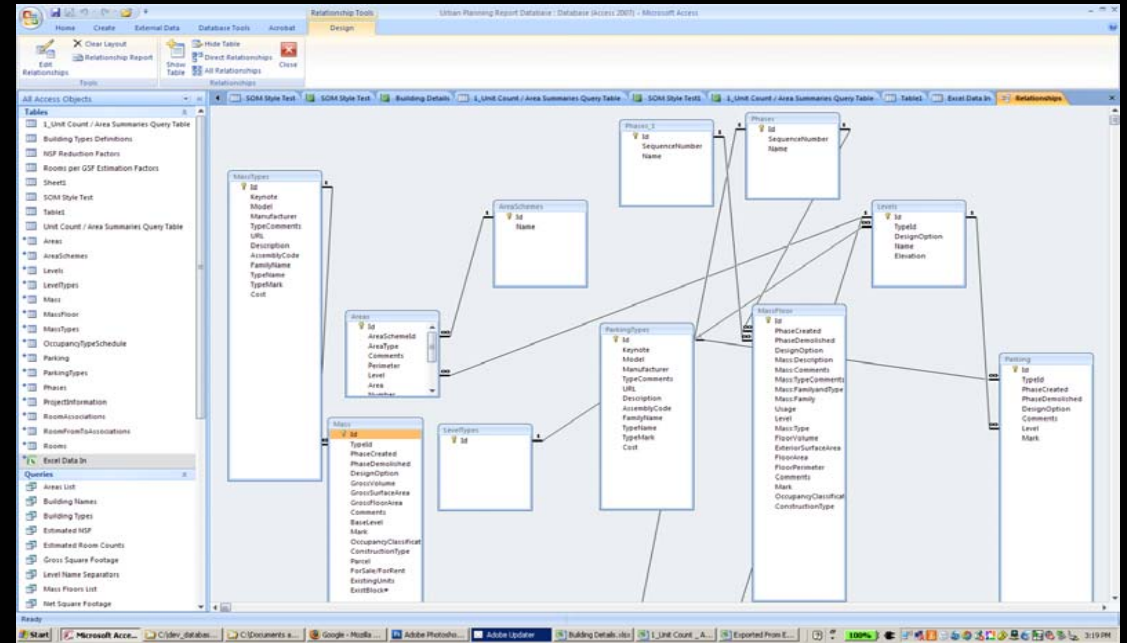
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Tool: Grasshopper  
Study: Solar Path Panel Sizing  
Project: Current Training w. Claudio  
Goal: To resize panels according to sun path

Lauren White - Studies

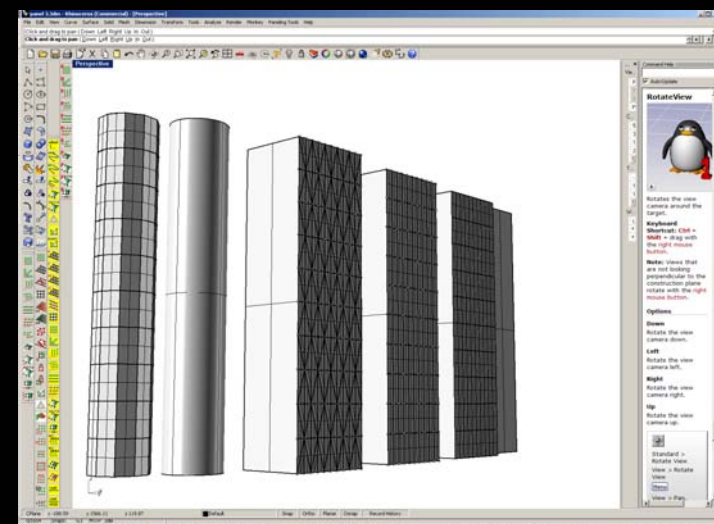
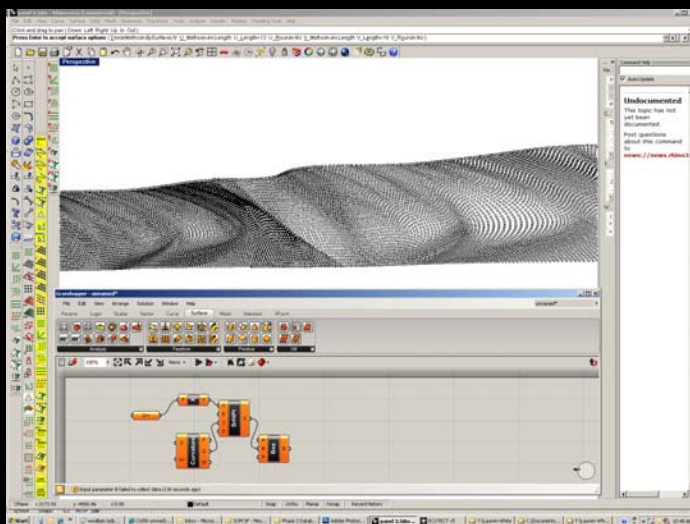
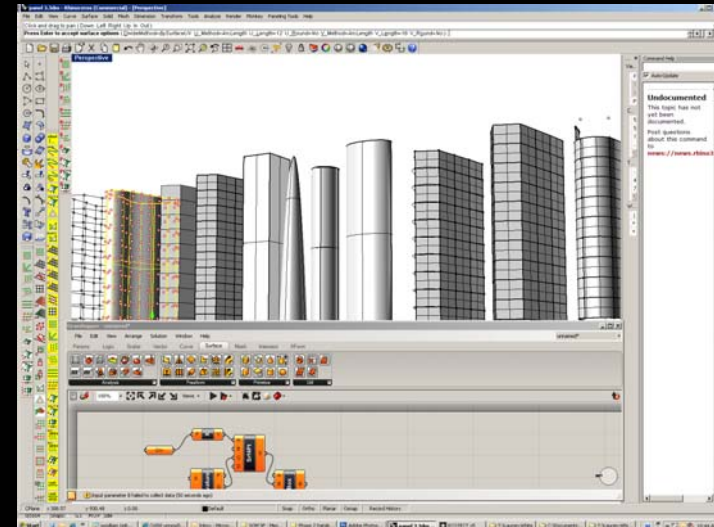
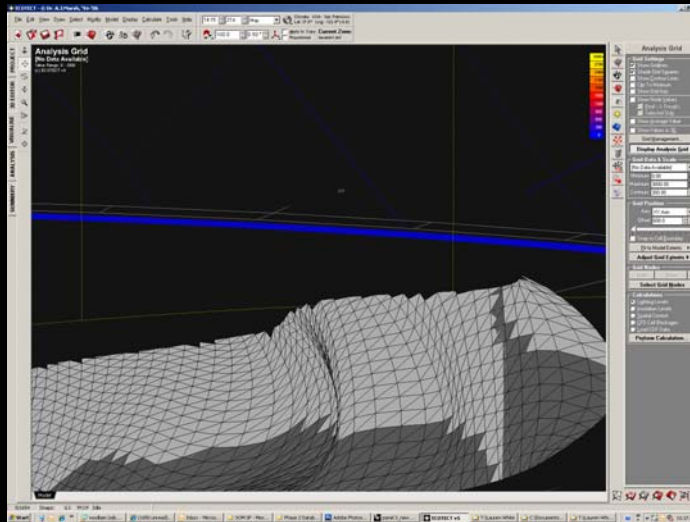
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Tool: Access – Excel Data Exchange  
 Study: Data to Reports  
 Project: Park Merced  
 Goal: To export Revit data to database and create reports

5



Lauren White - Studies

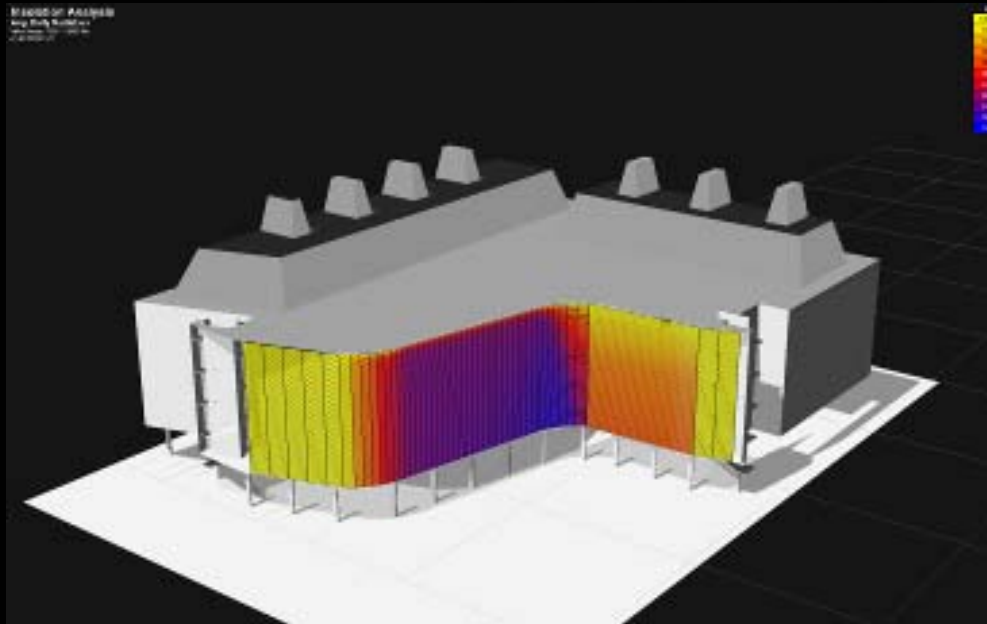


Goal: Interoperability With Core Tools and Processes



# Environmental Architecture Design Group Goals

To find ways to support staff and  
integrate environmental analysis  
into our core processes.



- Produce building models with environmental information that can be useful as a building design tool and marketing tool.
- Investigate site and building possibilities and constraints through dynamic modeling methods to analyze efficient algorithms and data structures to produce a series of design studies (form, orientation, shading, material selection, etc.) based on a dynamic range searching modeling cycle.
- Evaluate the relationship between indoor and outdoor environmental conditions so that it can be optimized to minimize energy demand and improve comfort while maintaining the design integrity.
- ETC.

**Integration of digital environmental information into existing core modeling tools.**



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## Green Building Ordinance

1/1/09

- At least 75% of the project's construction debris must be diverted.
- The use of low-emitting materials is required.

1/1/10

- LEED Silver rating required.

1/1/11

- Required 30% reduction in water use and a minimum 50% reduction in potable water use for landscaping.
- Energy generation or purchase green energy credits is required.

1/1/12

- LEED Gold rating required.

- Surrounded on three sides by water, **San Francisco is extremely vulnerable to climate change** caused by global warming and the associated rise in sea levels.

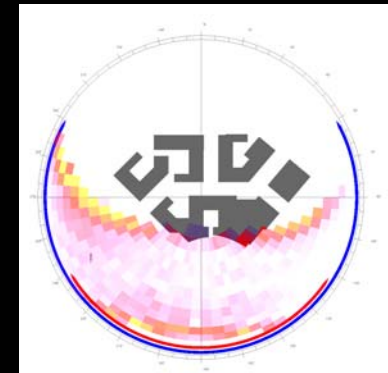
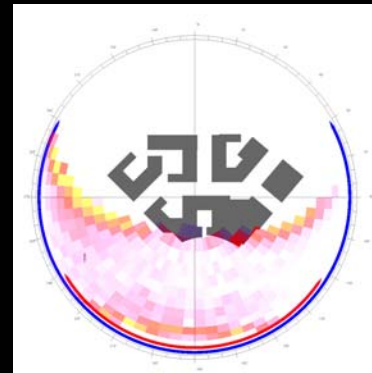
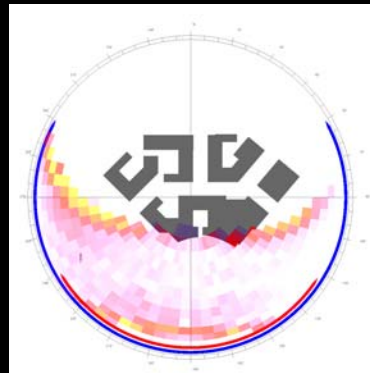
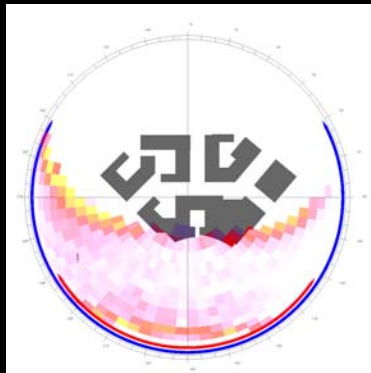
**Construction of more energy efficient buildings** can help San Francisco reduce its share of the greenhouse gas emissions that are a significant contributor to global warming.

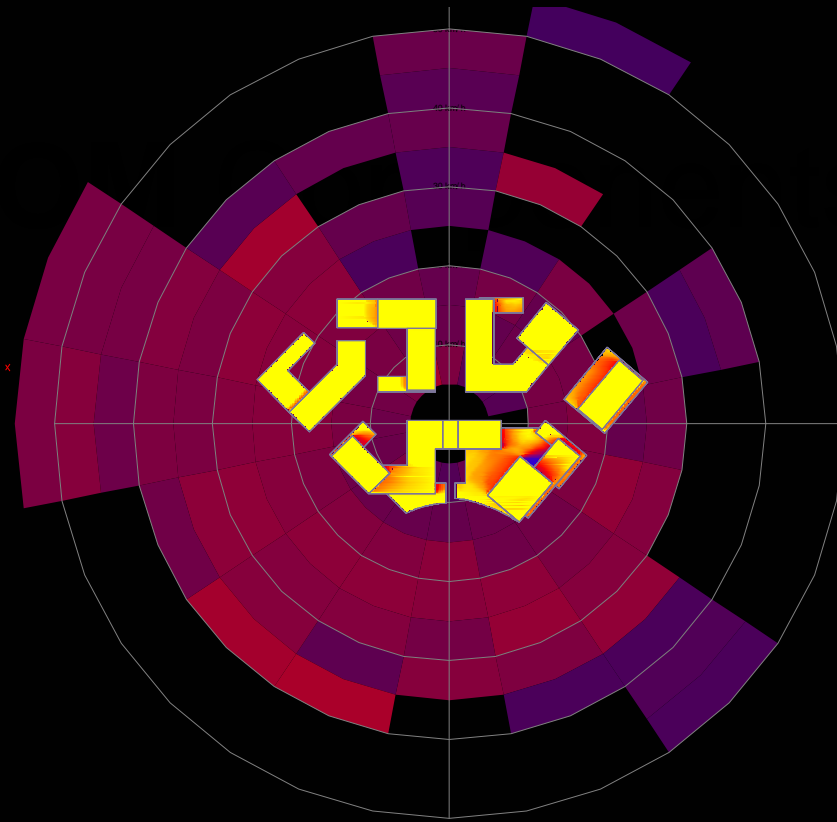
2002 Resolution established a **greenhouse gas emissions reduction target of 20 % below 1990 levels by 2012**

- Highest priority goals include: **energy security and cost reduction, affordable housing, mobility and transportation choices, solid waste reduction and recycling, reliable and affordable water supply, urban and rural forest protection, sustainable economic development, and clean air**

## Computational Geometry Studies

The development of efficient algorithms and data structures for producing multiple form solutions early on in the design process.



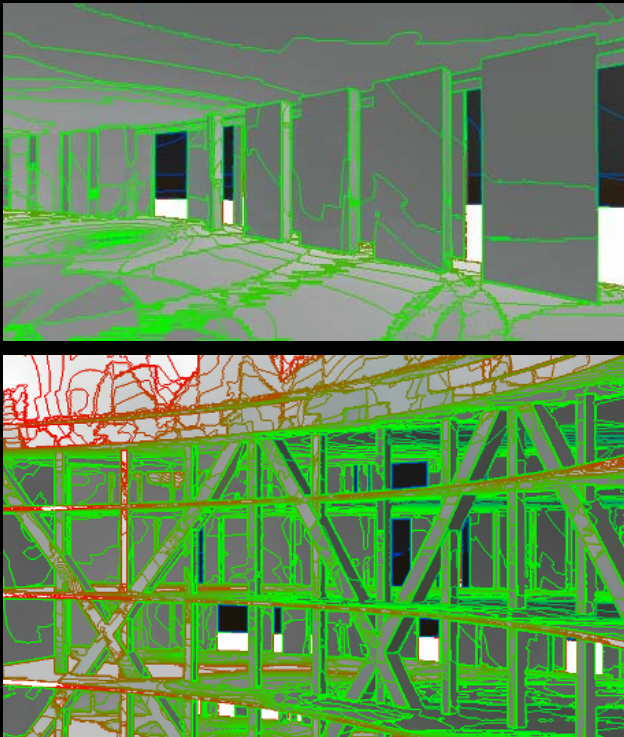


- A **check list** for designers to guarantee a minimum level of performance for every building.
- Number of **people** it will take.
- **Hours** it will take.
- **Tools** it requires.
- A **mindmap** to guide integration of a sustainable design process.
- A **tools matrix** that lists the types of analysis available, tools, and go-to people required.
- A **guidebook** that explains the checklist components in detail.
- A lunchtime **lecture** series to give more in depth coverage of environmental design concepts and provide a discussion forum.
- **Online** reference resources and blog.
- **Library** reference materials.
- Access to support **staff**.

**To aid integration into the phases of building design.**

# Interoperability

Application of Computational Design Group practices across the different disciplines.



- **Structural**
  - Carbon neutral impact of the structural materials.
  - Efficient use of materials.
- **Architectural**
  - Modeling internal and external environmental conditions.
  - Determining availability of natural resources (light, wind, etc.).
- **Interiors**
  - Modeling of naturally available daylight levels.
- **Planning**
  - Solar and wind analysis for more energy efficient master plans.
  - Site conservation/preservation measures.
  - Integration of alternative energy sources.
  - Sustainable water use plan.
- **Graphics**
  - Efficient signage lighting.
  - Responsible material selection.

# Proposed Pre-Schematic Design Integration Checklist



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## I. By Phase

Percentage of analysis that needs to be performed in each phase.

Create a phase plan for your project early on that includes a schedule and a list of people needed at certain estimated times.

Pre Design – 5%

Concept Design – 25%

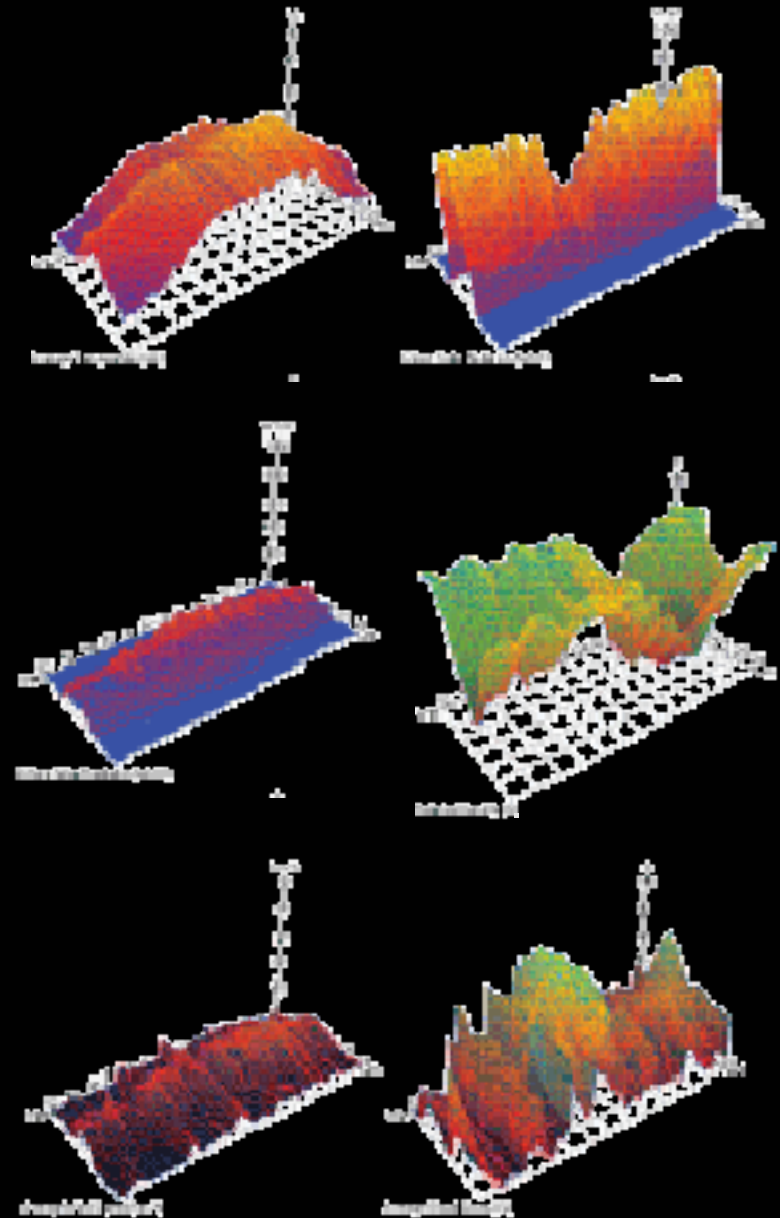
Schematic Design – 40%

Design Development – 20%

Construction Documents – 5%

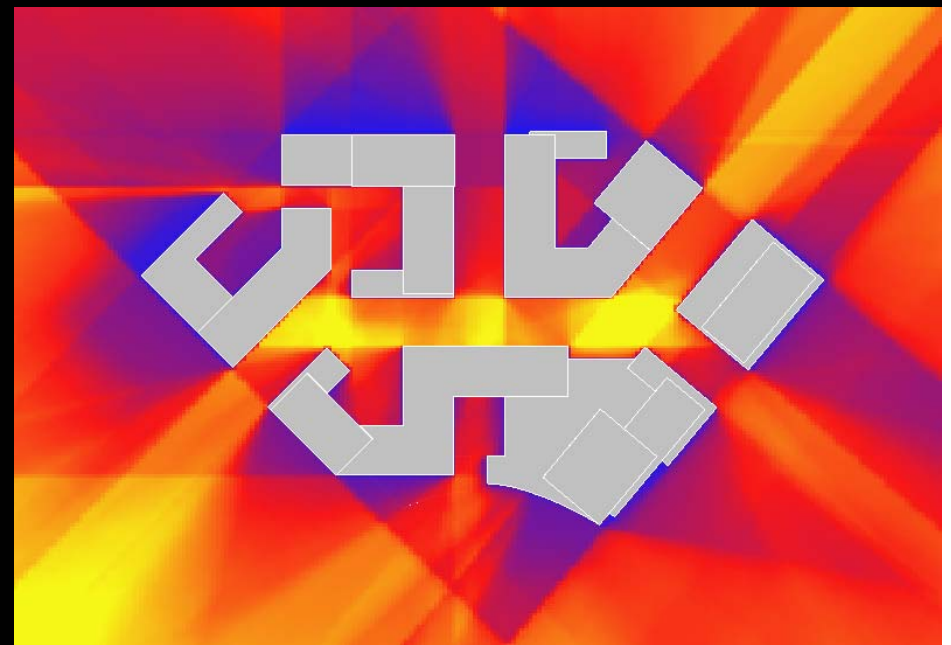
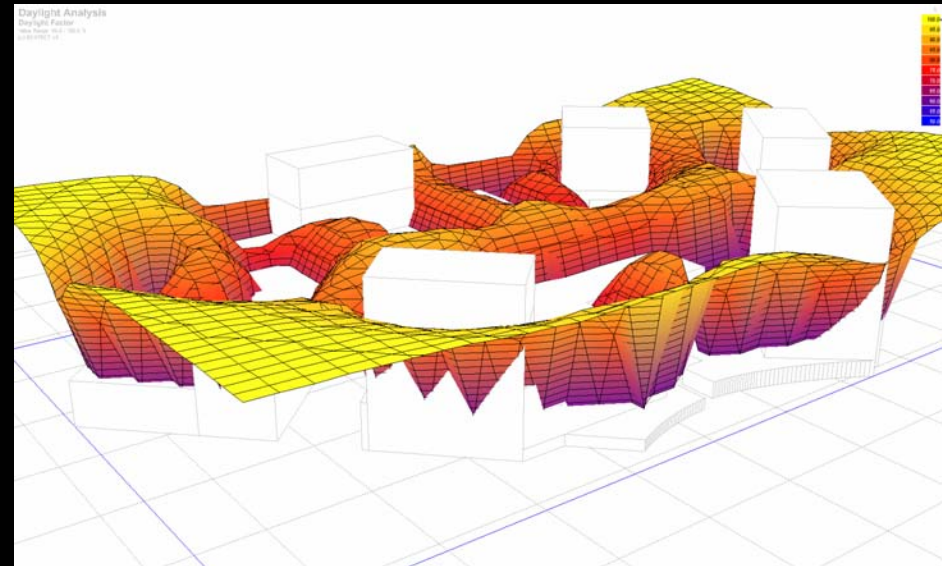
## II. Climate Analysis

Perform a detailed climate analysis to determine the site indicators of potential energy saving and passive comfort opportunities. Examine local seasonal microclimate conditions as well as diurnal climate patterns. Analyze site conditions and relationship of the building site to the surrounding environment.



### III. Program Requirements

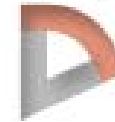
Establish building program and the associated requirements for lighting, ventilation, views and thermal conditions. Develop an associated occupancy profile including typical occupancy levels, activity levels and schedules for use in internal thermal load calculations.



## IV. Form and Orientation

Thermal, solar and wind analysis to determine optimal massing and orientation to provide passive thermal and visual comfort and minimize energy demand.

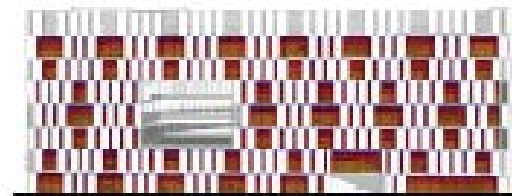
Northern Elevation



Solar Radiation (Btu)

Summer

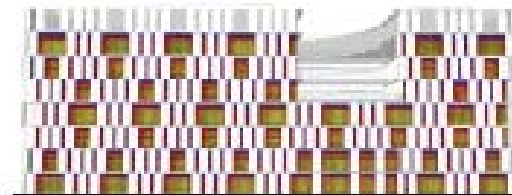
Southern Elevation



Solar Radiation (Btu)

Summer

Western Elevation

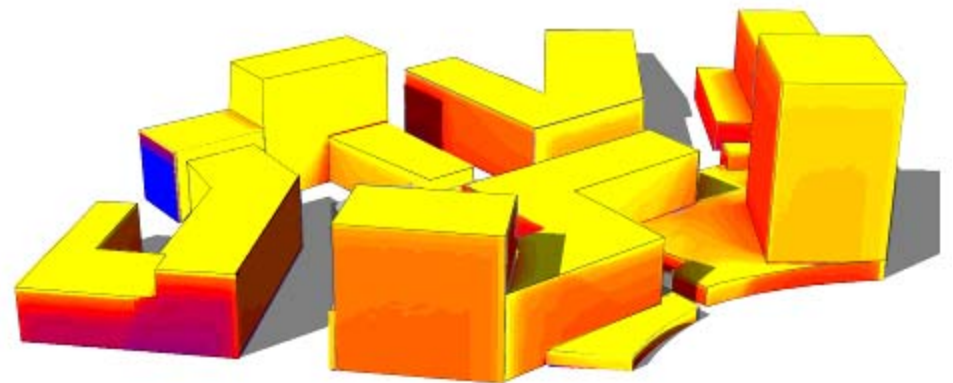
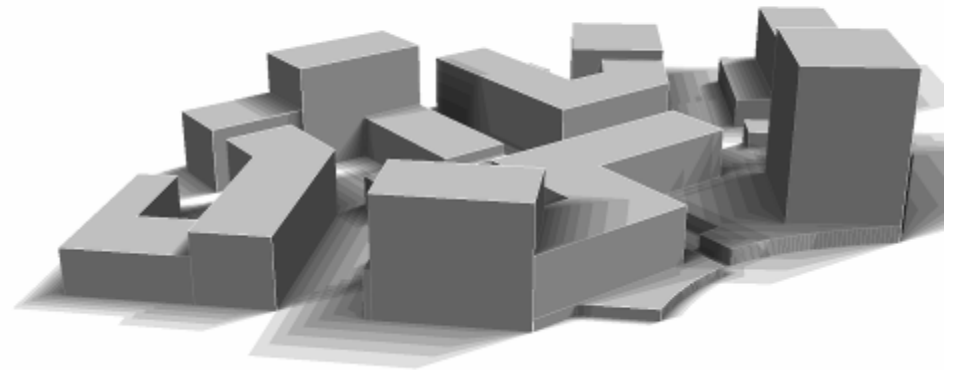


Solar Radiation (Btu)

Summer

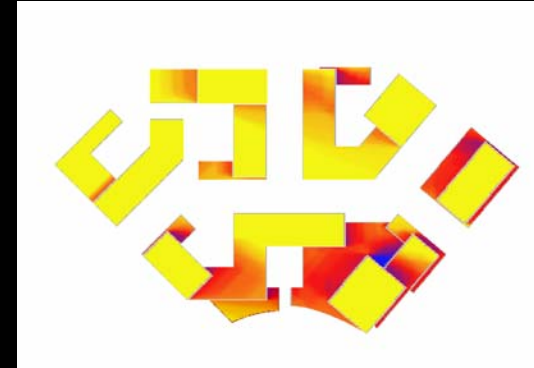
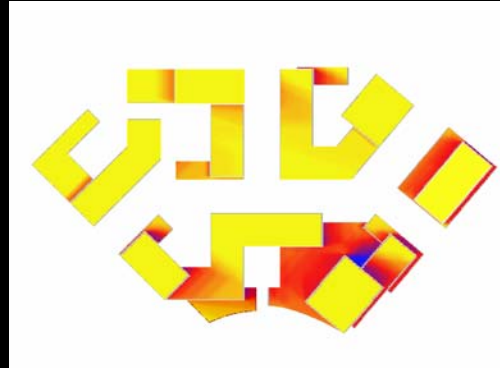
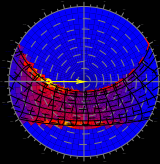
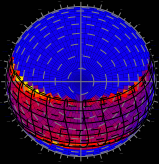
## V. Building Construction

Analysis of materials and composition. Develop the details of the building composition to achieve passive comfort. Identify materials that will provide energy performance benefits and manage the buildings' global warming impact/carbon footprint. Analyze the boundary between the external and internal environment with the building envelope; develop the façade construction details to modulate climate and maximize views.



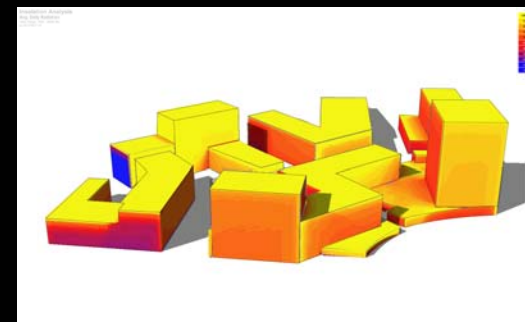
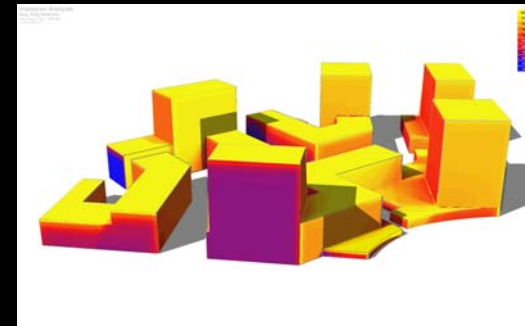
ORIGINAL

MODIFIED



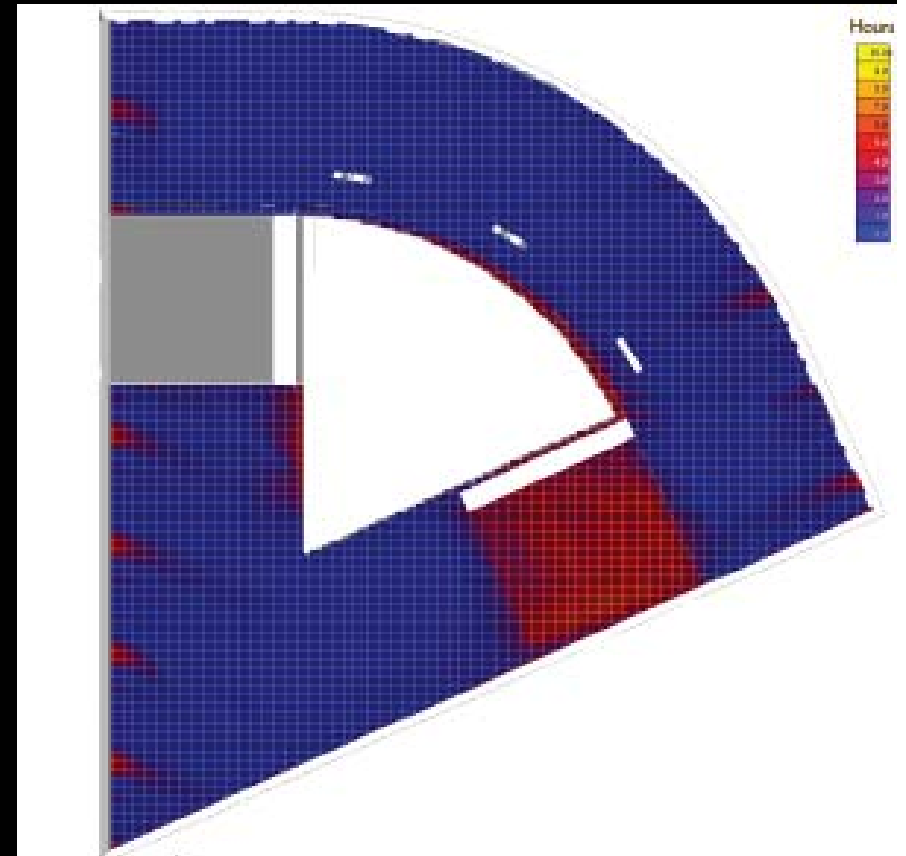
## VII. Value Engineering

Economical considerations lead to a comparative study between design solutions to decide how the design matches the goals of the building between performance and cost.



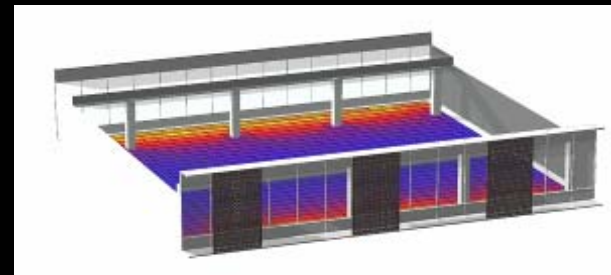
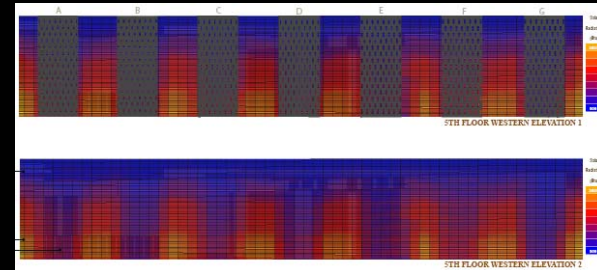
## VIII. Compliance and Documentation

Compliance with both LEED and Building Energy Code requirements and associated documentation.



## XI. Life Cycle Analysis

**Embodied Energy: the LCA Lifecycle Cost Analysis of the energy that goes into making and use of the building.**



# Summary:

This is proposal for a step by step method of incorporating environmental data into the 3D modeling process

The recommendation is that a Pre-Schematic Design phase be added to office standards

Lead designers should have budgetary support and tools that promote the incorporation of environmental analysis to inform the design process.



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