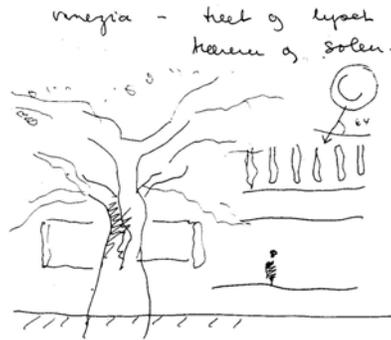


ARCH 5516 • LUMINOUS AND THERMAL DESIGN

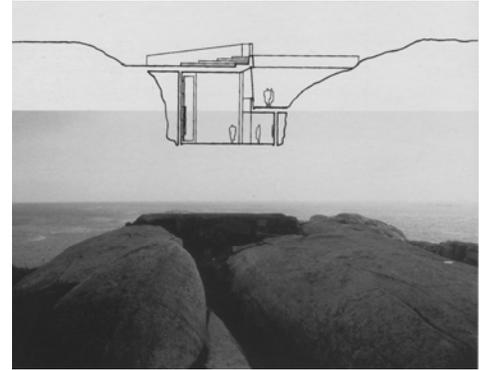
ECOLOGICAL DESIGN FOR THE 21ST C

“Architecture has the task of discovering and preserving these [site] memories, interpreting and manifesting them, making them comprehensible to the inhabitants.”

-Sverre Fehn



Sverre Fehn, Concept Sketch for Nordic Pavilion, Tree and Sun



Sverre Fehn, Proposal for an Art Gallery Verden Ends (the end of the Earth)

PROJECT ONE – Phase 1:

Site & Bioclimatic Design: Between Earth and Sky

Project One – Phase 1 Due Dates:

- Step A: due: Friday, January 22, 10:00 a.m.: in-process desk critique
- Step B due: Monday, January 25, 10:00 a.m.: in-process pin-up on balcony
- Step C due: Wednesday, February 2; formal presentation; courtyard

Grade weighting: 10% total grade (100 points); team grade

Electronic Reading:

- Millet, Marietta. *Light Revealing Architecture*. New York: Van Nostrand Reinhold, 1996, pp. 1-46 (PDF on e-reserve).
- Ralph Knowles, *Rhythms and Rituals: A Motive for Design*, http://www-rcf.usc.edu/~rknowles/rhythm_ritual/rhy_rit.html
- Greensource Building Projects Case Studies (scan website – this is a good source of case studies); http://greensource.construction.com/green_building_projects/default.asp

Project One – Phase 1 Objectives: Site and Bioclimatic Design

The objectives of the site and bioclimatic studies are to:

- Explore site and bioclimatic forces as they influence daylighting, thermal, and architectural design.
- Investigate poetic and pragmatic daylighting and thermal design opportunities and considerations related to site, bioclimatic, and ecological forces.
- Consider the architectural and environmental implications of site, climate, and place.
- Investigate processes and tools for site and bioclimatic analysis and design.

Problem Statement

In his essay, “Between Earth and Sky,” Gennaro Postiglione states that: “Every site constitutes a kind of archive in which the different stories intertwined in its evolution are conserved. Every site holds a key that guarantees the preservation of its meaning, even when the transformations caused by humankind tend to erase the traces and memories. Norwegian architect Sverre Fehn, suggests that it is the role of the designer to “preserve, interpret, and manifest” the story of a given place or site. A “bioregional” approach to daylighting and thermal design celebrates the ecological characteristics and history of a given place.

In Phase 1 you are asked to evaluate Rapson Hall at the site and building scales and develop preliminary design proposals that explore the bioclimatic “story” or “narrative” of your site and program for the “Minnesota Zero-Emission/Zero-Energy Design Lab” at the College of Design (see mnZED program brief for details).

Step A:

SITE AND BIOCLIMATIC ANALYSIS: A Story of “Place”

Due: Desk Critique Friday, January 21 (TAs will post review schedule)

Before beginning, please complete the reading for Project One – Phase 1. Take time to visit the site under varying conditions (clear vs. overcast conditions; morning vs. afternoon; calm vs. windy day; etc.). After you have become familiar with the “moods” and qualities of the site, develop a graphic analysis of the site and bioclimatic design opportunities. Use an annotated “Google Earth aerial photo” or “site plan” to create an analysis and to define your interpretation of the “narrative” or “story” of the site and building. The aerial photo or site plan should be enhanced with additional words, images, collages, sketches, or other graphic media to communicate your team’s critique of the design opportunities and constraints of the site. *Prepare materials for an in-process desk critique on Friday, January 21.*

Please consider the following suggested site and bioclimatic issues:

1. *Site and Bioclimatic Forces and Features:* *Prepare a graphic analysis of the physical forces and features of the site and building (e.g. annotated photos, Ecotect weather data, site/building diagrams, and/or mapping overlays to consider the site and building phenomena and building metabolism). Please consider:*
 - o Context: *Google Earth* photos: adjacent buildings impacts; optional Ecotect Solar Tool studies of site
 - o Seasonal and diurnal climatic site conditions (Ecotect and other weather data for sky conditions, temperatures, relative humidity, wind roses, and other related microclimate issues)
 - o Sun path for your climate and site
 - o Prevailing seasonal site and microclimate wind patterns due to topography, buildings, site conditions
 - o Views into and out of the site (existing or proposed)
 - o Impacts of adjacent buildings; access to light, wind, solar radiation; seasonal issues (existing or proposed)
 - o Contours, drainage, water features; phase change of water and seasonal issues (existing or proposed)
 - o Landscape issues, vegetation, wildlife habitat; biodiversity (existing or proposed)
 - o Pedestrian and vehicular circulation (existing or proposed)
 - o Other: identify any other factors that may influence the ecological site and building design response.
2. *Site and Luminous and Thermal Phenomena:* *Use annotated photographs to capture the quality and character of the luminous, and thermal experiences and phenomena on the site; consider the opportunities to celebrate diurnal or seasonal phenomena (sun, wind, water, rain, snow, landscape, habitat, day/night, etc.).*
3. *Construction & Enclosure:* *Use photos or diagrams to assess the relationship between the inside/outside; consider materiality, degree of enclosure, elevations and skin, and connection to site and place. Develop an inventory, written or graphic, of the existing materials, structural systems, and other building systems that may impact the proposed project.*
4. *Experiential and Poetic Opportunities:* *Use text, images, or diagrams to consider the experiential and poetic ecological opportunities of the site and building.*
5. *Ecotect Data:* *Include and interpret your bioclimatic data from Ecotect: What are the design implications of the seasonal and diurnal climatic conditions (sun, wind, temperatures, humidity, etc.)?*
6. *Critique and Summarize Design Opportunities and Constraints:* *Develop a graphic and/or written summary of the bioclimatic and ecological design opportunities you have found on the site and at the building scales: What are the bioclimatic and general design opportunities and constraints of the site? What do you want to elevate and reveal through design? How would you describe the bioclimatic story of the site and building?*

Step B:

BIOCLIMATIC MASSING MODELS: 1/16” Physical Models, Computer Studies, and Drawings

Due: Monday, January 25, 10:00 a.m. on balcony; all teams pin-up by 9:45 a.m.; Informal Review

You are asked to develop conceptual design proposals exploring the building siting and massing based on your “Site & Bioclimatic Analysis” for the mnZED Lab. Keep in mind that these are conceptual massing models which are intended to open your design ideas and thinking. Start by working as a team to develop as many quick “rip & tear massing models” as possible using 1/16” scale physical models. After exploring a broad range of proposals, the team is asked to critique the studies and to select “four proposals” to develop in greater detail. *On Monday, January 25 you are asked to present your team’s top “FOUR” design proposals (one per team member).*

NOTE ON PHYSICAL MODELS: Use balsa wood, cardboard, or other modeling materials. Please generate as many ideas as possible. Each team will need a simple “base model” of the old and new

portions of Rapson Hall (to test various massing schemes). Be mindful of the impact of adjacent surfaces and buildings (e.g. plan and sectional sketches are useful to explore relationships to adjacent buildings and spaces inside and outside). Remember these are simple study models; however your choice of modeling materials should illustrate what is opaque, transparent (open), translucent, or reflective .

For your informal review on Monday, January 25 please include the following:

1. 1/16" Site/Building Massing Models: Prepare at least four different 1/16" massing models (one per team member). Please present your earlier "rip and tear" exploratory studies.
2. Site/Building Plan and Section Drawings: Develop annotated plans and section drawings (include the earth/site) at 1"=16' to illustrate your site and bioclimatic design (at least one per team member).
3. Concept Diagrams: Use annotated drawings or diagrams to compare and contrast the design opportunities and constraints for each proposal.
4. Design Critique: As a team you are asked to critique each of the design proposals. Consider the bioclimatic strengths and weaknesses of each proposal.
5. Optional: Please add any additional images or studies that would be useful to explain your design investigations:
 - o Qualitative experience: Include model photos, words, images, writing, etc. or other media that capture the quality of desired light and thermal experience for each 1/16" proposal.
 - o Time Sequence Studies: Photograph your 1/16" models outside to study the diurnal and seasonal transitions (e.g. use a 45°NL sunpeg to photo models at June, Sept/Mar., and Dec. 21 at 9:00, noon, and 3:00).
 - o Solar Path Studies: use the Solar Tool from Ecotect at the building massing scale (e.g. morning, noon, and afternoon for June, March/Sept, and Dec. 21).
 - o Other relevant design and concept issues and images.

Step C: Final Phase 1 Requirements

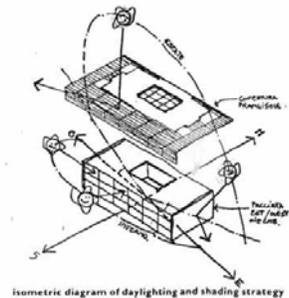
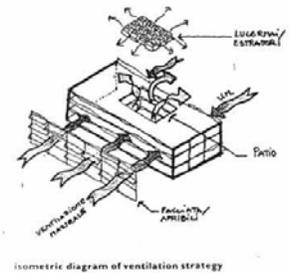
BIOClimatic MASSING MODELS: 1/16" Physical Models, Computer Studies, and Drawings

Due: Wednesday, February 2, Formal Review in the courtyard; 10 a.m. – 12 noon in courtyard

Using 24"x36" horizontal sheets, please develop a graphic format for your presentation boards that you will use throughout the class. Develop a graphic summary of your *Phase 1 Bioclimatic and Site Studies* for your "final" Project One presentation on Wednesday, February 2. *Please label all plans, elevations, sections and other diagrams. Include graphical scale and indicate "north" direction on all plans. Include names of all team members. Each team will have room for a maximum of six boards to illustrate both Phases 1 and 2 for all "final presentations".*

Submission Checklist:

1. Step A: Site and Bioclimatic Analysis and Critique: include a graphic summary of your site and bioclimatic analyses from Phase 1, including seasonal Ecotect weather data. Include a design critique of the site opportunities and constraints (annotations or brief written summary).
2. Step B: Four Bioclimatic Massing Models: 1/16" proposals
 - Site/building physical models: 1"=16'-0"
 - Site/building plans and sections: 1"=16'-0"
 - Site/building concept diagram(s) and/or isometrics of design proposal
 - Supporting qualitative images, photos, sketches, text as useful
 - Optional
 - o Time sequence studies of models
 - o Ecotect Solar studies at the site/building massing scale
 - o Other relevant materials
4. Design Critiques: Annotate your drawings or develop a brief written summary to communicate your team's design opportunities and constraints of each of the four massing proposals.
5. Bibliography: Please include citations and bibliography for any photographs and reference materials (throughout the semester).



Grading Criteria: Team Grade 10% overall grade (100 points total)

1. **Site and Bioclimatic Analysis: (40 points)**
 - Clarity, accuracy, and craft of site and bioclimatic analysis
2. **Bioclimatic Massing Model Proposals: (60 points)**
 - Clarity and craft of design intentions demonstrated in the models and drawings
 - Clarity of the design critique for each of the four massing proposals
 - Overall craft and graphic clarity of presentation boards