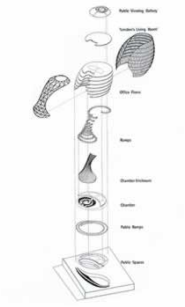
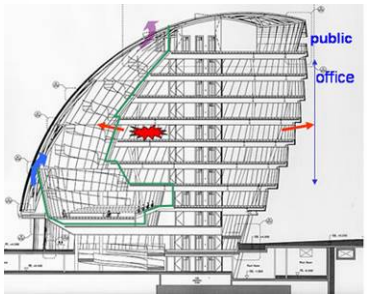
Greater London City Hall
Arch: Norman Foster



Exploded Axonometric



Annotated Section Drawing

PROJECT SIX: mnZED Lab Optimized Design Proposal
Integrated Design and Evaluation

- **In-process team critique: Monday, March 3, 2008:**
  sign-up for one 30 minute team critique "in studio" between 10:00 am-12:00 pm
- **In-process team critique: Wednesday, March 5, 2008:**
  sign-up for one 30 minute team critique "in studio" between 10:00 am-12:00 pm
- **Phase 3.0 Due on Friday, March 7; 8:45 a.m.:** All teams please pin-up by 9:00 in Rapson Hall Courtyard (class critiques from 9:00-11:30 am)

Introduction

In the final phase of Project Six, teams will complete the design and evaluation of their project. You will propose your final recommended design solution for the mnZED Lab Addition to Rapson Hall and compare the performance to the Baseline Case. This Baseline Case should be the initial concept that was presented in Project Two and analyzed as the Baseline Case in Project Three. Your final design should be informed by the analysis of your incremental design improvements made during Projects Two - Five. In Project Six you will integrate passive thermal and luminous design considerations as well as the key building systems including *Lighting, Heating, Cooling, Ventilation and Circulation*. The building solution should respond adequately to the program provided at the outset and it should meet the energy, daylighting and other relevant goals set by your team. You will analyze the final design and compare the results to the original Baseline Case showing the estimated improvements in energy use, greenhouse gas (carbon dioxide) emissions, thermal comfort, daylighting performance, life-cycle cost and other metrics (performance measurement) of your choice. To do this you will make the necessary modifications to your building model, using ECOTECT, and determine the resulting change in performance. You will present your findings through charts, graphs, annotated plans, sections or axonometric diagrams as appropriate and as outlined in the *Presentation Checklist* at the end of this assignment. In addition you will also be asked to show graphically how the various design strategies and related systems are integrated into your design.

STEP 1: DESIGN REFINEMENT

i Incorporate the preferred explorations in "Ecological Envelope" Design and "The Room" into your final design. Ask the questions:

- *Does the design, as a whole, integrate effective daylighting, heating, cooling and ventilation with other ecological opportunities?*
- *Does it foster a fivefold approach to ecological form and functionality?*
- *Does the design balance poetics and pragmatics*
- *Does the design positively impact the existing Rapson Hall facility in terms of environmental quality, energy use and aesthetics?*

ii Problem resolution: address potential problems or unresolved design issues in your design (e.g., unresolved circulation issues, building infrastructure connectivity and alignment, excessive floor area values with respect to program requirements, etc.).

iii Systems Integration: Holistically integrate all major systems including daylighting, passive and active heating, passive and active cooling, passive and active ventilation, renewable energy systems and related controls strategies.

iv Eco-effective Design: Using an eco-effective approach, optimize benefits resulting from your design proposal not only to the immediate building occupants, but also to external communities and ecosystems. (e.g., urban heat island effect, wildlife habitat, carbon emissions, etc.)

STEP 2: ECOTECT MODEL REFINEMENT: UPDATE YOUR FINAL ECOTECT MODEL

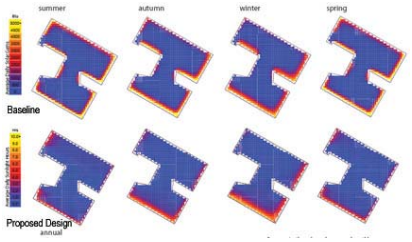
i Incorporate the necessary modifications reflecting all possible proposed design refinements from "Step 1: Design Refinements" into your ECOTECT model and save it as a "Final Design Case" for comparison to your preliminary design "Baseline Case" from previous projects.

ii Investigate problems and troubleshoot simulation errors and model construction problems (e.g., see "Error Messages" topic in the ECOTECT HELP!)

iii Check to see that all appropriate values for object materials, HVAC system mode, occupancy load and schedules, internal loads for lighting and equipment and establish the appropriate operating schedules are included.

STEP 3: PERFORMANCE ANALYSIS: FINAL DESIGN CASE

Simulate your "Final Design Case" using ECOTECT. Use the same time and seasons for all daylight and thermal studies as used in past studies (e.g. summer solstice - June 21, winter solstice - December 21 and Equinox (March/September 21).



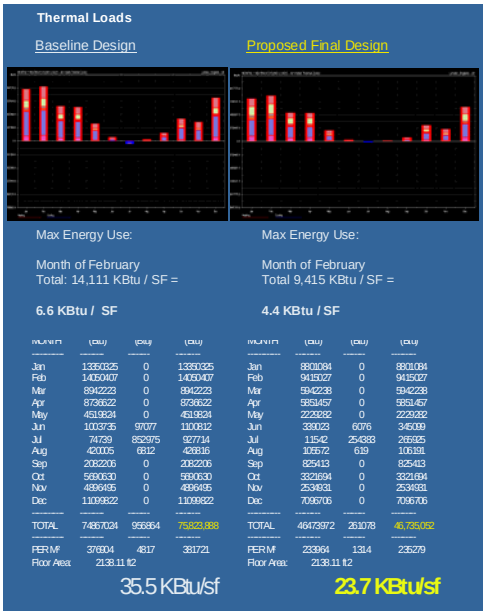
i <u>Daylight Studies</u>: perform a typical daylight illuminance analysis *(in lux)* of your final design proposal illustrating the diurnal and seasonal light levels.

ii <u>Thermal Studies</u>: perform the following thermal analysis:

a) Hourly Temperatures: Chart the hourly temperature profile for all Zones in your final design (select the same times of day and seasons as your Ecotect daylighting study – see above).

b) Passive Gains: Chart the passive gains breakdown preferably for selected zones where passive strategies are being employed or for all zones to evaluate the improved effectiveness of your passive design approach.

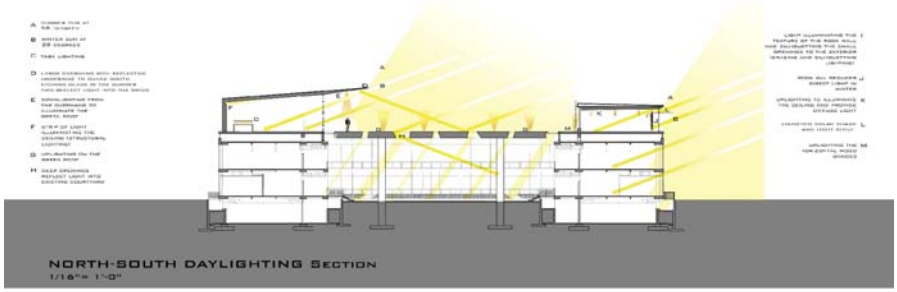
c) Average Monthly Heating and Cooling Loads for all zones – include both a loads Chart and Data Table similar to that required for Project Two. Indicate the thermal performance of your proposed final design in KBtu/sf as compared to Baseline design case?

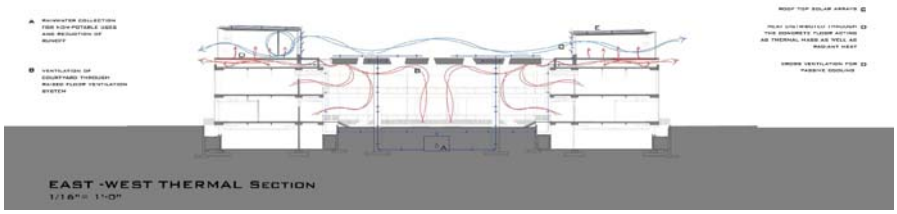


Note: You are asked to also include your original "Baseline Case" for daylighting and thermal in your final presentation.

STEP 4: MODEL AND GRAPHIC INTEGRATION STUDIES

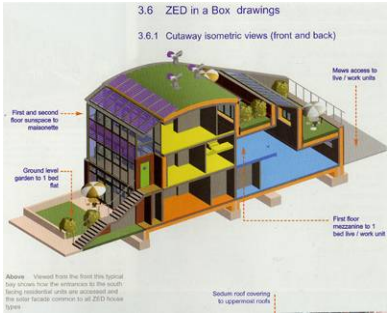
i 1/16" Massing Model: Develop a physical model of your final design project at 1/16 scale. You may update the massing mode from an earlier project based on your final design or you may fabricate a new model, whichever is more expedient.





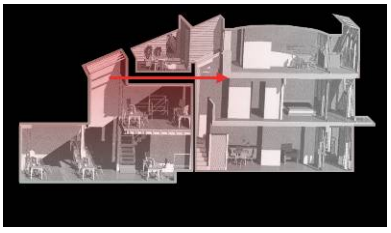
ii Graphical Systems Integration Studies: Use sections or sectional axonometric drawings to illustrate your approach to the following systems integration:

a) Daylight, electric lighting, and solar control systems integration. Include conceptual control strategies.
b) Passive/active solar and conventional heating systems integration.
c) Passive/active cooling and ventilation systems integration.
d) Renewable energy systems and proposed building integration concepts.



iii Plans and Other Renderings: Provide drawings representing how your design meets the program requirements:

a) Provide a site plan and area map for your project at an appropriate scale.
b) Floor Plans an appropriate scale (consider including room labels and area in s.f. Indicate zoning and circulation paths, etc.).
c) Provide perspective renderings of your building in full and/or partial views graphically representing the design details, materials and integration with the existing.

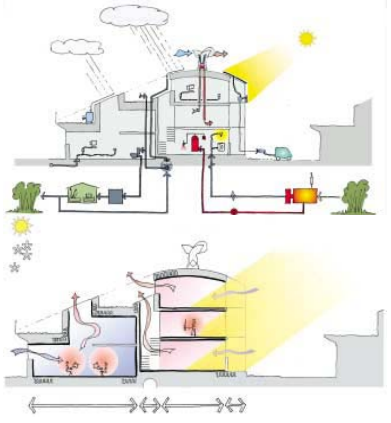


STEP 5: WRITTEN FINDINGS AND CONCLUSIONS

Develop a brief written summary of the findings and conclusions of your analysis and your design explorations.

Please include the following in your presentation:

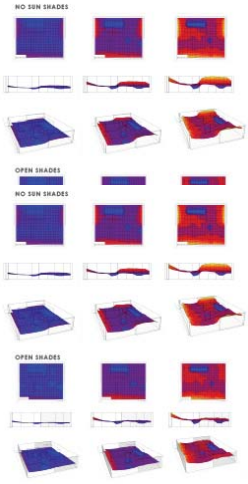
i. Design Intentions and Strategies: Summarize the critical design intentions and strategies related to daylight, thermal, and zero-energy design.
ii. ZED Performance: State clearly how well your final design meets your ZERO energy performance goal using written and/or graphic means.
iii. Carbon Emissions: State clearly how well your final design performs in terms of annual carbon emissions using written and/or graphic means.
iv. Ecological Summary: Summarize the Eco-effective benefits of your final design to the community and surrounding eco-systems.
v. Strengths and Weaknesses: List the major strengths and weaknesses of your design proposal?



PRESENTATION CHECKLIST: PROJECT SIX

FINAL REVIEW: FRIDAY, MARCH 7; 9:00-12:00; Pin up completed by 8:45 a.m.
Required format: 2 or more boards at 24"x 36" (vertical format). *Label all charts, tables, graphs, sections and other diagrams.*

1. ***Project Six: Phase 1.0:*** *Envelope study models and annotated wall sections- minimum 3 strategies (see Project Three – Phase 1.0 assignment)*
2. ***Project Six: Phase 2.0:*** *Room study model, lighting photostudies and Ecotect parametric analysis studies (see Project Three – Phase 2.0 assignment)*
3. ***Project Six: Phase 3:0***
   - ***a) ECOTECT Comparative Analyses – Proposed Final Design compared to Baseline Case from previous projects:***
     - *a. Daylight Illuminance Studies for final design (noon for June 21, Dec. 21, and March/Sept. 21)*
     - *b. Thermal Studies for final design*
       - Hourly Temperature Profile Chart for all Zones (same days as daylighting)
       - Average Monthly Heating and Cooling Loads Chart
       - Monthly Heating and Cooling Loads Data Table showing Peak Heating and Cooling Loads and times
       - Passive Gains Breakdown Chart (same days as daylighting studies)
     - *c. Baseline Cases for Daylight and Thermal from previous projects: include your earlier quantitative analyses to compare to your "Final Design Case":*
   - ***b) Model and Graphical Systems Integration Studies:***
     - *i) Updated Massing Model at 1/16" = 1'-0" scale*
     - *ii) Graphical Systems Integration Studies (building section or cutaway axonometric)*
       - Annotated study explaining your daylight and electric lighting systems integration (including solar control).
       - Annotated study explaining your passive and/or active solar heating systems integration.
       - Annotated study explaining your passive and active mechanical cooling and ventilation systems integration.
       - Annotated study explaining your renewable energy systems integration.
   - c) ***Written Findings and Conclusions - Include a brief written summary of the following:***
     - Design Intentions and Strategies
     - ZED Performance
     - Carbon Emissions
     - Ecological Summary
     - Strengths and Weaknesses



GRADING CRITERIA: Project Six: 40% total

Phase 1.0: Grading Criteria: 15%
Phase 1.0 Final due for grading on Friday, March 7: integrate with Final Project Three Presentation
- 60%: Clarity and execution of design intention demonstrated in the models
- 30%: Clarity and execution of design intentions demonstrated in the annotated sections
- 10%: Clarity and execution of precedent studies

Phase 2.0: Grading Criteria: 20%
Phase 2.0 Final due for grading on Friday, March 7: integrate with Final Project Three Presentation
- 60%: Clarity and execution of design intention demonstrated in the physical and Ecotect models
- 20%: Clarity and accuracy of parametric studies
- 20%: Clarity of intentions demonstrated in summaries, drawings, diagrams, and photographs

Phase 3.0: Grading Criteria: 15%
Phase 3.0 Final due for grading on Friday, March 7: integrate all Project Three Phases
- 50%: Completeness, clarity, and quality of final presentation
- 25%: Demonstration of understanding of analysis methods
- 10%: Clarity of findings and conclusions

NOTE: Please also submit 2 – 11"x17" color copy of your boards and a CD with all of your projects from the semester.