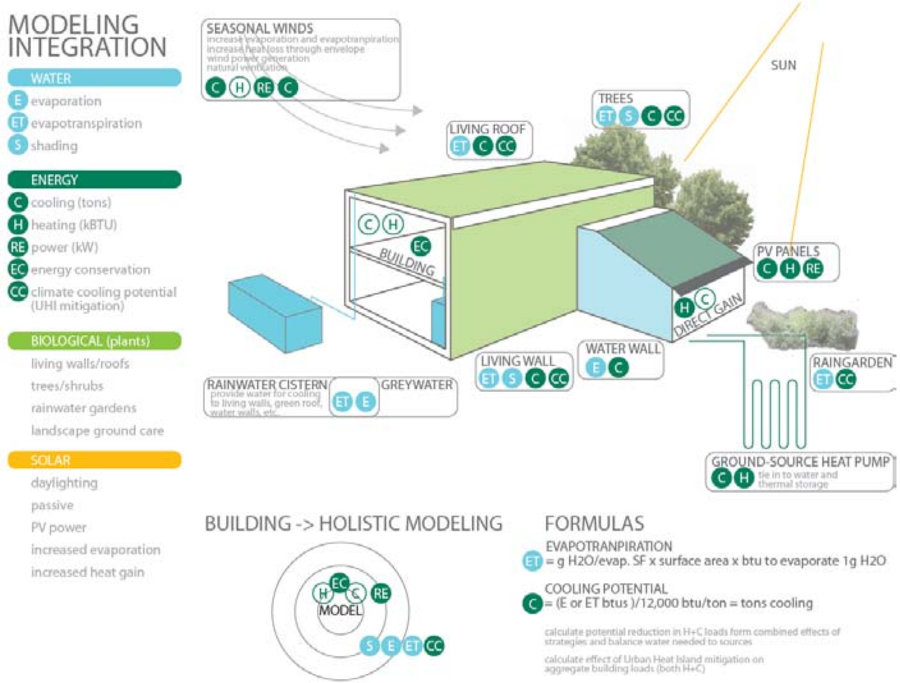
ARCH 5550 • LA 5405

Optimizing the Building/Landscape Interface

Envisioning the Sustainable Campus

Integrating carbon, energy, and water management strategies toward zero- and net-positive design



"We travel together, passengers on a little spaceship, dependent upon its vulnerable reserves of air and soil, all committed for our safety to its security and peace; preserved from annihilation only by the care, the work, and, I will say, the love we give our fragile craft. We cannot maintain it half fortunate, half miserable, half confident, half despairing, half slave to the ancient enemies of man, half free in a liberation of resources undreamed of until this day. No craft, no crew can travel safely with such vast contradictions. On their resolution depends the survival of us all."

Adlai Stevenson, US Ambassador to the United Nations, 1964

Exercise Three: Integration & Synthesis

Due: June 9, 2011, Formal Review @3:00 PM
Grade weighting: 40% total grade (40 points); *<u>individual grade</u>*

OBJECTIVES

- Integrate ecological, technical, and cultural systems to achieve a Zero+ campus
- Establish the design parameters deploying Zero+ strategies
- Synthesize strategic recommendations for UMN and campus designers to select appropriate systems
- Design the deployment of an integrated system that supports the creation of a Zero+ campus

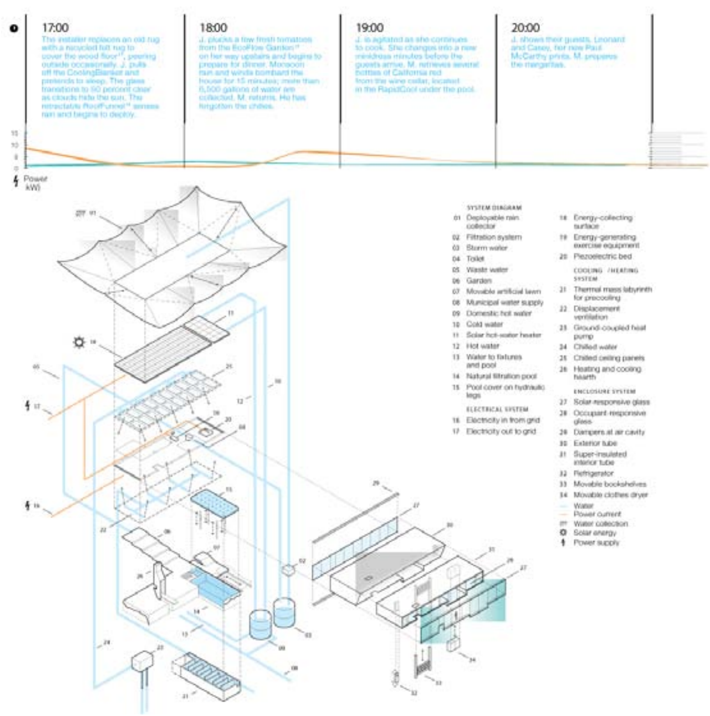
INTRODUCTION

'We have not been seeing our Spaceship Earth as an integrally designed machine which to be persistently successful must be comprehended and serviced in total.' -R. Buckminster Fuller. As our three week odyssey creating a user's manual for Spaceship Earth wraps up, we will attempt to explore the holistic servicing of the eco-technical systems that comprise the campus.

System integration is typically defined by engineers as attempting to make subsystems work together as a whole. This requires more than just tweaking the interface and physical connections between systems – there is the potential to add value to the entire system of systems and create new capacity that exceeds the individual abilities of the subsystems. Most approaches are iterative and require several cycles to achieve integration. There are several approaches to integration process that have design implications worth considering (though these approaches may best be applied to data and not physical processes):

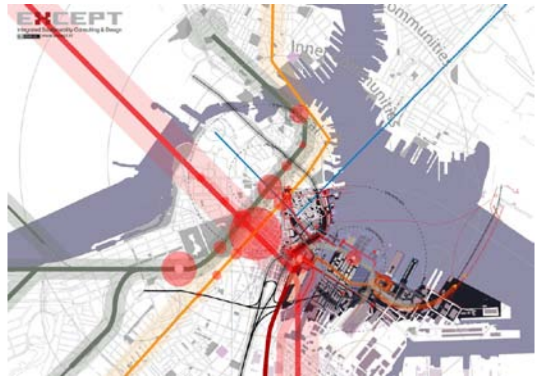
- **Vertical Integration** groups similar functions together into silos (sort of like the university's academic structure of specialized disciplines). The advantages are the ease and speed of getting similar processes to work together, this approach can be the cheapest in the short-term. Disadvantages are limited scalability and higher long-term costs.
- **Horizontal Integration** requires creating specialized interfaces to communicate/interact between systems. This approach perhaps is better suited to information networks and not physical processes. Advantages are greater flexibility, subsystems can easily be replaced, limiting the connectivity to a single interface/process point, scalability, and subsystems to be designed independently as long as the format of the interface is known. Disadvantages includes needing to develop a dedicated interface, and requiring each system to have a common output that can be shared.
- **Star (Spaghetti) Integration** has each system connected to each subsystem. Advantages include resilience in the interface, flexibility, elimination of redundancy of functionality, and the ability to integrate systems without having an established standard. Disadvantages are increased costs as system complexity increases and heterogeneity decreases, each subsystem exponentially increases the complexity.
- **Lean Integration** is a management approach focused on eliminating 'waste' from the system – even if in ecological systems 'waste = food'. Lean systems use reusable elements and performance metrics to optimize the processes over the long term in a continuous process. Advantages are holistic performance that looks at the entire system over the long term, seeking continuous improvement through optimizing the whole, and ability to adjust to changing conditions. Disadvantages include requiring a dedicated commitment to monitoring and the ongoing tweaking of the system (though automation can assist here), and requiring higher quality design/components that allow for ongoing optimization.

In the architectural world, systems integration typically discussed in the realm of lighting and AV systems. There are several common data protocols that have been developed for these applications including: [Digital Multiplexing (DMX512-A)] (for stage lighting and effect), [Remote Device Management (RDM)] (a refined DMX512 protocol), [ACN] or sACN (Streaming Architecture for Control Networks) which integrates IP addresses with DMX512). But these are all about effect and not environmental performance, so there is limited use of these data protocols in the bigger sustainability picture at the moment.



Diller & Scofidio,
www.nytimes.com/2007/05/20/magazine/20scofidio1.html

At the urban scale, there is an emerging interest in integrating everything from transit modes and utilities into the urban fabric. Most efforts to date have been academic design efforts that generate lots of pretty graphics (see above), but don't explore performance. **Physical proximity is not integration!** As environmental performance is the foundation of the Zero+ project, all attempts at integration for this assignment need to improve the holistic performance of the campus



Source: www.except.nl/

Of course, our failures are a consequence of many factors, but possibly one of the most important is the fact that society operates on the theory that specialization is the key to success, not realizing that specialization precludes comprehensive thinking.

R. Buckminster Fuller, *Operating Manual for Spaceship Earth*, 1963

METHODOLOGY

Evaluating Baseline Performance >> System Optimization >> **System Integration**

Successful integrating requires having a well defined performance target as well as understanding of all the systems that need to play well together. Integration does require an iterative process that optimizes both the subsystems and the assembled whole. Your biggest challenge is taking intangible criteria such as aesthetics, comfort, and habitat quality and marrying them to physical processes like the water cycle or energy.

Methodology for the final presentation should roughly follow these steps:

1. Define the integration process including all systems, inputs, outputs, physical design parameters and appropriate performance metrics
2. Design! (consider temporality/seasonality, modularity, ephemeral and intangibles poetics)
3. Evaluate the performance of the system with appropriate metrics or model the performance using a software tool or tools of your choice
4. Tweak the design to enhance performance and poetics
5. Repeat steps 3 & 4 as needed (or as time permits)
6. Evaluate your success based on established objectives and provide a compelling case for your client. If possible include Life-cycle cost/benefit curves based on your own modeling, other analytical processes or precedent research.
7. Produce presentation and final report deliverables.

DELIVERABLES DUE: THURSDAY 6/9

For the final review, please refine all graphics previously produced for the course.

The final presentations will have two parts: a team synthesis presentation (5 minutes) and individual presentations (10 minutes each + 8 minutes of discussion). The individual presentation should explore one aspect of your team work in greater detail and represent your own personal interests. As a team, please coordinate individual projects so that they complement each other.

- Executive summary of the integration process (including recommendations of what works and what doesn't work) with brief discussion of costs, benefits, impacts related to the system, and your problem statement
- Diagrams of your integrative strategies, including the design parameters, and variables
- Graphic interpretation of integrated performance data based on the modeling of your integrated system(s) with 'cost-benefit curve(s)'
- Wide spread deployment timeline and quantification of greater societal benefits (based on your performance modeling 'cost-benefit curve'), and smaller scale phasing/modularity
- Experiential vignettes showing seasonal/temporal conditions, a detailed illustrative plan (based on the groups master plan), and section diagrams including alternative deployment configurations
- Refined versions of all previously developed materials and graphics of the integrated building/landscape/infrastructure

Assemble the relevant portions of the research, analysis and design work completed during the course of the 3 week course into a letter size horizontal format document using the report course template provided.

Final Report: Incorporate the most important elements of your work into the Indesign report template located on the course Moodle site. The contents of your work should roughly conform to the table of contents provided in the template. Teams are encouraged to collaborate on common analysis work provided all the analysis work is submitted in an appropriate format by at least one individual. If unsure, simply include it in your report for submission.

Note: You must include a "Zero+ Design Narrative" as part of your Executive Summary. Include a 1-2 page description of the most important findings of your research and analysis, and your stated Zero+ Objectives (a.k.a., manifesto) for your project as well as the key strategies and how they contribute to the Zero+ Objectives.

Final Report Submission Requirements

Submit on a CD-ROM including the following:

- *.idd (Indesign) Report File packaged with all Images*
- ~~*.idd (Indesign) Appendix A-B File packaged with all Images*~~
- *.pdf version of Report and Appendixes*

Note: final grades are due on Wednesday June 15th. Your team is required to submit the CD-ROM with the items above before then to receive your final grades or risk receiving an 'I' for the course.

GRADING CRITERIA - Exercise Three: *40% total of grade (40 pts)*

Note: both team and individual components will be evaluated

- Innovation and synthesis leading to optimization (you won't be graded on the level of performance, but on the rigor of your process as you attempt to optimize the system)
- Clarity and accuracy of quantitative analysis charts, graphs and annotated drawings
- Clarity and accuracy of conclusions drawn
- Inclusion of sources and suitable bibliography