UNIVERSITY of NOTRE DAME
School of Architecture

DESIGN VI/ ARCH 41121 (& AME 47431)

BUCCELLATO STUDIO SPRING 2015
Environmental Stewardship through Interdisciplinary Research and Design

PROJECT 1B:
CRITICAL CIRCUMSTANCES

ISSUED: JANUARY 23, 2015

Building on your recent study of the influences of climate, site, local materials, technologies, and culture on architecture and form-making, this exercise is designed to expand your growing knowledge and appreciation of indigenous architectural forms and what they can teach us about the craft of a specific building type, one that is in constant demand around the globe: shelter.

In recent decades, the activities of humans have had profound – and potentially irreversible – impact on the planet. In light of this, you and your colleagues have planned a set of research excursions into each of the four climatic zones (hot-dry, hot-humid, temperate, and cold) to study and document the broader ecological impacts of the built environment around the globe. After much preparation and much training for your excursions into some of the world's most vulnerable – and inhospitable – natural environments, you bid each other *buon viaggio* and set off for your distant research field stations, never imagining that it would be several *years* – not months – before your research teams would reunite to exchange your findings – and stories of survival.

In the course of traveling to your remote destination, your small research team (4 students: 2 ARCH, 2 AME) becomes stranded in an isolated part of the world. You are lost, off-the-grid, and unable to reconnect with or return to civilization. At least one of you has been significantly injured or incapacitated as a result of your circumstances. Finding and creating a sustainable shelter is both an immediate and long-term concern.

Fundamental Considerations:

1. Safety, comfort, and survivability (both the inhabitants and the structure), including the selection of a suitable site.
2. Must support basic functions of human habitation and survival: sleeping, cooking, bath/washing, communication/ socialization.
3. Waste free: only truly "local" materials; with minimal tools, you must be able to construct your shelter using only that which is at hand. This may include both salvaged and natural materials.
4. There are no sources of electricity.
5. Suggested maximum gross footprint: 150 square feet.
6. As current students of the University of Notre Dame, you are subject to the rules of *du Lac,* and distinct sleeping quarters are required for the male and female members of your team.

Project Objectives:

1) Achieve a basis for understanding the fundamental requirements of human shelter
2) Consider function in habitation, which has become increasingly involved and complex
3) Gain appreciation for the ways in which it is possible to live comfortably at a very minimal level – the level at which much of the world still lives

4) Consider what is truly necessary to sustain life and describe, through your design of a shelter in a specific location and under severe circumstances, the best methods for achieving it
    - Close collaboration between ARCH and ME teammates encourages a rapid, iterative approach to the project, beginning with extensive massing and optimization studies
    - This collaborative process (to achieve optimal design configuration, given the criteria above) should be captured and well documented in the final design presentation

Complimentary Energy Analysis
In order to obtain a realistic understanding of your shelter's performance – i.e., what type of thermal comfort does it provide – an energy analysis of the design must be conducted using SketchUp and Sefaira. These should focus, in particular, on the massing of the shelter and must take into account the absence of any thermal management system (heaters, air conditioners, etc.) ME students should work closely with their ARCH teammates to rapidly analyze iterative designs to achieve at an 'optimal' structure that will provide the thermal comfort necessary for a sustained stay (years) in the shelter.

Recommended Resources:
To plan your research excursions to understand the broader impacts of the built environment on the earth, you may choose to consult the Notre Dame Global Adaptation Index (ND-GAIN). For the purpose of locating yourselves on the globe (and where you will ultimately find yourselves stranded and in need of shelter), the GAIN Matrix (http://index.gain.org/) usefully illustrates regions and specific countries that are currently most vulnerable to the consequences of climate change and those that are similarly least able to cope with change.

"Sample" scenario:

Stranded on the Northwest Passage:
Climate Zone: Cold
http://geology.com/articles/northwest-passage.shtml
A warmer planet has made a previously impassible stretch of the Canadian Archipelago navigable during the artic summer. You and your colleagues have ventured there to understand how this new gateway will influence oceanic commerce and the finite resources involved. Midway through your passage, your vessel becomes icebound during a freak storm. Not only do you lose your primary means for travel, but communication is severed and one of you has been blinded by cable that was loosened in the storm. Once the storm passes, you set out on foot with as many supplies from the ship that you can carry, but circumstances force you to stop well short of civilization and establish shelter…

Your successful completion and presentation of Project 1b requires the following (at minimum):

Documentation and Analysis Drawings:
Project Narrative
Each research team (4 students, 2 ARCH and 2 ME) must generate a detailed written description (500 words or less) explaining the circumstances surrounding their predicament, including:
- Which of the four climate zones the Team has become isolated in
- How the Team happened to arrive there (and become stranded) and with what usable resources
- The critical conditions of their surroundings (terrain, climate, food and water sources, native populations)

Presentation/ Visual Components monochromatic ink on mylar or vellum

- *Diagrams, Analysis, and Process*: Concise and methodical graphic description of design optimization *process*, including step-by-step analysis and performance feedback leading up to final design/ configuration of shelter. Your graphic presentation of your design *process* and final design solution can be approached in a myriad of ways, but must include the following drawings (at minimum):
    - **Massing Diagrams** (i.e., isometric): this series of concise building (envelope) diagrams will serve to describe your iterative process* and illustrate the specific climate/ context forces on building form, they must incorporate elements from the thermal analysis and predicted thermal comfort
    - Final **Building Plan**(s), including immediate context and predicted thermal comfort
    - Final **Building Section**, including lighting and ventilation solutions
    - Final **Technical Wall Section**, to describe "typical" envelope construction, including all typical connections, from conditions sub-grade, wall to floor, typical opening, and the roof-to-wall connection

      * Your diagrams should purposefully and clearly articulate any performance and analysis feedback-driven design decisions

Bibliography

Technical Memo (five page maximum, follow required format)
Detailed description of thermal analysis approach, assumptions, results, and discussion.

DEADLINE FOR PROJECT 1b: Wednesday, February 4 @ 10:00 pm

PROJECT 1b REVIEW: Friday, February 6 @ 2:00 pm

DEADLINE FOR PROJECT 1 TECHNICAL MEMO: Monday, February 9 at 2:00 pm