AIA COTE Top Ten for Students

CURRICULUM ADDENDUM

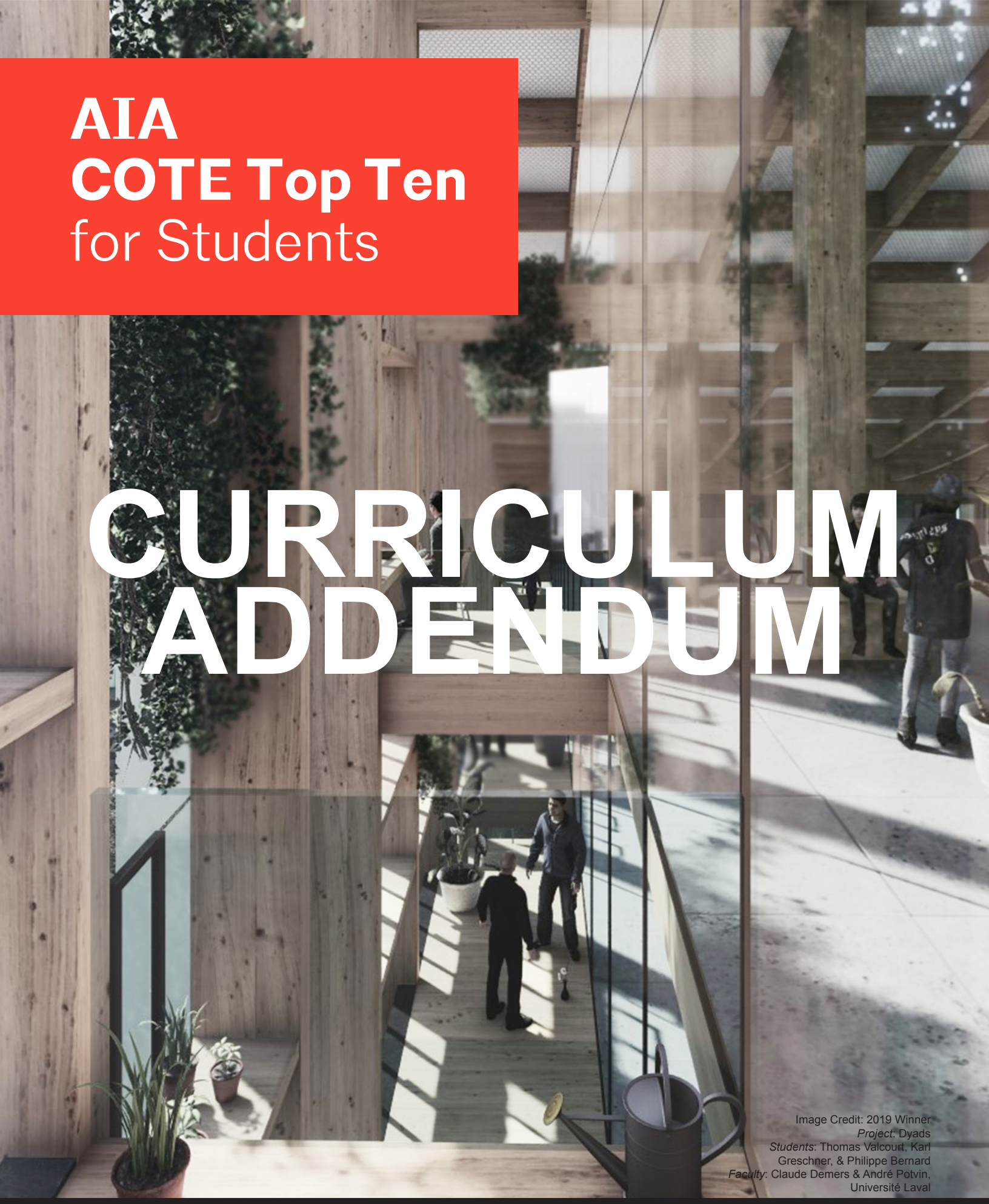

Image Credit: 2019 Winner
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AIA Committee on the Environment 2019-2020 Student Design Competition

Curriculum Addendum

This scaffold for the competition follows a typical studio arc. The use of the addendum is not a requirement of the competition; it is intended to be flexible in its guidance and to be used in whole or part to enrich the studio curriculum. The guide is organized into the following parts of a typical studio flow: philosophy, site research, program, precedent, conceptualization, design development, and representation. Each part offers questions for discussion, and resources (suggested readings, tools, and exercises to spur thinking, analysis, and validation). The list is not exhaustive and may be developed further by studio faculty and students.

PHILOSOPHY

Questions – discerning intent

- Why is sustainability a lens through which we must look when designing?
- What ways can it be approached?
- How can it support design excellence in other lenses?
- What do we achieve by recognizing excellence?
- Readings and Resources:
- Guy, Simon, and Graham Farmer. “Reinterpreting Sustainable Architecture: The Place of Technology.” Journal of Architectural Education 54(3): 140-148.
- Muller, Brook. Ecology and the Architectural Imagination. London: Routledge, 2014. Print.
- “Systems Thinking.” Education for Sustainable Living. Center for Ecoliteracy, n.d. <http://www.ecoliteracy.org/essays/systems-thinking>
- Wells, Malcolm. “A Regeneration-Based Checklist for Design and Construction,” Society of Building Science Educators, 2009. <http://www.sbse.org/resources/>

PROGRAM

Opportunities – leveraging the requirements

- How can I stack functions within spaces and make spaces serve multiple functions?
- How can I design spaces efficiently so that I can design less building?
- What level of enclosure does the program need – support, shelter, tempering, conditioning?

CONCEPTUALIZATION

Exercises – rooting and inspiring the work

Native Patterns

- Research a non-destructive native plant or animal that could inhabit landscape of the building
- Draw or model a pattern that flora or fauna encapsulates either physically or temporally
- Diagram the relationship between the parts of the pattern

Envelopes and Budgets

- Create site models that show, in 3 dimensions, the solar envelope and the buildable envelope
- Calculate an energy budget based on the insolation, wind availability, water availability, or other renewable energy that can be captured on site
- http://pvwatts.nrel.gov/ calculator for solar PV
- http://www.reuk.co.uk/ calculators for wind, hydro, biomass, geothermal, etc.
- Calculate a water budget based on the rainwater falling on site

Process Metrics

- Begin to calculate and respond to metrics using software such as Sefaira http://sefaira.com/

SITE RESEARCH

Guidelines – understanding the site

- What bioregion is the site a part of? What eco-region or eco-tone is the site a part of? What watershed is the site a part of?
- What country, state, county, city, neighborhood, or other cultural/political groupings is the site a part of?
- What is the history of the site – when was it developed, what has occupied it, did geological or ecological events take place there?
- What is the soil type at the site? Is it fertile or barren, strong or weak, thin or deep?
- What is the topography of the site?
- How do users (humans, other animals, plants) arrive at the site?
- How does water enter and leave the site?
- What quantity of water enters and leaves the site and when does it enter and leave?
- Where does water collect on site? Where does it disperse?
- What quantity of sunlight falls on the site and when does it fall?
- What is the sun path at the site; what obstructions adjust the solar envelope?
- What quantity of wind blows through the site, where does it blow from, and when does it blow?
- What quality of air is at the site – is it humid or dry, clean or polluted, fast moving or languid?
- What plants are native to the site? What are their characteristics and what are their uses to humans, other animals, and other plants? What do they need to thrive?
- What animals are native to the site? What are their characteristics and what are their uses to humans, other animals, and other plants? What do they need to thrive?
- Are any of the plants or animals found at the site endemic, endangered, or rare? Are any invasive or pestilent?
- What is the energy mix available to the site from the grid?
- What is the character of the surrounding area? If there are buildings, how old are they, what style are they in, what are they used for, what state of repair are they in? If there are not buildings, what is the surrounding land used for? Is the area dense or loose?
- What would you categorize as constraints, assets, or liabilities of the site?
    - o Constraints:
        - Topography
        - Existing Buildings, Roads and other transportation infrastructure, and Pavement
        - Utilities
        - Surface Water and Flood Zones
        - Culturally Sensitive Areas
    - o Assets: elements that should be emphasized or replicated
    - o Liabilities: elements that are unattractive, in disrepair, or are disjointed
- What is scarce at the site? What is at the site in abundance?
- What building materials are native to the site? Near the site? Within 100 or 500 miles of the site? Are there opportunities to tap into a cradle-to-cradle material at or near the site?
- What weather patterns are typical to the site? What kind of weathering or damage do they typically cause? What kind of events do they produce and how are those events experienced?
- What patterns of human use are typical to the site and how do they wear at buildings? What kinds of events occur near the site, and how are those events experienced?
- What sounds are typical of the site? How loud are they, when do they occur, and where do they come from?
- How can this information inform the design of the building?
- Resources for site study:
    - o Climate Consultant: http://www.energy-design-tools.aud.ucla.edu/climate-consultant/request-climate-consultant.php
    - o DeKay, Mark and G.Z. Brown. Sun, wind & light: architectural design strategies. 3rd ed. Hoboken: John Wiley & Sons, 2014. Print.
    - o Kwok, Alison, and Walter Grondzik. The Green Studio Handbook, 2nd ed. London: Routledge, 2011. Print.

PRECEDENT

Strategies – accomplishing the task

- Draw from http://aiatopten.org or http://2030palette.org to find a precedent with a strategy that is appropriate to your site
- Outline:
  - o All sustainability strategies used
  - o Synergies between strategies
  - o Architectural impacts and tectonic effects of strategies
- Present to studio for discussion and comparison
- Readings:
  - o Hawken, Paul, Amory B. Lovins, and L. Hunter Lovins. “Tunneling Through the Cost Barrier.” Natural capitalism: creating the next industrial revolution. Snowmass, CO: Rocky Mountain Institute, 2008. Available at: http://www.natcap.org/images/other/NCchapter6.pdf
  - o Muller, Brook. “In Poetic Association: Acts of Architecture in the Realm of Landscape Ecology.” ARCC Conference Proceedings 2007: 27-34. Available at: http://www.aia.org/aiaucmp/groups/ek_public/documents/pdf/aiap016760.pdf

DESIGN DEVELOPMENT

Critiques – forging the work

In addition to the measure descriptions, narrative building questions, and prompting bullet points, these questions can be used to deepen and refine the studio projects:

Measure 1: Design For Integration

- What is your design intent? What design goals are you setting?
- How strategies are incorporated into the overall design to support that intent?

Measure 2: Design for Community

- What is this place like? How is the place that you're designing similar to and different from the larger context in which it lies?
- How do you celebrate the ecological, cultural, social, and economic aspects of the site and program? How do you transform and work with those things on the site?

Measure 3: Design for Ecology

- In what way are you contributing to the ecosystem(s) your project inhabits? How are you helping the people, other animals, and plants thrive? How are you using "wastes" as inputs?
- What can your site do to strengthen a network at a bigger scale – a food-shed, a watershed, a migration pathway, a transit corridor, a scientific data collection study, etc.?

Measure 4: Design for Water

- How can the movement of water through the site – arrival, collection, storage, filtration, treatment, use, reuse, conservation, irrigation, landscape feature, infiltration, evaporation, dispersal – be seen by inhabitants? How is the water story read on site?
- What needs to happen to balance the water use on site and in the program with the water available at the site? How can water be retained at the site rather than quickly moving from the site?

Measure 5: Design for Economy

- In what ways will this project be economical and enhance the economy?
- What savings can be achieved to lower costs for energy, water, waste, construction materials and methods?

Measure 6: Design for Energy

- How is an energy budget set up for your project? What are the big energy uses on site? Do all spaces within the program the program require energy at all times of the day?
- How can the movement of energy through the site – arrival, collection, storage, use, conservation – be seen by inhabitants?

Measure 7: Design for Wellness

- How does design promote the health of the occupants?
- Design strategies for daylighting, task lighting, views, ventilation, indoor air quality, and personal control systems

Measure 8: Design for Resources

- Does the choice of materials enhance health, durability, maintenance, energy use? How to encourage reduction of the impacts of extraction, manufacturing, and transportation?
- What is the life-cycle embodied energy of each material used on the site?

Measure 9: Design for Change

- How does the building change over the course of the year, decades, and/or centuries? How can the building be changed (repaired, altered, removed, enhanced)?
- How does the design anticipate restoring or adapting function in the face of stress or shock, such as natural disasters, blackouts, etc.?

Measure 10: Design for Discovery

- What and how does the building teach its inhabitants and visitors? Is this what you would like them to learn?
- What and how have you learned from the process of designing the building?

REPRESENTATION

Examples – conveying the intent

Suggested illustrations and diagrams:

- Illustration of sustainable design intent or innovations
- Illustration of connection to region/community
- Inhabitant Profile
- Psychrometric or Bioclimatic Chart profile illustrating design strategies
- Section or diagram demonstrating strategies
- Photo, drawing, or diagram of daylight and ventilation strategies (can be of test models)
- Sankey/distribution diagram of water use on site (hopefully with a loop!)
- Sankey/distribution diagram of energy use on site
- Wall section or material palette
- Anticipated timeline of building's existence
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RESOURCES, READINGS, TOOLS

1. AIA COTE website: https://network.aia.org/committeeontheenvironment/home
2. Spreadsheet: Percent of Stormwater Managed Onsite
3. Two Year Rainfall Estimates
4. AIA COTE Top Ten for Professionals Projects: http://www.aiatopten.org/
5. Architecture 2030: 2030 Palette, The Zero Tool: Architecture2030.org
6. Athena Impact Estimator for Buildings: https://calculatelca.com/software/impact-estimator/
7. Climate Consultant: http://www.energy-design-tools.aud.ucla.edu/climate-consultant/request-climate-consultant.php
8. The Construction Carbon Calculator: http://buildcarbonneutral.org/
9. DeKay, Mark and G.Z. Brown. Sun, Wind & Light: Architectural Design Strategies. 3rd ed. Hoboken: John Wiley & Sons, 2014.
10. Eley, Charles. Design Professional's Guide to Zero Net Energy Buildings, Island Press, 2016.
11. Guy, Simon, and Graham Farmer. "Reinterpreting Sustainable Architecture: The Place of Technology." Journal of Architectural Education 54(3): 140-148.
12. Hawken, Paul, Amory B. Lovins, and L. Hunter Lovins. "Tunneling Through the Cost Barrier." Natural capitalism: creating the next industrial revolution. Snowmass, CO: Rocky Mountain Institute, 2008. Available at: http://www.natcap.org/images/other/NCchapter6.pdf
13. Kwok, Alison, and Walter Grondzik. The Green Studio Handbook, 3rd ed. Routledge, 2018. Print.
14. La Roche, Pablo. Carbon Neutral Architectural Design. CRC Press, 2011.
15. Maclay, Bill. The New Net Zero: Leading-Edge Design and Construction of Homes and Buildings for a Renewable Energy Future, Chelsea Green Publishing, 2014.
16. Muller, Brook. "In Poetic Association: Acts of Architecture in the Realm of Landscape Ecology." ARCC Conference Proceedings 2007: 27-34. Available at: http://www.aia.org/aiaucmp/groups/ek_public/documents/pdf/aiap016760.pdf
17. Muller, Brook. Ecology and the Architectural Imagination. Routledge, 2014.
18. PVWatts Calculator: http://pvwatts.nrel.gov/
19. Specific hazard and climate analysis for project. https://www.epa.gov/climate-impacts
20. "Systems Thinking." Education for Sustainable Living. Center for Ecoliteracy, n.d. http://www.ecoliteracy.org/essays/systems-thinking
21. Wells, Malcolm. "A Regeneration-Based Checklist for Design and Construction," Society of Building Science Educators, 2009. http://www.sbse.org/resources/
22. The Zero Tool is used to compare a building's design or an existing building's energy use intensity (EUI) with similar building types, understand how a building achieved its EUI (via energy efficiency, on-site renewable energy, and/or green power purchases), and set EUI targets: https://zerotool.org/