Regenerative Design
Humans intentionally participating as nature – Actively Co-Evolving the Whole System

Restorative Design
Humans doing things to nature – Assisting with the evolution of sub-systems

Sustainable Design
Neutral – "100% less bad" (McDonough)

Green/High Performance Design
Relative Improvement (LEED, GB Tool, Green Globe, etc.)

Conventional Practice
"One step better than breaking the law" (Croxton)
LIVING BUILDING CHALLENGE
A Visionary Path to a Restorative Future
www.livingbuildingchallenge.org
THE METAPHOR OF THE FLOWER

ROOTED IN PLACE AND YET:

Harvests all energy + water
Is adapted to climate and site
Operates pollution free
Is comprised of integrated systems
Is beautiful
WHY A CHALLENGE?

Infusing inspiration and poetry
Embracing the psychology of the ‘end game’
Rewarding early adopters
Creating models for the future
Stirring the pot
Pulling the market forward
TWO RULES

1. All Imperatives assigned to a Typology are mandatory to earn ‘Living’ status.

2. Living Building Challenge certification is based on actual, rather than modeled or anticipated, performance.
FOUR TYPOLOGIES
SIX “LIVING TRANSECT” CATEGORIES
<table>
<thead>
<tr>
<th>NEIGHBORHOOD</th>
<th>BUILDING</th>
<th>LANDSCAPE + INFRASTRUCTURE</th>
<th>RENOVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td>SITE</td>
<td></td>
<td></td>
<td>LIMITS TO GROWTH</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>URBAN AGRICULTURE</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>HABITAT EXCHANGE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CAR FREE LIVING</td>
</tr>
<tr>
<td>WATER</td>
<td></td>
<td></td>
<td>NET ZERO WATER</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ECOLOGICAL WATER FLOW</td>
</tr>
<tr>
<td>ENERGY</td>
<td></td>
<td></td>
<td>NET ZERO ENERGY</td>
</tr>
<tr>
<td>HEALTH</td>
<td></td>
<td></td>
<td>CIVILIZED ENVIRONMENT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HEALTHY AIR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BIOPHILIA</td>
</tr>
<tr>
<td>MATERIALS</td>
<td></td>
<td></td>
<td>RED LIST</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EMBODIED CARBON FOOTPRINT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RESPONSIBLE INDUSTRY</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>APPROPRIATE SOURCING</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>CONSERVATION + REUSE</td>
</tr>
<tr>
<td>EQUITY</td>
<td></td>
<td></td>
<td>HUMAN SCALE + HUMANE PLACES</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DEMOCRACY + SOCIAL JUSTICE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RIGHTS TO NATURE</td>
</tr>
<tr>
<td>BEAUTY</td>
<td></td>
<td></td>
<td>BEAUTY + SPIRIT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>INSPIRATION + EDUCATION</td>
</tr>
</tbody>
</table>

**SUMMARY MATRIX**

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SITE

Restoring a healthy coexistence with nature

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www.livingbuildingchallenge.org
The project may only be constructed on previously developed sites, greyfields and/or brownfields that are not classified as any of the following:

- sensitive ecological habitats
  (wetlands, primary dunes, old-growth forest, native prairie)
- prime farmland
- within the 100-year flood plain
The Project team must document conditions prior to the start of work.

On-site landscape may only include native and/or naturalized species, planted in such a way that emulates density and biodiversity of indigenous ecosystems and supports succession.

**plant succession** The gradual evolution of vegetation over time. Also involved in plant community restoration. In *autogenic succession* the plants themselves are the genesis of change; succession is directed from within the ecosystem.
The project must integrate opportunities for agriculture appropriate to its scale and density using the Floor Area Ratio (F.A.R.) as a basis for calculation.
FAR < .05

80% of the project area must be used for food production.

02 URBAN AGRICULTURE

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FAR .05 - .09

50% of the project area must be used for food production.

02 URBAN AGRICULTURE
FAR .10 - .24

35% of the project area must be used for food production.

02 URBAN AGRICULTURE
FAR .25 - .49

30% of the project area must be used for food production.
FAR $0.50 \geq 0.74$

25% of the project area must be used for food production.
FAR \( \geq .99 \)

20% of the project area must be used for food production.

02 URBAN AGRICULTURE
FAR 1.0 ≥ 1.49

15% of the project area must be used for food production.

02 URBAN AGRICULTURE
FAR 1.5 ≥ 1.99

10% of the project area must be used for food production.

02 URBAN AGRICULTURE

© 2012 Int’l Living Future Institute
FAR 2.0 ≥ 2.99

5% of the project area must be used for food production.

02 URBAN AGRICULTURE
FAR $\geq 3.0$

0% of the project area must be used for food production.

02 URBAN AGRICULTURE
For each hectare of development, an equal amount of land away from the project site must be set aside in perpetuity as part of a habitat exchange.
The permanent easement or transfer of ownership must be to an official Land Trust organization to ensure proper safeguarding and long-term care.

Land trust: a nonprofit organization that, as all or part of its mission, actively works to conserve land by undertaking or assisting in land or conservation easement acquisition, or by its stewardship of such land or easements.
The project should contribute to the creation of pedestrian-oriented communities.

Evaluate the potential for the project to enhance the ability of a community to support a car free lifestyle based on the ratio of the following occupancy types:

a. Residential
b. Commercial (Business or Mercantile), Assembly, Educational, Institutional
c. Light Industrial (Factory, Storage)
Building or Neighborhood project: the proposed development may not lower the density of the existing site or the catchment area of the Transect.

Neighborhood projects: the proposed development also may not cause the predominant occupancy type within the catchment area to exceed the maximum percentage:

<table>
<thead>
<tr>
<th>Transect</th>
<th>Maximum percentage of any single occupancy type within catchment area</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>--</td>
</tr>
<tr>
<td>L2</td>
<td>--</td>
</tr>
<tr>
<td>L3</td>
<td>70%</td>
</tr>
<tr>
<td>L4</td>
<td>60%</td>
</tr>
<tr>
<td>L5</td>
<td>50%</td>
</tr>
<tr>
<td>L6</td>
<td>40%</td>
</tr>
</tbody>
</table>
Catchment Area

1. Survey the territory outside the project boundary that is an outline of its perimeter offset one kilometer.

2. Remove areas obstructed by:
   - bodies of water
   - a series of 2+ train tracks
   - freeways
   - streets that are 5+ lanes across

Catchment Area for a Neighborhood project also includes the proposed project itself.
WATER

Creating water independent sites, buildings + communities
100% of the project’s water needs must be supplied by captured precipitation or other natural closed loop water systems that account for downstream ecosystem impacts, or by re-cycling used project water. Water must be appropriately purified without the use of chemicals.
100% of storm water and used, project water discharge must be managed onsite to feed the project’s internal water demands or released onto adjacent sites for management through acceptable natural time-scale surface flow, groundwater recharge, agricultural use or adjacent property needs.
ENERGY

Relying only on current solar income
100% of the project's energy needs must be supplied by on-site renewable energy on a net annual basis.
HEALTH

Maximizing physical and psychological health + well being
Every occupiable interior space of the project must have operable windows that provide access to fresh air and daylight.
To promote good indoor air quality, a Renovation, Building, and building(s) completed as part of a Neighborhood project must comply with best practices.

Conduct air quality testing at pre-occupancy and after 9 months of occupancy to measure levels of Respirable Suspended Particulates (RSP) and Total Volatile Organic Compounds (TVOC).
- Entryways must have an external dirt track-in system and an internal dirt track-in system contained within a separate entry space.

- All kitchens, bathrooms, copy rooms, janitorial closets and chemical storage spaces must be separately ventilated and exhaust directly to outside air.

- Ventilation rates must be designed to comply with ASHRAE 62 and equipment must be installed to monitor levels of carbon dioxide (CO₂), temperature and humidity.

- Smoking must be prohibited within the project boundary.

**Guideline for maximums in testing:**

- CO₂ 1000 ppm or 500+ outdoor level (L3-L6)
- CO 9 ppm or 2+ outdoor level (L3-L6)
- RSP 30 ug/m³ by mass measurement or 900,000 ft³ by laser particle counter
- TVOC 500 ug/m³ micrograms per cubic meter
The project must be designed to include elements that nurture the innate human attraction to natural systems and processes.

- Environmental features
- Natural shapes and forms
- Natural patterns and processes
- Light and space
- Place-based relationships
- Evolved human-nature relationships
The Six Biophilic Design Elements

10 BIOPHILIA

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MATERIALS

Endorsing products + processes that are safe for all species through time

www.livingbuildingchallenge.org
The project cannot contain the identified worst-in-class materials or chemicals, which include carcinogens, persistent organic pollutants, bioaccumulative toxins, and endocrine disruptors.
Asbestos
Cadmium
Chlorinated Polyethylene and Chlorosulfonated Polyethylene
Chlorofluorocarbons (CFCs)
Chloroprene (Neoprene)
Formaldehyde (added)
Halogenated Flame Retardants
Hydrochlorofluorocarbons (HCFCs)
Lead (added)
Mercury
Petrochemical Fertilizers and Pesticides
Phthalates
Polyvinyl Chloride (PVC)
Wood treatments containing Creosote, Arsenic or Pentachlorophenol
The project must account for the total footprint of embodied carbon (tCO2e) from its construction through a one-time carbon offset tied to the project boundary.
Offsets may only be from renewable energy projects that ensure real, verifiable, permanent carbon reductions.

Also consider:

- Meet/exceed criteria of: Gold Standard, VCS, Climate Action Reserve, Green-e Climate Protocol
- Green-e certified (3rd party verification)
- Additionality
- Forecasted performance
- Unique Recipients
- Transparency / Education to buyers
- Social co-benefits
- Minimal environmental impacts
The project must advocate for the creation and adoption of third-party certified standards for sustainable resource extraction and fair labor practices. Applicable raw materials include stone and rock, metal, minerals and timber.
For timber, all wood must be certified to Forest Stewardship Council (FSC) 100% labeling standards, from salvaged sources, or from the intentional harvest of timber onsite for the purpose of clearing the area for construction or restoring/maintaining the continued ecological function of the onsite bionetwork.

**WHY FSC?**
- Triple bottom line: social, economic, environmental interests
- Supports health and long-term integrity of forests (biodiversity, habitat) and communities
- Provides strict management and monitoring procedures
- Chain of Custody + independent verification
The project must incorporate place-based solutions and contribute to the expansion of a regional economy rooted in sustainable practices, products, and services.
### 14 APPROPRIATE SOURCING

<table>
<thead>
<tr>
<th>ZONE</th>
<th>MAX DISTANCE</th>
<th>MATERIALS/SERVICES</th>
<th>MASTERFORMAT CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>20,004 km</td>
<td>Ideas</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>15,000 km</td>
<td>Renewable Technologies</td>
<td>Divisions: 42, 48</td>
</tr>
</tbody>
</table>
| 5    | 5,000 km     | Assemblies that actively contribute to project performance + adaptable reuse once installed | Divisions: 08 (exterior), 11, 14, 22, 23, 26, 33, 44  
Sections: 07 50 00, 10 21 23, 10 22 00, 10 70 00, 44 40 00 |
| 4    | 2,500 km     | Consultant Travel                                                                  | -                                                                |
| 3    | 2,000 km     | Light or low-density materials                                                     | Sections: 07 31 00, 07 33 00, 07 40 00, 09 50 00, 09 60 00         |
| 2    | 1,000 km     | Medium weight or density materials                                                 | Divisions: 06, 08 (interior)                                     
Sections: 07 32 00, 09 20 00, 09 30 00, 12 30 00                  |
| 1    | 500 km       | Heavy or high-density materials                                                    | Divisions: 03, 04, 05, 31, 32                                    |
The project team must strive to reduce or eliminate the production of waste during design, construction, operation, and end of life in order to conserve natural resources.
The project team must create a Material Conservation Management Plan that explains how the project optimizes materials in each of the following phases:

- Design Phase
- Construction Phase
- Operation Phase
- End of Life Phase

During construction, teams must divert wasted materials from landfills:

<table>
<thead>
<tr>
<th>Material</th>
<th>Minimum Diverted/Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metals</td>
<td>95 %</td>
</tr>
<tr>
<td>Paper and Cardboard</td>
<td>95 %</td>
</tr>
<tr>
<td>Soil, and biomass</td>
<td>100 %</td>
</tr>
<tr>
<td>Rigid Foam, carpet &amp; insulation</td>
<td>90 %</td>
</tr>
<tr>
<td>All others - combined weighted average</td>
<td>80 %</td>
</tr>
</tbody>
</table>

Hazardous materials in demolition waste are exempt from percentage calculations.
EQUITY

Supporting a just, equitable world
The project must be designed to create human-scaled rather than automobile-scaled places, so that the experience brings out the best in humanity and promotes culture and interaction.
In context of the character of each Transect, there are specific design requirements that contribute to livable places.
All primary transportation, roads and non-building infrastructure that are considered externally focused must be equally accessible to all members of the public regardless of background, age and socioeconomic class - including the homeless - with reasonable steps taken to ensure that all people can benefit from the project’s creation.

Access for those with physical disabilities must be safeguarded through designs meeting the Americans with Disabilities Act (ADA).
The project may not block access to, nor diminish the quality of, fresh air, sunlight and natural waterways for any member of society or adjacent developments.
Fresh Air
The project must be designed to protect adjacent properties from any noxious emissions that would compromise its ability to use natural ventilation.

Sunlight
The project may not block sunlight to adjacent building façades and rooftops such that they are shaded in such a way to preclude access to daylight or use of renewable energy technologies.

Natural Waterways
The project may not restrict access to the edge of any natural waterway, assume ownership of water contained in these bodies or compromise the quality or quantity that flows downstream.
BEAUTY

Celebrating design that creates transformative change
The project must contain design features intended solely for human delight and the celebration of culture, spirit and place appropriate to its function.
Educational materials about the performance and operation of the project must be provided to the public to share successful solutions and to motivate others to make change.
PROGRAM CERTIFICATIONS - “LIVING” STATUS
IF YOU'VE GOT IT, FLAUNT IT!

PETAL RECOGNITION: 3 MINIMUM (INCL. WATER, ENERGY OR MATERIALS)
Let Living Building Challenge™ put a spotlight on your highest-performing projects with PETAL RECOGNITION.

The International Living Building Institute offers partial program certification - ‘Petal Recognition’ - to projects that satisfy the requirements in three categories of the Living Building Challenge, when at least one is Water, Energy or Materials.

Certification provides a platform for your projects to inform other efforts throughout the world and accelerate the adoption of restorative principles in the built environment.

Renovation or New Construction. Landscape, Infrastructure, Building or Neighborhood.

Celebrate your significant achievements and differentiate yourself in this quickly evolving market.

Register for Petal Recognition today.
THERE ARE DOZENS OF PROJECTS IN PURSUIT OF THE CHALLENGE...
EXAMPLES OF COMPLETED + IN-PROGRESS PROJECTS PURSuing ‘LIVING’ STATUS, PETAL RECOGNITION + NET ZERO ENERGY BUILDING CERTIFICATION
EXAMPLES OF COMPLETED + IN-PROGRESS PROJECTS PURSUING ‘LIVING’ STATUS, PETAL RECOGNITION + NET ZERO ENERGY BUILDING CERTIFICATION

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A CALL TO ACTION: living. building. challenge.

www.livingbuildingchallenge.org
FLOW
The Making of a Living Building

“When the well’s dry, we know the worth of water.”

— BENJAMIN FRANKLIN
A Living Building will:

- Harvest all its own water and energy needs on site;
- Be adapted specifically to site and climate and built primarily with local materials;
- Operate pollution-free and generate no wastes that aren’t useful for some other process;
- Promote the health and well-being of all inhabitants;
- Comprise integrated systems that maximize efficiency and comfort;
- Be beautiful and inspire us to dream.
VISION
Omega will be a global center for the development of human potential.

MISSION
Through innovative educational experiences that awaken the best in the human spirit, Omega provides hope and healing for individuals and society.

VALUES
Accountability
Holism
Integrity
Service
Simplicity
Sustainability
Teamwork
Welcoming
Prerequisite
SITE
Responsible
Site Selection
Living Building Challenge

Prerequisite
SITE
Limits to Growth
Living Building Challenge

Prerequisite
SITE
Habitat Exchange

Scenic Hudson
Used on the project as substitutes for typical products:
- HDPE, Cast Iron pipe
- Reclaimed lumber and plywood
- Phenol-formaldehyde adhesive in glulam
- Polyisocyanurate insulation
- GreenFiber cellulose insulation
- EPDM roof membrane
- Lutron Vela fabric
Toxic Red List

The Omega Center for Sustainable Living does not contain any of the following Living Building Challenge™ Red List materials or chemicals.

- Cadmium
- Chlorinated Polyethylene and Chlorosulfonated Polyethylene
- Chlorofluorocarbons (CFCs)
- Chloroprene (Neoprene)
- Formaldehyde (added)
- Halogenated Flame Retardants
- Hydrochlorofluorocarbons (HCFGs)
- Lead
- Mercury
- Petrochemical Fertilizers and Pesticides
- Phthalates
- Polyvinyl Chloride (PVC)

Wood treatments containing Creosote, Arsenic, or Pentachlorophenol
Construction Carbon Calculator Results

Approximate net embodied CO2 for this project is **-1,387 metric tons.**

### Your Entries

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Square Feet</td>
<td>6,246</td>
</tr>
<tr>
<td>Stories Above Grade</td>
<td>1</td>
</tr>
<tr>
<td>Stories Below Grade</td>
<td>0</td>
</tr>
<tr>
<td>System Type</td>
<td>mixed</td>
</tr>
<tr>
<td>Ecoregion</td>
<td>Eastern Temperate Forests</td>
</tr>
<tr>
<td>Existing Vegetation Type</td>
<td>Short Grass or Lawn</td>
</tr>
<tr>
<td>Installed Vegetation Type</td>
<td>Wetlands</td>
</tr>
<tr>
<td>Landscape Disturbed (SF)</td>
<td>95,036</td>
</tr>
<tr>
<td>Landscape Installed (SF)</td>
<td>93,949</td>
</tr>
</tbody>
</table>

Construction Carbon Calculator formula version 0.03.5, last updated 2007.10.11. These results are an approximation. Your actual carbon footprint may vary. See assumptions for more information.
Living Building Challenge

Prerequisite MATERIALS
Responsible Industry
Renewable Energy Technologies
Germany v. Philippines v. Mexico

Building performance assemblies
Rainscreen wall assembly

Consultant travel
Tipping Mar, Berkeley, CA too far
BNIM / BGR just made it
Everyone else okay
Low-weight/density materials
Insulation

Medium-weight/density materials
Wood (all)
Windows (exception for glass)

Heavy-weight/density materials
Concrete
Steel
99% of metals scraps recycled.
99% of cardboard scraps and waste recycled.
99% of rigid foam waste was reused elsewhere or recycled.
99% of wood waste was shredded for mulch or stored for future use.
100% of food waste was composted.
100% of glass waste, paper, and plastic packaging waste was recycled.
Conserve Water Resources
- Utilize landscapes that thrive without the use of supplemental irrigation water
- Harvest rainwater to supplement water needs

Avoid Surface Water Runoff
- Reuse runoff water where practicable
- Promote groundwater recharge and evaporation rather than surface runoff
- Avoid concentration of runoff and spread rainwater over the landscape through multiple appropriate design strategies
- Manage woodlands to reduce surface runoff from undeveloped areas

Avoid Surface & Groundwater Contamination
- Use bioretention swales, rain gardens, etc., to remove stormwater pollutants

Make Water Systems Transparent
- Where water is transferred from space to space, use surface conveyance rather than enclosed pipes
- Make visible subsurface seepage from permeable pavements, bioswales, etc.
- Incorporate constructed wetlands into landscape design as a garden-like feature
Prerequisite

**WATER**

Sustainable Water Discharge

- **Septic Tanks**: The first step in the process, this is where the majority of suspended solids in the water are separated. Slowly, bacteria break down organic pollutants in the water, and the water works to displace the outflow that settles to the bottom of the tank and the excess partially clarified water is removed off the Aerator Tank.

- **Anaerobic Tank (Anaerobic Digester)**: New bacteria set free and suspended solids become anaerobic digester sludge.

- **Constructed Wetlands**: The water passes through the root structure of wetland plants. The plants remove chemicals and remove the Biological Oxygen Demand (BOD) - a measure of the rate at which biological organisms oxidize the available oxygen and convert it into by-products.

- **Aerated Lagoons (Greenhouse)**: In this step, additional growths are added to an aerated lagoon. A tertiary relationship, the plant roots act as a substrate for microbial populations that further assist in the water.

- **Sand Filter**: This stage is the third-biological-filtration of the water prior to being returned to the environment. Microorganisms living inside and between the grains of sand are fed by any remaining organic compounds in the water.

- **Subsurface Disposal**: If this stage the water is not treated by the soil, it is subsurface or subsurface for chambers that are treated with the processed water and allowed to percolate into the soil.

**Legend**

- **Overflow**: Blue
- **Treatment Cell**: Green
- **Rain Garden**: Green
- **Gravel Path**: Gray
- **Gravel Parking Surface**: Gray

**Scale**: 1" = 30' 0"
Did you know...

(No text visible on the sticker)
Living Building Challenge

Prerequisite

WATER
Sustainable Water Discharge
Living Building Challenge

Prerequisite

INDOOR QUALITY
Healthy Air / Source Control
This is a healing place.

- Dr. John Todd
Living Building Challenge

Prerequisite

BEAUTY + INSPIRATION
Inspiration + Education

16
The Omega Center for Sustainable Living is slated to achieve both LEED® Platinum and Living Building Challenge™ certifications.
water reclamation process begins

The Eco Machine™ treats all the water from Omega’s campus, including water used in toilets, showers, the kitchen, the café, etc. Wastewater is collected in decentralized tanks located throughout campus and then flows to a central collection tank.
equalization tanks

From various tanks throughout campus where many of the solids are separated out, water arrives at the equalization tank. These large tanks allow surges in water use to be evenly released into the Eco Machine over the course of the day.
aerated lagoons

In the aerated lagoons, the water is injected with air and runs through a series of open tanks where it is scrubbed and cleaned by plants, fungi, algae, bacteria, snails, and other organisms. In turn, these organisms use the nutrients from the water to grow and thrive.
disperal fields

Currently, the processed water is safely reintroduced to the environment via two large dispersal fields under the parking lot. Eventually, we plan to use the water on campus to irrigate our gardens and flush toilets.
The Omega Center for Sustainable Living is the first building in the world to achieve both LEED Platinum and Living Building Challenge certification.