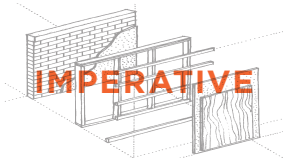
MATERIALS

# NET POSITIVE WASTE

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| | |
|---|---|
| BUILDING | ✓ |
| RENOVATION | ✓ |
| LANDSCAPE + INFRASTRUCTURE | ✓ |

## INTENT

To reduce environmental burdens from the extraction, processing and disposal of materials and turn waste into a valuable resource through beneficial reuse.

## REQUIREMENTS

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 and to find ways to integrate waste back into either an industrial loop or natural nutrient loop.

All projects must feature at least one salvaged material per 500 square meters of gross building area or be an adaptive reuse of an existing structure.

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, including the consideration of appropriate durability in product specification
- Construction Phase, including product optimization and collection of wasted materials
- Operation Phase, including a collection plan for consumables and durables
- End of Life Phase, including a plan for adaptable reuse and deconstruction

*Materials Diversion Requirements*

| Material | Minimum Diverted/ Weight |
|---|---|
| Metals | 99% |
| Paper and cardboard | 99% |
| Soil and biomass | 100% |
| Rigid foam, carpet & insulation | 95% |
| All others - combined weighted average | 90% |

For all project types, there must be dedicated infrastructure for the collection of recyclables and compostable food scraps.

A project that is located on a site with existing infrastructure must complete a pre-building audit that inventories available materials and assemblies for reuse or donation.

## CHANGES IN 3.0

Diversion rates have been increased.

One salvaged material is required per 500 square meters gross building area.

## CLARIFICATIONS

### ONE SALVAGED MATERIAL PER 500 SQUARE METERS ($M^2$)

The salvaged material requirement is intended to turn salvaged materials into a "positive" through beneficial reuse. The requirement for one material per 500 square meters of gross building area is intended as guidance on the amount of salvaged materials. The salvaged materials do not need to be distributed evenly but should be sufficiently spread out and prominently located so as to be visible to each of the primary occupant types in the building.

### MATERIALS CONSERVATION MANAGEMENT PLAN (MCMP)

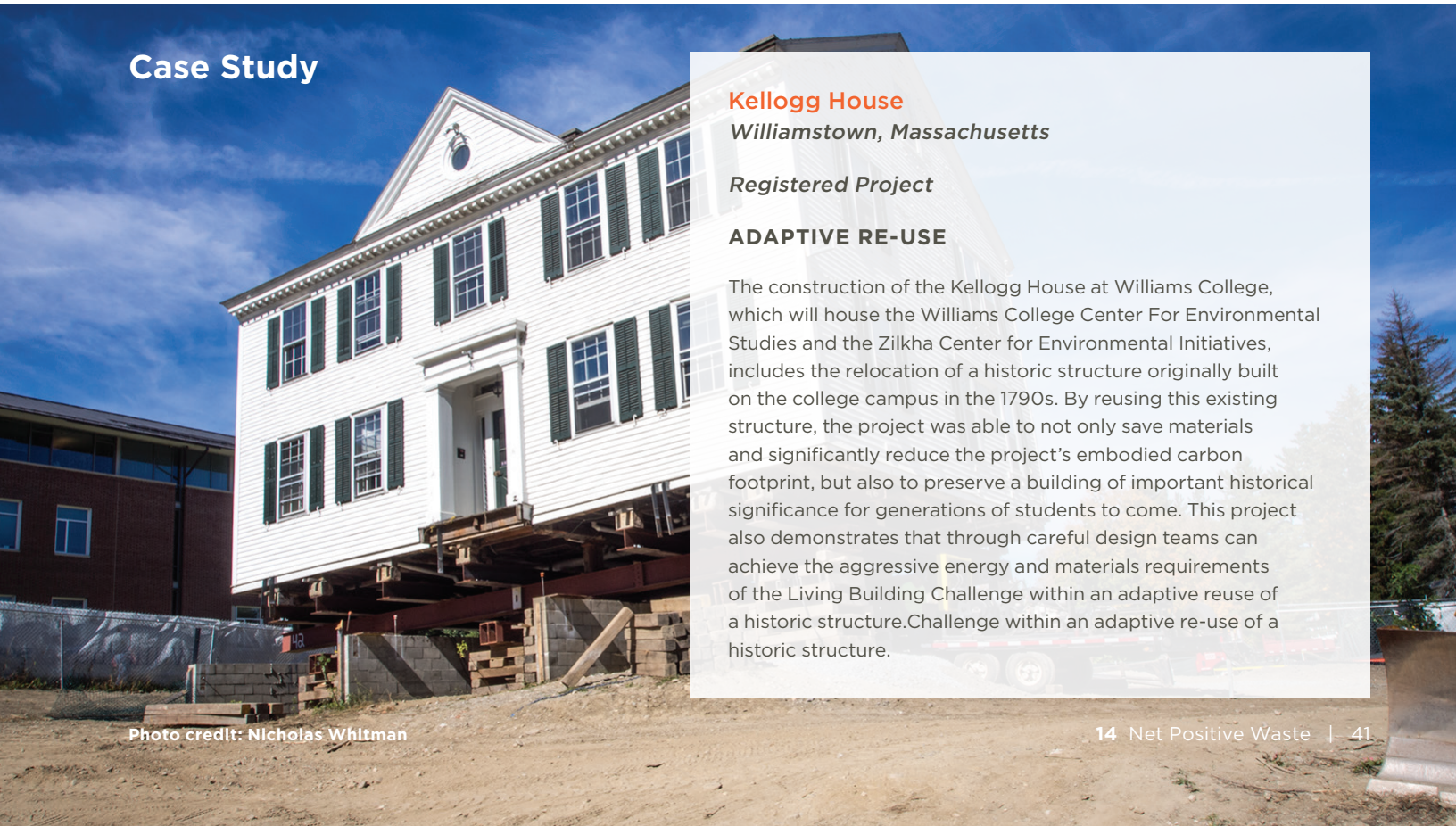
The intent of the MCMP is to encourage the project team to have a thorough conversation about what can be done during each phase of design, construction, occupancy and end of life to encourage conservation and reduce waste. It is expected that teams will cover the four areas in a substantive way and decide as professionals how far to probe. The Institute acknowledges that the amount of information to provide will vary by project and Typology, however a one to two page document is unlikely to be sufficient.

**Design Phase**

For the design phase, project teams should be mindful of adaptive reuse and durability. However, rather than consider durability as a blanket objective, teams are encouraged to consider 'appropriate durability'. For instance, certain products/assemblies should last for the duration of the project's life, while others should be selected based on likely duration of use. For example, a stone countertop may not be the best option in the kitchen of an office with a short-term lease. Consider if the inevitable churn would result in renovations prior to the exhaustion of the product's functional capabilities.

**End of Life**

For the end-of-life section of the plan, percentages of a project that must be recyclable or reusable have not been established at this time. Teams have flexibility to determine a balanced way to address the variety of issues that come into play when considering the products used and material conservation throughout the life cycle of a project.



## Case Study

### Kellogg House

***Williamstown, Massachusetts***

***Registered Project***

**ADAPTIVE RE-USE**

The construction of the Kellogg House at Williams College, which will house the Williams College Center For Environmental Studies and the Zilkha Center for Environmental Initiatives, includes the relocation of a historic structure originally built on the college campus in the 1790s. By reusing this existing structure, the project was able to not only save materials and significantly reduce the project's embodied carbon footprint, but also to preserve a building of important historical significance for generations of students to come. This project also demonstrates that through careful design teams can achieve the aggressive energy and materials requirements of the Living Building Challenge within an adaptive reuse of a historic structure.Challenge within an adaptive re-use of a historic structure.

**Photo credit: Nicholas Whitman**

### CONSTRUCTION MATERIALS DIVERSION

Project teams are expected to go further afield from their job site than they might on a non-LBC project in order to stimulate and support recycling innovators if necessary. Teams are encouraged to examine alternative construction methods that might reduce the amount of product waste, particularly where no recycling infrastructure exists locally, and to consider the challenges of recycling when determining whether to use specific products in the project.

### ALTERNATIVE DAILY COVER

Incineration or allocation as "alternative daily cover" is not permitted. Diverted waste includes materials that are recycled, reused, salvaged or composted.

### "ALL OTHER" MATERIALS

"All others - combined weighted average" from the Standard includes the following materials: asphalt; concrete and concrete masonry units (CMUs); brick, tile and masonry materials; untreated lumber; plywood, oriented strand board (OSB) and particle board; gypsum wallboard scrap; glass; plumbing fixtures; windows; doors; cabinets; architectural fixtures; millwork, paneling and similar; electric fixtures, motors, switch gears and similar HVAC equipment; duct work; control systems; and switches. The team needs the combined weighted average of those materials to be recycled at a 90% or greater rate.

### AVERAGE DIVERSION RATES FOR COMMINGLED FACILITIES

If project teams are using a commingled recycling/diversion facility that accepts combined (unsorted) waste, only those facilities that can document a minimum average monthly diversion rate of 90% for ALL materials leaving their facility are eligible. As noted above, diverted materials are those that are recycled, reused, salvaged or composted; wastes that are incinerated or allocated to "alternative daily cover" may not be included in the facility's diversion rate.

### PRE-BUILDING AUDIT

Projects using sites with existing infrastructure must complete a "pre-building audit" that inventories available materials and assemblies for reuse or donation. A pre-building audit is an inventory of all existing materials found onsite for the purpose of identifying opportunities for diverting materials otherwise slated for demolition.

The audit process typically consists of a site visit to visually survey existing infrastructure and to estimate the quantity of materials and their conditions (i.e., damage from fire or water, rot, hazardous materials, etc.). An audit report should be produced, identifying each material and potential markets for salvage, recycling or on-site reuse. The pre-building audit report should be included in the project's Material Conservation Management Plan.

Pre-building audits should take place early in the design process so that materials can be identified for potential reuse on-site and so that salvage and deconstruction activities can begin prior to demolition. The audit would ideally be performed by a deconstruction specialist or contractor, though anyone on the project team may perform the audit.

### SALVAGE OR SURPLUS

It is acceptable for surplus or salvaged products to be donated or sold to any organization, business or for use on another concurrent or scheduled project. Selling or giving away materials via informal markets like Craigslist is also acceptable, as long as the materials are intended for reuse and a receipt is provided.

Please note that there must be a plan in place to use all materials set aside in this way. Otherwise, there is a potential for the material to be disposed of after a period of disuse because it is not needed, it can no longer be stored, or is compromised, or for another reason.

Heavy materials, such as soil, should be sold or donated as close to the project site as possible.

## EXCEPTIONS

**I14-E1 4/2010** Hazardous Materials

Hazardous materials in demolition waste, such as lead-based paint, asbestos and polychlorinated biphenyls (PCBs), are exempt from percentage calculations. The project team must provide documentation of the proper disposal of any hazardous materials excluded from materials calculations.

**I14-E2 5/2014** Municipal Limitations

Although project teams are expected to make every effort to avoid landfill deposits, there is a temporary exception for meeting this level of diversion in jurisdictions where municipalities do not have systems in place to collect all listed construction materials. Project teams must advocate to the Authority Having Jurisdiction (AHJ) for the creation of sufficiently robust public waste diversion systems.

**I14-E3 5/2014** Surplus to Project Team

The project owner or team may divert project materials to their own concurrent or future projects without a receipt, as long as there is a plan in place to use all diverted materials and the quantity and use of each product is sufficiently documented.

The project team must provide a brief narrative and photographs that document the materials diverted, the means used to verify diverted weight or volume, and the intended eventual use.

## CALCULATIONS

*Combined Weighted Average of "All Other" Materials*

| Material | Diverted Weight (lbs) | Diversion Rate (%) | Diversion Factor | Weighted Diversion Rate (%) |
|---|---|---|---|---|
| Asphalt | 200 | 100 | .4 | 40 |
| CMU | 150 | 90 | .3 | 27 |
| OSB | 50 | 100 | .1 | 10 |
| Glass | 40 | 50 | .08 | 4 |
| HVAC Equipment | 10 | 50 | .02 | 1 |
| Gypsum | 50 | 90 | .1 | 9 |
| **Total Weight** | **500** | | **1** | **91** |

### CALCULATION STEPS

**For each material considered part of "all other materials":**

1. Calculate the total diverted material weight
2. Establish the material-specific Diversion Rate, typically from the recycling facility
3. Determine the Diversion Factor for each material

   Diversion Factor = Weight of Material/Total Diverted Weight of all "other materials"
4. Determine the weighted diversion rate (%)

Weighted Diversion Rate (%) = Diverted Rate x Diversion Factor

**After all "other materials" Weighted Diversion Rates are established:**

5. Add all the Weighted Diversion Rates together to determine the combined weighted average.

For example, Asphalt as shown above:

1. Diverted Weight = 200 #
2. Diversion Rate = 100%
3. Diversion Factor = 200#/500# = 0.4
4. Weighted Diversion Rate = 100 x 0.4 = 40
5. Add all individual material diversion rates

For all materials in the table above:
Combined Weighted Average = 91%.

## SCALE JUMPING

Not applicable.

## DOCUMENTATION REQUIREMENTS

### BASIC DOCUMENTATION

All projects require all Basic Documentation, unless noted otherwise.

**I14-1** Materials Conservation Management Plan

Completed Conservation Management Plan explaining how the project team optimized materials in design, construction, and operations phases, and how they planned for reduced waste at the project's end of life. Projects on sites with existing infrastructure also need to include the required Pre-building Audit Report.

**I14-2** Diversion Table

Completed construction waste diversion table, in Excel format, showing percentages of waste diverted (by weight) in each category (metals; paper + cardboard; soil + biomass; rigid foam, carpet + insulation; and all others). The calculations must be based on tangible data that correlates to receipts provided.

**I14-3** Diversion Documentation

Copies of receipts, recycling percentage reports and provider names for all tipping fees, recyclers, and building materials salvage services.

**I14-4** Salvaged Materials Documentation

Noted architectural drawings showing location of salvaged items.

**I14-5** Photographs

Photographs of specific designated on-site areas for separated or commingled construction waste.

### EXCEPTION DOCUMENTATION

Projects that use Exceptions or compliance paths that are not standard for all projects require additional documentation.

*I-14 Exception Documentation Summary Table*

| EXCEPTION | | I14-a Exception Narrative | I14-b Technical Documentation | I14-c Advocacy Letters | 114-d Photographs |
|---|---|---|---|---|---|
| I14-E1 | Hazardous Materials | | x | | |
| I14-E2 | Municipal Limitations | | | x | |
| I14-E3 | Surplus to Project Team | x | | | x |

**I14-a** Exception Narrative
Narrative explaining the relevant information for the Exception in question.

**I14-b** Technical Documentation
Legal, economic or contract documents that verify Exception requirements have been met, such as:

- Official documents such as current business licenses or registrations
- Contracts or receipts showing transactions related to Exception requirements

**I14-c** Advocacy Letters
Letters to advocate for better waste reduction options.

**I14-d** Photographs
Photographs

## DEFINITIONS

**Adaptive Reuse**
The process of reusing a site or building for a purpose other than the original purpose for which it was built or designed.

**Alternative Daily Cover (ADC)**
Material other than earthen material placed on the surface of a municipal solid waste landfill at the end of each operating day to control vectors, fires, odors, blowing litter and scavenging. In some jurisdictions, construction and demolition waste is permitted as alternative daily cover, however it is not an acceptable strategy for waste diversion within the Living Building Challenge.

**Consumables**
Non-durable goods that are likely to be used up or depleted quickly. Examples include office supplies, packaging and containers, paper and paper products, batteries and cleaning products.

**Deconstruction**
The systematic removal of materials from a building or site for the purpose of salvage, reuse and/or recycling.

**Durables**
Goods that have utility over time, rather than being used up quickly. Examples include appliances, electronic equipment, mobile phones and furniture.

## RESOURCES

**Design for Disassembly in the Built Environment**
Brad Guy and Nicholas Ciarimboli, prepared on behalf of City of Seattle and King County, WA
http://your.kingcounty.gov/solidwaste/greenbuilding/documents/Design_for_Disassembly-guide.pdf

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**Waste equals food, whether it's food for the earth, or for a closed industrial cycle. We manufacture products that go from cradle to grave. We want to manufacture them from cradle to cradle.**

**William McDonough, Cradle to Cradle: Remaking the Way We Make Things**