

MATERIALS PETAL HANDBOOK

AUGUST 2014

LIVING BUILDING
CHALLENGESM 3.0

A Visionary Path to a Regenerative Future



INTERNATIONAL
LIVING FUTURE
INSTITUTETM

Copyright © 2014 by International Living Future Institute™

All rights reserved. No part of this document may be modified, nor elements of this document used out of existing context without written permission. For information, contact the International Living Future Institute at info@living-future.org.

Living Building ChallengeSM (the Challenge) is a trademark of the International Living Future Institute (the Institute). The terms “Living Buildings” and “Living Building” are also trademarks of the Institute. No use of these terms is allowed without written permission from the Institute, and no project may claim to reach “Living Landscape,” “Living Infrastructure,” “Living Renovation,” or “Living Building” status without review and approval by the Institute.

The Institute grants substantial limited uses of Petal Handbooks (Handbooks) including the following:

- Petal Handbooks may be printed and distributed to registered project teams for the purposes of education and understanding of the Challenge. These handbooks are intended for International Living Future Institute (or Cascadia Green Building Council) members only and should not be distributed beyond a single printed copy per member.
- This document may be purchased from the Institute as a professionally printed copy with binding or downloaded in PDF and used by registered project teams. However, the Institute encourages registered teams to access this document through the Living Building Challenge website at living-future.org/lbc in order to guarantee the most current version of this document is transmitted.

Use of this document in any form implies acceptance of these conditions. The Institute reserves the right to modify and update the Living Building Challenge and Petal Handbooks at its sole discretion.



THE INTERNATIONAL LIVING FUTURE INSTITUTE

The International Living Future Institute is a non-profit organization offering green building and infrastructure solutions at every scale—from small renovations to neighborhoods or whole cities. The mission of the Institute is to lead and support the transformation toward communities that are socially just, culturally rich and ecologically restorative. The Institute administers the Living Building Challenge the built environment’s most rigorous and ambitious performance standard.

IMPERATIVE 10: RED LIST

IMPERATIVE 11: EMBODIED CARBON FOOTPRINT

IMPERATIVE 12: RESPONSIBLE INDUSTRY

IMPERATIVE 13: LIVING ECONOMY SOURCING

IMPERATIVE 14: NET POSITIVE WASTE



TABLE OF CONTENTS

INTRODUCTION	2	12: RESPONSIBLE INDUSTRY	
HOW TO USE THIS HANDBOOK	2	INTENT	28
ADDITIONAL TOOLS AND SUPPORT	4	REQUIREMENTS	28
		CHANGES IN 3.0	28
		CLARIFICATIONS	29
10: RED LIST		EXCEPTIONS	30
INTENT	6	SCALE JUMPING	31
REQUIREMENTS	6	DOCUMENTATION REQUIREMENTS	32
CHANGES IN 3.0	6	DEFINITIONS	33
CLARIFICATIONS	7	RESOURCES	33
EXCEPTIONS	12		
SPECIFIC EXCEPTIONS	14	13: LIVING ECONOMY SOURCING	
SCALE JUMPING	16	INTENT	35
DOCUMENTATION REQUIREMENTS	16	REQUIREMENTS	35
DEFINITIONS	18	CHANGES IN 3.0	35
RESOURCES	19	CLARIFICATIONS	36
		EXCEPTIONS	38
11: EMBODIED CARBON FOOTPRINT		SCALE JUMPING	38
INTENT	21	DOCUMENTATION REQUIREMENTS	38
REQUIREMENTS	21	DEFINITIONS	38
CHANGES IN 3.0	21	RESOURCES	38
CLARIFICATIONS	21		
EXCEPTIONS	24	14: NET POSITIVE WASTE	
SCALE JUMPING	24	INTENT	40
DOCUMENTATION REQUIREMENTS	25	REQUIREMENTS	40
DEFINITIONS	26	CHANGES IN 3.0	40
RESOURCES	26	CLARIFICATIONS	41
		EXCEPTIONS	43
		CALCULATIONS	43
		SCALE JUMPING	44
		DOCUMENTATION REQUIREMENTS	44
		DEFINITIONS	44
		RESOURCES	44

INTRODUCTION

The Living Building Challenge is a certification program, advocacy tool and philosophy defining the most advanced measure of sustainability in the built environment today. As a certification program, it addresses all buildings, at all scales and is an inclusive tool for transformative design. Whether the project is a single building, a renovation or a park, the Living Building Challenge provides a framework for design, construction and improving the symbiotic relationship between people and all aspects of the built environment.

This Handbook is one in a series of publications that is intended to serve as a resource for project teams pursuing the Living Building Challenge 3.0. Because the Living Building Challenge Standard (the Standard) is continuously informed by the work that project teams are doing on the ground, these Petal Handbooks have been developed to clarify and consolidate the rules *at a set point in time* to provide a unified reference for project teams.

The Dialogue (explained below) provides the platform for project teams to request exceptions, clarifications and definitions related to program requirements. The Handbooks consolidate relevant Dialogue posts and the footnotes from the Standard into one location, to provide a simplified and consistent set of rules for easy reference. The Handbooks define the requirements for each Petal *as of their date of issue*. Project teams are encouraged to routinely check the Dialogue for postings after the issue date of this handbook in order to remain up to date on the program.

Any Dialogue ruling made after the date of this Handbook takes precedent over the information contained here. As a result, Handbooks will be updated on an as-needed basis to incorporate new Dialogue posts and to add more detailed information over time, but responsibility still rests with the project teams to be up to date on rulings that could affect their certification.

HOW TO USE THIS HANDBOOK

This Handbook describes the rule set or “body of law” for achieving all Imperatives that make up the Place Petal within the Living Building Challenge. It should be used in conjunction with the Living Building Challenge Standard 3.0. These rules apply to projects registered under 3.0 and not yet in Construction Documents by the publication date of this Handbook. Projects already in Construction Documents may apply these rules at their discretion.

ICONS



Net Zero icons identify Imperatives where partial or full compliance is required for Net Zero Energy Building (NZEB) Certification. The icons also identify which documentation is required and other information that is particularly relevant to NZEB projects.



Transect icons identify information relevant to a particular transect.



Scale Jumping icons identify either where Scale Jumping is permissible for each Imperative, or information that is particularly relevant to Scale Jumping.



Typology icons identify information relevant to a particular typology.

BUILDING	✓
RENOVATION	✓
LANDSCAPE + INFRASTRUCTURE	✓

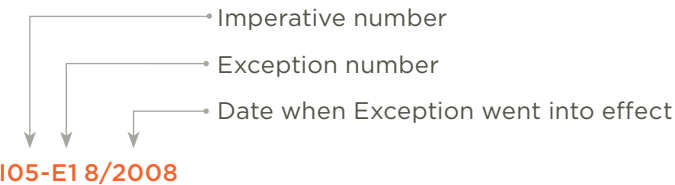
Typology tables identify which typologies are required to meet each Imperative. Where a typology is not checked within the table, projects within that typology are exempt from the Imperative.

CLARIFICATIONS AND EXCEPTIONS

This Handbook contains both Clarifications and Exceptions that consolidate Dialogue posts and the footnotes from the Standard to provide a simplified and consistent set of rules for easy reference.

Exceptions reflect current regulatory barriers or market realities and are therefore temporary. Exceptions will be phased out over time as regulations are updated and new technologies or materials become available.

Each Exception listed in the Petal Handbook is identified with a unique number. Project teams must reference the appropriate Exception numbers when submitting Dialogue posts and documentation for audit.



ADDITIONAL TOOLS AND SUPPORT

For project teams seeking further guidance, the International Living Future Institute offers several avenues for additional support:

Declare.

Your Product
Your Company
 Final Assembly: City, State, Country
 Life Expectancy: 000 Years
 End of Life Options: Recyclable (42%), Landfill

Ingredients:
Your First Ingredient (Locally Sourced Location, ST), **Sustainably Sourced Ingredient** (Location, ST), **Non-toxic Item** (Location, ST), **Living Building Challenge Red List**, **Another Component**, **US EPA Chemical of Concern**, **Last Ingredient**

Living Building Challenge Criteria:
 XXX-0000 EXP: 11/11/2011
 VOC Content: 0.00 mg/m³ VOC Emissions: CDPH Compliant
Declaration Status
☐ LBC Red List Free
☒ LBC Compliant
☐ Declared

MANUFACTURER RESPONSIBLE FOR LABEL ACCURACY
 INTERNATIONAL LIVING FUTURE INSTITUTE™ declareproducts.com

Technical Assistance is offered by the Institute to support a project team's process of adopting the principles of the Challenge. Optional technical services include charrette facilitation, design development guidance and workshops, all of which are designed to provide input at a point in a project when changes are still possible.

living-future.org/lbc/support

The **Dialogue** is an online host for the transparent exchange of ideas between project teams and the Institute. It is the official venue to request feedback on proposed strategies for meeting the requirements of the Living Building Challenge. Only active, registered project teams can submit requests to the Dialogue.

Declare™ is a “nutrition label” and online database for building materials, providing manufacturers with a clear, elegant and informative pathway for disclosing the ingredients within their products. Project teams are encouraged to select products through Declare to ensure they meet Living Building Challenge materials requirements. If a suitable product cannot be found in Declare, project teams can streamline the process of materials research, selection, and documentation by requesting that a manufacturer list their products in Declare.

declareproducts.com

Just.

Organization Name:
Organization Type:
Headquarters:
Satellite Facilities:
Number of Employees:

Social Justice and Equity Indicators:

Diversity	Worker Benefit
<input type="checkbox"/> Non-Discrimination	<input type="checkbox"/> Worker Happiness
<input type="checkbox"/> Gender Diversity	<input type="checkbox"/> Employee Health Care
<input type="checkbox"/> Ethnic Diversity	<input type="checkbox"/> Continuing Education
Equity	Local Benefit
<input type="checkbox"/> Full Time Employment	<input type="checkbox"/> Local Control
<input type="checkbox"/> Pay-Scale Equity	<input type="checkbox"/> Local Sourcing
<input type="checkbox"/> Union Friendly	
<input type="checkbox"/> Living Wage	Stewardship
<input type="checkbox"/> Gender Pay Equity	<input type="checkbox"/> Responsible Investing
<input type="checkbox"/> Family Friendly	<input type="checkbox"/> Community Volunteering
	<input type="checkbox"/> Positive Products
Safety	<input type="checkbox"/> Charitable Giving
<input type="checkbox"/> Occupational Safety	<input type="checkbox"/> Animal Welfare
<input type="checkbox"/> Hazardous Chemicals	<input type="checkbox"/> Transparency

THE SOCIAL JUSTICE LABEL
 SPC-001 EXP: 10/26/2014

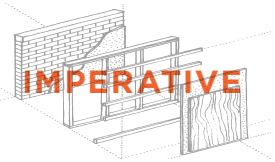
INTERNATIONAL LIVING FUTURE INSTITUTE™ justorganizations.com

Just™ is an innovative social justice label for all types and sizes of organizations. The program provides an innovative transparency platform for organizations to reveal much about their operations, including how they treat their employees and where they make financial and community investments. Please see Imperative 18 for Living Building Challenge 3.0 requirements pertaining to the JUST program.

justorganizations.com

MATERIALS

RED LIST



10

BUILDING



RENOVATION



LANDSCAPE + INFRASTRUCTURE



INTENT

To eliminate the use of worst-in-class materials/chemicals with the greatest impact to human and ecosystem health.

REQUIREMENT

The project cannot contain any of the following Red List materials or chemicals:

- Alkylphenols
- Asbestos
- Bisphenol A (BPA)
- Cadmium
- Chlorinated Polyethylene and Chlorosulfonated Polyethylene
- Chlorobenzenes
- Chlorofluorocarbons (CFCs) and Hydrochlorofluorocarbons (HCFCs)
- Chloroprene (Neoprene)
- Chromium VI
- Chlorinated Polyvinyl Chloride (CPVC)
- Formaldehyde (added)
- Halogenated Flame Retardants (HFRs)
- Lead (added)
- Mercury
- Perfluorinated Compounds (PFCs)
- Polychlorinated Biphenyls (PCBs)
- Phthalates
- Polyvinyl Chloride (PVC)
- Polyvinylidene Chloride (PVDC)
- Short Chain Chlorinated Paraffins
- Wood treatments containing Creosote, Arsenic or Pentachlorophenol
- Volatile Organic Compounds (VOCs) in wet-applied products

CHANGES IN 3.0

The Red List has been expanded to include additional toxic chemicals:

- Alkylphenols
- Bisphenol A (BPA)
- Chlorobenzenes
- Chromium VI
- Perfluorinated Compounds (PFCs)
- Polychlorinated Biphenyls (PCBs)
- Polyvinylidene Chloride (PVDC)
- Short Chain Chlorinated Paraffins
- VOCs in wet-applied products

The Red List now applies to systems furniture.

A number of Exceptions have been eliminated or modified:

- Mercury is no longer allowed in fluorescent lamps
- HFRs in foam insulation is no longer allowed

The restriction on petrochemical fertilizers and pesticides is now addressed under the requirements of Imperative I-01, Limits to Growth.

CLARIFICATIONS

CHEMISTRY ABSTRACTS SERVICE (CAS) REGISTRY NUMBERS

CAS numbers are unique numerical identifiers for nearly every known chemical, compound or organic substance and an effective and transparent way to evaluate building product ingredients and communicate with manufacturers. To assist project teams, a list of CAS Registry Numbers that correspond with each Red List item is available on the Institute's project team resource page and will be updated as new information becomes available. See *CAS Registry Numbers List under Resources below*.

VOLATILE ORGANIC COMPOUNDS (VOCs)

Wet-applied products must meet established emission VOC content standards described below and some specific toxic solvents are banned.

Wet Applied Products

Wet-applied products (coatings, adhesives and sealants) must have VOC levels below the South Coast Air Quality Management District (SCAQMD) Rule 1168 for Adhesives and Sealants or the CARB 2007 Suggested Control Measure (SCM) for Architectural Coatings, as applicable.

Small Containers of Sealants and Adhesives

Containers of sealants and adhesives with capacity of 16 ounces or less must comply with applicable category limits in the California Air Resources Board (CARB) Regulation for Reducing Emissions from Consumer Products.

Solvents

The following California-defined Group II toxic exempt solvents are banned and must not be intentionally added to products.

- | | |
|----------------------------------------------------------------|--------------------------------------------------|
| • methylene chloride (dichloromethane) | • ethylfluoride (HFC-161) |
| • 1,1,1-trichloroethane (methyl chloroform) | • 1,1,1,3,3,3-hexafluoropropane (HFC-236fa) |
| • trichlorofluoromethane (CFC-11) | • 1,1,2,2,3-pentafluoropropane (HFC-245ca) |
| • dichlorodifluoromethane (CFC-12) | • 1,1,2,3,3-pentafluoropropane (HFC-245ea) |
| • 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113) | • 1,1,1,2,3-pentafluoropropane (HFC-245eb) |
| • 1,2-dichloro-1,1,2,2-tetrafluoroethane (CFC-114) | • 1,1,1,3,3-pentafluoropropane (HFC-245fa) |
| • chloropentafluoroethane (CFC-115) | • 1,1,1,2,3,3-hexafluoropropane (HFC-236ea) |
| • cyclic, branched, or linear, completely methylated siloxanes | • 1,1,1,3,3-pentafluorobutane (HFC-365mfc) |
| • (VMS) | • chlorofluoromethane (HCFC-31) |
| • tetrachloroethylene (perchloroethylene) | • 1,2-dichloro-1,1,2-trifluoroethane (HCFC-123a) |
| | • 1 chloro-1-fluoroethane (HCFC-151a) |

“Why should we tolerate a diet of weak poisons, a home in insipid surroundings, a circle of acquaintances who are not quite our enemies, the noise of motors with just enough relief to prevent insanity? Who would want to live in a world which is just not quite fatal?”

Rachel Carson, Silent Spring

ACCEPTABLE DOCUMENTATION

See *Documentation Requirements* for all approved options.

Letters

Letters from a manufacturer stating that a product does not contain Red List ingredients are not typically acceptable. A productive conversation about product chemistry is facilitated by an open exchange about what ingredients are actually in building materials rather than blanket statements about what is not. The first step towards a transparent materials economy is a complete assessment of a product's chemistry.

Teams may use letters to confirm a product is Red List compliant if the letter contains a full ingredients list or if they cannot find other products on the market that are willing to be transparent and are therefore using Exception I10-E4 Proprietary Ingredients.

Ingredients Lists

Documentation must address 100% of ingredients. To simplify the documentation for the team, manufacturers should be encouraged to join Declare.

If the ingredients list:

- Describes ingredients as “mixture”, the team must request specific Chemistry Abstract Services (CAS) numbers for that “mixture”
- Uses a percentage range for quantities (i.e. 40-55%), the team must use the lowest percentages or contact the manufacturer to confirm 100% accounting of ingredients.
- Lists less than 100% of the ingredients, the team must get written confirmation from the manufacturer that 100% of the product is Red List free and must use Exception I10-E4, Proprietary Ingredients

Case Study

The Bullitt Center
Seattle, Washington
Undergoing Preliminary LBC Audit

INDUSTRY TRANSFORMATION

The project team for the Bullitt Center specified Prosoco's R-Guard FastFlash® system as an air and water barrier in the project's rainscreen assembly as a key component in their Net Zero Energy strategy. When they contacted Prosoco about their product formulation, the manufacture revealed that the product contained phthalates, persistent bio-accumulative reproductive toxins that appear on the Red List. When the Bullitt Center project team explained that they would not use a product containing phthalates, Prosoco developed a Red List-free replacement. They partnered with a local company, Building Envelope Innovations, to conduct performance testing just in time to be specified on the project. Prosoco subsequently removed phthalates from all of its FastFlash® products, and adopted the Red List as a framework to eliminate toxic ingredients across their product lines.

MATERIALS LIST TRANSPARENCY

In the spirit of transparency and collaboration, the materials lists for all Certified projects will be posted on the project team resources page that is accessible to active project team members only. *See Resources.*

This will ensure that each successive project can build upon the pioneering work of preceding project teams and that the Living Building Challenge community can work together to transform the market for transparent ingredients and healthy products.

Project team materials lists are offered a resource to assist teams in materials research and specification; however, please note:

- The lists themselves cannot be used for materials documentation. Project teams must independently confirm all materials ingredients.
- Each team must conduct their own research and collect their own ingredient documentation for each material.
- Declare (declareproducts.com) is the only official database of compliant building materials that fully addresses the Basic Documentation requirements.
- Some materials may be compliant only through an Exception that requires advocacy or other Exception Documentation.

We encourage project teams to take advantage of these lists to reach out to companies in a coordinated effort, advocating for them to join Declare and drive forward the transparency movement.

DECLARE

Declare is a “nutrition label” and online database for building materials. Declare labels clearly indicate whether a product is LBC compliant and which Exceptions apply, if any. Sending manufacturers the Declare Product Declaration Form and asking them to supply an ingredients list using that reporting format will facilitate each team’s research process and collectively build demand for product transparency.

C2C, HPD AND PHAROS

Cradle to Cradle Certified Product Standard (C2C), Health Product Declaration (HPD) and Pharos are resources that project teams can use to research and identify materials that may be Red List compliant. However, additional documentation is usually required.

Cradle to Cradle (C2C)

Products certified under C2C Version 2.1.1 with a Material Health score of Gold or Platinum, and products certified under Version 3.0 with a Material Health score of Bronze, Silver, Gold or Platinum are likely to comply with the Red List because they are inventoried to at least 100pm and C2C uses a similar assessment protocol to the Red List. However, since C2C has no public disclosure requirement, project teams must get written confirmation from the manufacturers that the products do not include any Red List materials/chemicals and request that manufacturers fully disclose ingredients.

Healthy Product Declaration (HPD)

A complete HPD with Full Disclosure of Intentional Ingredients is acceptable product documentation if none of the ingredients are on the Red List. A partially disclosed HPD that only has Full Disclosure of Known Hazards is not acceptable; greater transparency is required, and therefore project teams must request full disclosure of ingredients and written confirmation that the product does not include any Red List ingredients.

Pharos

Some products in the Pharos database have incomplete ingredients lists and/or do not have complete participation from manufacturers. Teams must follow up with manufacturers to compile and confirm complete ingredients lists.

UNINTENTIONAL TRACE AMOUNTS

There are instances when a Red List ingredient is present in a product because it naturally occurs in the product's raw materials or was unintentionally added through certain manufacturing or reclamation processes. Therefore, as a general rule, products should have "no intentionally added" Red List ingredients. Intentionally added ingredients are defined as each discrete chemical, polymer, metal, bio-based material or other substance, added to the product by the manufacturer or suppliers, that exists in the product as delivered for final use. Although trace amounts of unintentional ingredients are allowed, a full list of all intentionally added ingredients is still required. The following products are known to fall under this Clarification:

Unintentional Trace Amounts

- Recycled steel
- Galvanized metal
- Portland cement
- Fly ash
- Magnesium oxide board
- Paint

Trace Amounts from Manufacturing

- Clay
- Minerals
- Wood
- Gypsum

HALOGENATED FLAME RETARDANTS (HFRS)

HFRs include PBDE, TBBPA, HBCD, Deca-BDE, TCPP, TCEP, Dechlorane Plus and other retardants with bromine or chlorine. Boron is not an HFR and is allowed. Many products, including virtually all foam insulations, contain HFRs.

HYDROFLUOROCARBONS (HFCs) VERSUS HYDROCHLOROFLUOROCARBONS (HCFCs)

Hydrofluorocarbons (HFCs) are not on the Living Building Challenge Red List, except as banned solvents in wet-applied products as defined above. Hydrochlorofluorocarbons (HCFCs) are on the Living Building Challenge Red List because they not only have a high global warming potential, but also contribute to the destruction of the ozone layer.

Case Study

Natural Resource Defense Council Midwest Office

Chicago, Illinois

Certified Petal

MATERIAL RESEARCH PROCESS

The Midwest offices of the Natural Resource Defense Council (NRDC) pursued Materials Petal Certification and the Red List Imperative in order to align the project with the organization's environmental mission and create a healthy office environment for the organization's employees. Given a tight budget and aggressive schedule, success depended upon an integrated approach to the research and selection of materials. Knowing that it would not be possible to review all materials in advance of the project, the team set clear guidelines and developed a review process that played to the strengths of each team member.

The project team drafted specification documents that legally obligated the contractor to meet LBC requirements and provided training for the general contractor and all subcontractors to ensure they understood the Standard. Even with an aggressive schedule they were able to achieve Certification on time and within budget. The NRDC has now committed to pursuing LBC certification for all of their future tenant improvement projects, including the second registered LBC project in China, the NRDC Beijing Office.

METALS

Metals that have a standardized CAS number, such as steel, mild stainless steel and aluminum, do not need an additional ingredients list for the constituent alloys. An ingredients list for coatings is still required.

POLYETHELENES AND POLYOLEFINS

Polyethelene, including Medium Density Polyethelene (MDPE), Low Density Polyethylene (LDPE), Linear Low Density Polyethylene (LLDPE), and High Density Polyethelene (HDPE), is allowed under the Red List. Polyolefins such as Polypropelene (PP) and Polybutene (PB), and Polyolefin Elastomers such as Ethylene Propylene (EPM rubber) and Ethylene Propylene Diene Monomer (EPDM rubber) are also allowed.

Chlorinated Polyethylene (CPE) and Chlorosulfonated Polyethylene (CSPE) are not allowed since their manufacture produces dioxin, a persistent bio-accumulative toxic chemical.

SYSTEMS FURNITURE

Office systems furniture must meet the Red List.

FREESTANDING FURNITURE AND EQUIPMENT (FF&E)

Furniture, fixtures or other equipment that has no permanent connection to the structure of a building or utilities and is not part of the systems furniture does not need to be tracked for Red List. This includes all residential furniture and discrete elements for offices such as occasional tables and chairs, area rugs, couches, and office printers not included in systems furniture.

RECYCLED MATERIALS

Products and materials with recycled content are encouraged, but cannot have Red List materials as a primary ingredient, or create a market for a Red List material. For example, if a product is dependent on the properties of a Red List ingredient (such as HFRs or PVC) and could not be produced without that ingredient, then it should not be used. A recycled content product with a Red List ingredient can be used if the Red List ingredient is:

- unintentionally added to the recycled content product due to it being in the recycled materials
- not a primary ingredient and
- not necessary in the final product

RENOVATION PROJECTS



Red List materials are allowed when they are left in situ in renovations or additions in any Typology.

CFCs and HCFCs in mechanical equipment are not allowed to remain, except in the case of certain Tenant Improvement projects. *See Exception I10-E14 in Specific Exceptions below.*

FORMALDEHYDE

Formaldehyde is a known carcinogen and can cause respiratory problems and allergic reactions even in low concentration in the air. There are multiple types of formaldehyde that are commonly used in building products as a binder. Urea Formaldehyde is the most commonly used binder in composite wood products, but has a high potential to off-gas, affecting indoor air quality. Phenol formaldehyde has the formaldehyde bound much more tightly in the resin and therefore less potential to off-gas, but still has toxicity concerns throughout the chemical's lifecycle. There are specific exceptions for both urea and phenol formaldehyde in limited applications when the alternative has even higher toxicity risk, such as mineral wool insulation or there are no alternatives available on the market, such as structural composite wood sheet goods.

MISCELLANEOUS HARDWARE AND ACCESSORY PRODUCTS

Miscellaneous hardware, such as nails, screws, bolts, brackets, and small accessory products such as toilet roll holders & robe hooks, outlet covers and junction boxes are not tracked for Red List and do not require an ingredients list or advocacy. Items that are specified to ensure a specific type of product is used (i.e. water stops or expansion joints) do not fall under this Clarification. All such products that are known to be primarily composed of Red List ingredients, such as PVC screws, should be avoided.

EXCEPTIONS

All Exceptions require additional documentation. See *I-10 Exception Documentation Summary Table*.

The Red List currently has two types of Exceptions: General and Specific. Advocacy to remove Red List ingredients is still required for both General and Specific Exceptions, unless noted otherwise.

GENERAL EXCEPTIONS

General Exceptions are broad rulings that apply across materials or project types. They should be reviewed for relevance by all teams that have Red List compliance concerns.

I10-E1 8/2008 General Red List

Items on the Red List are ubiquitous in building products. There may be instances when products do not comply with this Imperative, a compliant, Red List-free alternative cannot be found, the product cannot be designed out of the project and an exception has not yet been established (Specific Exceptions to Red List on page 16). In these instances, teams must also communicate with manufacturers (typically at least three) regarding Red List-compliant products that could replace the non-compliant product and advocate to the selected manufacturer for elimination of the Red List ingredients from their product. Project teams are not required to post General Red List Exception requests to the Dialogue, though they may do so if they are unsure whether a particular material qualifies.

The project team must try to find a compliant product and, if they are not successful, provide Due Diligence Documentation of their effort in the form of correspondence, research results, etc.

Products that have been allowed in specific instances, but which still require a search for an alternative by each project team are:

- Fire Hose Reels
- Resilient Wedge Gate Valve With Epoxy Coating

I10-E2 5/2013 Small Electrical Components

Complex electrical or data products that are made up entirely of small electrical components, such as fire alarms, meters, sensors, thermostats and load break switches, do not need to be tracked for Red List. Instead, these products must meet the European Union's Restriction of the Use of Certain Hazardous Substances (RoHS) Directive, which establishes the following maximum concentration values for toxic chemicals tolerated by weight in homogeneous materials:

- Lead (0.1 %)
- Mercury (0.1 %)
- Cadmium (0.01 %)
- Hexavalent chromium (0.1 %)
- Polybrominated biphenyls (PBB) (0.1 %)
- Polybrominated diphenyl ethers (PBDE) (0.1 %)

Large electrical equipment, such as a PV panel, is not considered a small electrical component, but may be partially comprised of small electrical components. Project teams must still gather supporting data for the equipment housing and other major components, such as glass.

I10-E3 4/2010 **Small Mechanical Components**

Small components within complex mechanical equipment do not need to be tracked for Red List. A small mechanical component must be part of a complex mechanical product with at least 10 parts, and be no more than 10% of the total assembly by weight and volume. Examples include small gaskets or valves within mechanical products such as HVAC equipment, pumps or composting toilet systems.

Large mechanical equipment, such as HRVs, heat pumps, water treatment systems, etc., are not considered small components but may have small components in them.

Project Teams must still gather supporting data for the mechanical equipment housing and other major components.

I10-E4 9/2012 **Proprietary Ingredients**

Due to market realities, manufacturers are typically allowed to withhold either:

- One proprietary or second-tier supplied ingredient in any percentage; or
- Multiple ingredients if they add up to less than 1% of the product by both weight and volume.

If the percentage of ingredients that a manufacturer is withholding as proprietary exceeds those allowances and the product cannot be avoided in the project, the manufacturer must confirm in writing that the product is Red List-compliant, and state the total percentage being withheld.

An ingredients list of non-proprietary ingredients is still required for I10-2 Supporting Data.

HPDs with Full Disclosure of Known Hazards can be used as documentation for this Exception only if none of the proprietary ingredients are assessed as GreenScreen V1.2 Benchmark 1 Hazards. HPDs with Full Disclosure of Known Hazards are not acceptable as Basic Documentation.

I10-E5 3/2009 **Red List and Code**

Red List materials are allowed when they are mandated by code (such as PVC piping) and the team is unable to get a variance. The team must propose an alternative solution to the Authority Having Jurisdiction (AHJ) and, if that alternative is rejected, advocate to the AHJ or other mandating authority (i.e. the National Fire Protection Association) regarding the toxicity of the Red List materials and requesting for a change in the requirement. The project team must provide:

- The request for a variance and the official AHJ response to that request to document due diligence
- An official statement of the policy or code that conflicts with Imperative requirements
- Advocacy to the AHJ or other mandating authority to change their policy or code

Advocacy to the manufacturer of the Red List product is not required.

SPECIFIC EXCEPTIONS

Specific Exceptions are specific to a Red List ingredient and/or building material and are based on the limited availability of Red List-compliant options. Because the lack of options is well established, searching for Red List-compliant products for these Exceptions is not required in most cases. However, some research is encouraged since the market is always evolving.

I10-E6 9/2013 Glass-Mat Gypsum Sheathing

A small amount of formaldehyde is allowed in glass-mat gypsum sheathing products. Glass-mat decking is not included in this Exception since it is available without formaldehyde.

I10-E7 2/2009 Solar Battery Systems

Some lead is allowed in solar battery systems.

I10-E8 1/2009 Door Hardware

Some lead is allowed in door hardware. Steel hardware and salvaged materials should be given preference when possible. Note that lead is added to brass to assist with the ease of casting/machining. Lead-free and low-lead grade brass alloys are available, but are not yet typically used in architectural hardware applications.

I10-E9 3/2013 Phenol Formaldehyde in Mineral Wool Insulation

Phenol formaldehyde is allowed in rigid mineral wool insulation for exterior applications (such as rain screen assemblies or foundation insulation).

While rigid mineral wool insulation does contain some formaldehyde, most of the formaldehyde is eliminated in the production process through a chemical reaction and high heat. Rigid mineral wool insulation installed on the exterior of the building possess less risk to humans and ecosystem than rigid foam insulation products, which almost always contain HFRs and use blowing agents with high global warming potential.

I10-E10 8/2008 Structural Composite Wood Members

Added phenol formaldehyde is allowed in composite structural members, such as glulam beams.

I10-E11 1/2009 Composite Wood Sheet Goods

Structural composite wood sheet goods and substrates for systems furniture may have added phenol formaldehyde (no urea formaldehyde). Door-rail joints may contain urea formaldehyde

Composite wood sheet goods used for non-structural purposes, such as for casework, trim, and door cores, are not included in this Exception and may not have any added formaldehyde.

I10-E12 9/2010 HFRs in Foam Insulation

Foam insulation with HFRs are allowed in the following applications where space is limited and alternative products either cannot provide the required R-value performance and/or are required by code.

- Structural Insulated Panels (SIPS)
- Insulation in hollow metal doors
- Spray insulation for renovation projects
- Under slab insulation
- Roof and exterior insulation

Foam insulation in these cases must still meet all other Red List requirements.

Foam insulation is not allowed in cavity-fill applications where many alternative Red List-compliant options are on the market without HFRs.

I10-E13 6/2012 Mercury in UV Disinfection Lamps

Mercury is allowed in UV filtration lamps for projects that pursue the Water Petal if no other acceptable non-chemical filtration methods can be identified.

I10-E14 10/2012 Tenant Improvement (TI) Projects with HCFCs

Small tenant improvement projects are exempt from the requirement to retrofit or replace an existing mechanical system that uses HCFCs for a Red List-compliant system, if the tenant space project floor area makes up less than 25% of the area serviced by the existing chiller. Any additional equipment installed for the project must comply with Imperative requirements. Teams must advocate for the replacement of the non-compliant HVAC unit with the building owner and provide drawings confirming the area served by the unit in question.

I10-E15 10/2013 PVC Wire in Residential Projects

PVC electrical wire, such as Romex, is allowed in residential applications since this is the only wire currently allowed by the National Electrical Code (NEC) to be installed without conduit. Teams are encouraged but not required to use PVC-free wires in conduit, such as XHHW, or HFR-free alternatives, like Low Smoke Zero Halogen (LSZH) wire.

I10-E16 10/2013 HFRs in Non-PVC Wiring (Non-Residential Projects):

Halogenated Flame Retardants (HFRs) are allowed in non-PVC electrical wiring, such as XHHW cables, due to National Electrical Code (NEC) requirements. Teams are encouraged but not required to use HFR-free alternatives, like Low Smoke Zero Halogen (LSZH) wire. Commercial buildings are not allowed to use PVC wire unless the team can document that it is a specific requirement in the project's jurisdiction.

Non-PVC LSZH cables are required for all data cable applications since these products are currently readily available on the market.

I10-E17 8/2011 Plumbing

Low levels of lead are allowed in plumbing pipes and fixtures provided they meet the Federal Definition of "Lead-Free" as defined in S. 3874 (111th): Reduction of Lead in Drinking Water Act, effective January 1, 2014.

I10-E18 8/2011 Commercial Water Systems

Commercial water systems that don't connect to potable water (i.e., sprinklers, roof drains, backflow preventers), are allowed to meet a higher lead content than potable water systems, if alternatives are not found or not allowed by code.

Specific Exceptions to Red List

Formaldehyde	I10-E10 8/2008	Structural composite wood	Phenol formaldehyde is allowed; Urea formaldehyde is allowed in finger joints
	I10-E11 1/2009	Composite wood sheet goods	Phenol formaldehyde allowed in structural composite wood sheet goods
	I10-E9 3/2013	Mineral wool insulation	Phenol formaldehyde allowed in mineral wool insulation
Halogenated Flame Retardants	I10-E12 9/2010	Spray foam insulation	In renovation projects and applications where alternatives cannot meet required R-value performance
	I10-E12 9/2010	SIPS	
	I10-E12	Under slab insulation, exterior and roof insulation	When required by code or alternatives cannot meet required R-value performance
	I10-E12	Hollow metal doors	When required by code
Hydrochloro-fluorocarbons (HCFCs)	I10-E14 10/2012	Tenant Improvements	When space is <25% of existing chiller floor area
Lead: added	I10-E7 2/2009	Solar battery systems	
	I10-E8 1/2009	Door hardware	
	I10-E17 2/2009	Plumbing	See Exceptions
	I10-E18 8/2011	Commercial water systems	See Exceptions
Mercury	I10-E13 11/2010	Mercury in UV disinfection lamps	Traces of mercury in UV disinfection equipment
Polyvinyl Chloride (PVC)	I10-E3 4/2010	Irrigation valves and fittings	Considered small components
	I10-E5 3/2009	When code mandated (i.e., wiring or piping)	Exception expanded to other materials
	I10-E23	PVC residential wiring	PVC wiring is allowed in residential applications

SCALE JUMPING

Not applicable.

DOCUMENTATION REQUIREMENTS**BASIC DOCUMENTATION**

All projects require all Basic Documentation, unless noted otherwise.

I10-1**Materials Tracking Table**

The Materials Tracking Table must be completed and provided in sortable Excel format. A template is available to registered projects on the project team resources page. See *Resources*.

I10-2**Supporting Data**

Supporting data is required for each product. Acceptable documentation must include one of the following, confirming no Red List chemicals are present (see *Acceptable Documentation under Clarifications*):

- Living Building Challenge Compliant or Red List Free Declare ID number
- Health Product Declarations with Full Disclosure of all Intentional Added Ingredients
- Complete Material Safety Data Sheet (MSDS)

- Complete Globally Harmonized System Safety Data Sheet (GHS SDS),
- Complete manufacturer-supplied ingredient list

I10-3**Wet-Applied Product VOC data**

Manufacturer-supplied VOC content data:

- Declare Label with VOC disclosure
- Health Product Declaration (HPD) with VOC disclosure
- MSDS or GHS SDS with VOC data
- Image of VOC content on product label
- Signed statement of compliance and VOC content disclosure from manufacturer

EXCEPTION DOCUMENTATION

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

I-10 Exception Documentation Summary Table

EXCEPTION		I10-a Due Diligence Documentation	I10-b Technical Docs	I10-c Advocacy Letter	I10-d Manufacturer Letter
I10-E1	General Red List	x		x	
I10-E2-E3	Various Small Components			x	
I10-E4	Proprietary Ingredients			x	x
I10-E5	Red List and Code	x	x	x	
I10-E6-E13	Various			x	
I10-E14	HCFCs in TIs		x	x	
I10-E15	PVC Wire in Residential			x	x
I10-E16	HFRs in Non-PVC Wiring		x	x	
I10-E17-E18	Various			x	

I10-a**Due Diligence Documentation**

Documents demonstrating genuine effort to exclude Red List products.

Communications must include requests to the parties supplying, and/or requiring the non-compliant material, as well as the response from those parties.

I10-b**Technical Documentation**

Legal, economic or contract documents that verify Exception requirements have been met, including:

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

I10-c**Advocacy Letter**

A letter to the entity that provides or requires Red List products advocating for the elimination of Red List materials.

Advocacy is required for all non-compliant products that are part of a Living Building Challenge project, including those addressed in Specific Exceptions. There are two types of advocacy letters:

- Letters to the AHJ that requires Red List products be used, requesting the policy be changed
- Letters to the manufacturer providing the code-required but non-compliant material, requesting a Red List-compliant alternative

Only one type of letter is required for any given Exception, unless noted otherwise. Sample letter templates are posted on the project team resource page. *See Resources.*

I10-c**Manufacturer Letter**

A letter from a manufacturer confirming information that is not otherwise available, such as a letter confirming there are no Red List materials in proprietary ingredients.

DEFINITIONS**Freestanding Furniture and Equipment (FF&E)**

Furniture, fixtures or other equipment that has no permanent connection to the structure of a building or utilities and is not part of office systems furniture.

Salvaged Materials

Used building materials that can be repurposed wholly in their current form or with slight refurbishment or alterations.

Small Mechanical Component

Part of a complex mechanical product composed of at least 10 parts that is no more than 10% of the total product assembly by weight and volume.

Systems Furniture

A modular furniture system that might include work surfaces, cabinetry, file systems, flexible partitions and office chairs to create or furnish a series of office workspaces.

RESOURCES**TEAM RESOURCES****CAS Registry Numbers List**

A list of specific Chemical Abstracts Service Registry Numbers for the general chemical groups on the Red List is posted on the project team resource page.

Declare

A voluntary product labeling program where manufacturers disclose ingredients and source location of their products.

declareproducts.com

Project Team Resources Page

Resources for all registered project teams including publicly available materials lists.

living-future.org/lbc/project-team-resources

GENERAL INFORMATION

Building Green

A research tool for Green Design that includes Greenspec, a database of healthy building materials.

buildinggreen.com

EPA Action Plan Published List

The United State Environmental Protection Agency list of hazardous chemicals with a published action plan to address health concerns.

epa.gov/oppt/existingchemicals/pubs/ecactionpln.html

European Union's Restriction of the Use of Certain Hazardous Substances (RoHS) Directive

The European Union regulation on the use of hazardous substances in electrical and electronic equipment.

eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:174:0088:0110:en:PDF

Green Ideas Green Action (GIGA)

Database of green building materials in China.

gigabase.org/

Health Product Declaration

Standard reporting format for product ingredients and identification of health hazards.

hpdcollaborative.org/

GreenWizard

Greenwizard is a online interactive product library of building materials and project management tools to identify, compare and evaluate building materials.

greenwizard.com

Pharos

A chemical and materials database and research tool that allows side-by-side comparison of products and chemical formulations.

pharosproject.net

REACH

The European Community regulation on chemicals and their safe use.

ec.europa.eu

CASE STUDY EXAMPLES

Midwest Offices, Natural Resource Defense Council, Case Study

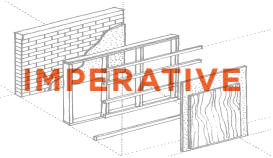
living-future.org/case-study/nrdchicagooffice

Bechtel Environmental Classroom

living-future.org/case-study/bechtelenvironmentalclassroom

MATERIALS

EMBODIED CARBON FOOTPRINT



11

BUILDING



RENOVATION



LANDSCAPE + INFRASTRUCTURE



SCALE JUMPING PERMITTED

Omega Institute, Rhinebeck, NY
Living Certification - Living Building Challenge 1.3
Photo: Farshid Assassi / Courtesy: BNIM Architects



INTENT

To minimize projects' embodied carbon through design as well as to offset projects' climate change-related construction impacts.

REQUIREMENTS

The project must account for the total embodied carbon (tCO₂e) impact from its construction through a one-time carbon offset in the Institute's new Living Future Carbon Exchange or an approved carbon offset provider.

CHANGES IN 3.0

Revised list of approved calculators to provide more useful tools to reduce a project's embodied carbon.

Teams have the option to use the Living Future Carbon Exchange program.

CLARIFICATIONS

COMPLIANCE

To meet this Imperative, project teams must incorporate carbon reduction strategies in the design phase. The project team must then purchase Certified Emission Reductions (CERs), carbon offsets through the Institute's new Living Future Carbon Exchange, or an acceptable, 3rd-party-verified program to offset 100% of the final project's construction-based carbon contribution.

FINAL CARBON ANALYSIS

Project teams must determine the estimated footprint of the final design to determine the amount of carbon offsets that must be purchased.

CALCULATION REQUIREMENTS

Calculations must include total embodied carbon (tCO₂e) from construction materials and processes. The carbon "cost" of all project renewable energy systems must also be included in the calculation.

Renewable Energy Systems

If the calculator used does not explicitly include the embodied carbon of renewable energy systems, the team must separate out the embodied carbon of their renewable energy system and add it to the total. Unless there is more accurate information available from the panel manufacturer or a relevant database, photovoltaic panels should be calculated using the standard embodied carbon conversions below:

- Monocrystalline 242 Carbon kg CO₂ per m²
- Polycrystalline 208 Carbon kg CO₂ per m²
- Thin film 67 Carbon kg CO₂ per m²

Offsets through design

On-site activities, such as the installation of renewable energy systems, planting native landscapes, etc., may not be applied to reduce the calculated embodied carbon footprint of the project as it relates to fulfilling this Imperative. Any sections in available calculators that offer opportunities to account for such project elements should be left blank for the purpose of determining the amount of carbon offsets required.

Lifespan

All projects should use a standard 50-year lifespan when calculating embodied carbon for consistency and to ensure buildings with longer lifespans are not penalized for replacement of materials over time.

LIVING FUTURE CARBON EXCHANGE™

The Institute now operates a Living Future Carbon Exchange program. The Institute aggregates and then directly funds renewable energy projects for worthwhile social organizations, creating a high value carbon offset with positive social co-benefits.

ACCEPTABLE CARBON CALCULATORS

The Institute has identified the following six carbon calculators which range in complexity for use by project teams.

Athena EcoCalculator

calculatelca.com/software/ecocalculator/

Free simple easy to use spreadsheet tool that provides general information about the impact of design based upon pre-defined assembly and envelope configurations by inputting square footages.

Athena Impact Estimator

calculatelca.com/software/impact-estimator/

The tool is a more sophisticated version of the EcoCalculator that allows users to create their own assemblies and envelope configurations and allows flexibility for complex designs and existing buildings.

Environment Agency's Carbon Calculator for Construction Activities

environmentagency.gov.uk/business/sectors/136252.aspx

Free downloadable spreadsheet tool that requires detailed material information such as weight of material, distance traveled and type of transportation.

Case Study

Phipps Center for Sustainable Landscapes
Pittsburgh, Pennsylvania
Completed Preliminary Audit; NZEB Certified

EMBODIED CARBON THROUGH LCA

The Phipps Center was the subject of an in-depth embodied carbon analysis conducted by the University of Pittsburgh. The report concludes that the embodied carbon content of the Phipps Center for Sustainable Landscapes is nearly equal, per square foot, to that of standard commercial construction. This achievement defies the conclusion of several peer-reviewed studies that high-performance building generally entails higher embodied carbon. Notably, the photovoltaic array and inverters account for fully 49% of the total embodied carbon, making this achievement all the more impressive.

The Phipps project employed a 40% fly ash replacement for Portland cement, which resulted in a 25% reduction in embodied carbon for cement—one of the biggest drivers of embodied carbon. This project demonstrates that you can achieve high environmental performance and renewable system integration without a significant increase in embodied carbon.

eTool**etool.net.au**

Free web-based calculator with a user friendly interface that can either use predefined assemblies or allow the user to create their own. Based upon Australian product data.

The Footprint Company**footprintcompany.com.au/**

Complex analysis tool that requires a registration fee. In addition to a standard lifecycle analysis (LCA) portal, this calculator uses a hybrid life cycle analysis (HLCA) that uses the quantities of materials combined with the carbon intensity of materials or the monetary value and the overall carbon intensity of economic output.

Tally**prweb.com/releases/tally/application/prweb11282923.htm**

A Life Cycle Analysis (LCA) application for Autodesk® Revit® that allows you to calculate the environmental impacts of building materials and compare options directly within a Revit® model.

Other Options

Project teams may use a carbon calculator that is not listed above if it meets the outlined Calculation Requirements and is approved through the Dialogue as comparable to at least one of the listed calculators, prior to the team purchasing offsets.

IN-DEPTH CARBON ANALYSIS

A team may also hire a Life Cycle Analysis (LCA) consultant to conduct an in-depth carbon analysis at least as rigorous as the calculators listed above and following the calculation requirements.

PURCHASING CARBON OFFSETS

Carbon offsets must be certified by Green-e Climate (green-e.org), or an equivalent program. Other certification programs must be submitted to the Dialogue for approval.

To ensure real, verifiable, and long-term carbon emission reductions while encouraging the expansion of clean energy, carbon offsets must be demonstrated to be sourced from either:

- Renewable energy projects
- or
- Landfill gas-to-energy projects where the methane would otherwise be released in the atmosphere

Hydroelectric and nuclear power options are not acceptable renewable energy projects for the Challenge.

Third-Party Certification

Third-party certification guarantees that stringent criteria are met regarding the creation and quality of the carbon offset and oversight of the retail transaction. Project-level assurances for additionality, performance, and transparency include ensuring that:

- The project adheres to documented methodologies that guarantee the permanent reduction of greenhouse gas emissions.
- Project details are reported and verified.
- The project has been examined and validated by a third-party investigator.

Retail-level assurances for uniqueness and transparency include:

- An independent verification audit of the carbon offset provider to ensure exclusive retail delivery and guarantee against the double-counting of offsets
- and
- An independent evaluation of the carbon offset provider for truth in marketing

The retirement of an eligible carbon offset credit in a registry is not considered equivalent to a carbon offset certification program such as the Green-e Climate certification program. Approved certification programs, in addition to retirement, must include an audit of the entire chain of custody of the offset including the retail transaction.

CERS, VERS & RECS

Only Certified Emission Reduction (CER) and Verified Emission Reduction (VER) carbon credits are suitable for purchase; Renewable Energy Certificates (RECs) are not acceptable.

Carbon Offsets may be generated anywhere in the world; offsets do not have to be local, although local solutions are encouraged if they meet the program requirements.

EXCEPTIONS

All Exceptions require additional documentation. *See I-11 Exception Documentation Summary Table.*

I11-E1 8/2008 Renovation Offset Reduction

The amount of carbon offsets required may be reduced by up to 50% for projects that are registered under the Renovation typology. Project teams need to demonstrate that the percentage of reduction is appropriate based on the extent of project work and the calculator selected.

SCALE JUMPING

This Imperative by its nature jumps beyond the Project Boundary for compliance.

Scale Jumping for this Imperative also allows the project to be part of a large offset purchase by the owner or a third party, as long as the project is specifically addressed in the offset calculation.

By the time the design for most human artifacts is completed but before they have actually been built, about 80-90 percent of their life cycle economic and ecological costs have already been made inevitable.

Joseph Romm

DOCUMENTATION REQUIREMENTS

BASIC DOCUMENTATION

All projects require all Basic Documentation, unless noted otherwise.

- I11-1

Carbon Calculations

The input to and results from the selected carbon calculator showing TCO2e for the project or an in-depth report outlining the methodologies, scope and findings of the professional analysis of embodied carbon life cycle.
- I11-2

Carbon Offset Receipts

Receipt from the Living Future Carbon Exchange or other carbon offset program as proof of purchase.
- I11-3

Optional Carbon Reduction Narrative

A one to two page narrative addressing:

 - The process and findings from the initial carbon analysis
 - The specific strategies employed by the project team to reduce embodied carbon

EXCEPTION DOCUMENTATION

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

I-11 Exception Documentation Summary Table

EXCEPTION		I11-a Exception Narrative
I11-E1	Renovation Offset Reduction	x

- I11-a

Exception Narrative

Description of the calculation methodology and carbon reduction percentage based upon calculator used and extent of work for the project.

DEFINITIONS

Additionality

The principal that money directed to a certain cause must add capacity to that cause, not be a credit for existing systems. For this imperative, carbon reduction purchases must have additionality; they must add capacity for additional renewable energy production and environmental benefit.

Certified Emission Reduction (CER)

A carbon credit that equals the reduction of 1 ton of CO₂ based on capacity of proposed infrastructure projects that generate long-term beneficial impacts through the reduction of greenhouse gases. Also known as a Verified Emission Reduction (VER).

Life Cycle Analysis (LCA)

A technique to assess environmental impacts associated with all the stages of a product's life cycle (i.e., from raw material extraction through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling).

Renewable Energy Certificates (REC)

Energy commodities that can be sold, traded or bartered in the market and represent the generation of 1,000 kWh based on units of energy generated from renewable power systems already in place.

RESOURCES

PROVIDERS

Living Future Exchange

<http://living-future.org/exchange>

Green-e Climate Certified Carbon Offset Providers

green-e.org/getcert_ghg_products.shtml

GENERAL INFORMATION

Methodological Tool for the Demonstration and Assessment of Additionality

cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf

Making Sense of the Voluntary Carbon Market: A Comparison of Carbon Offset Standards,” Stockholm Environment Institute

panda.org/about_our_earth/all_publications/?126700/A-Comparison-of-Carbon-Offset-Standards-Making-Sense-of-the-Voluntary-Carbon-Market

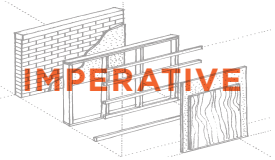
CASE STUDIES

A Materials Life Cycle Assessment of a Net-Zero Energy Building, Phipps Center for Sustainable Landscapes

mdpi.com/1996-1073/6/2/1125

MATERIALS

RESPONSIBLE INDUSTRY



12

BUILDING



RENOVATION



LANDSCAPE + INFRASTRUCTURE



INTENT

To reduce the damaging environmental and social impacts related to industries that rely on natural resource extraction and plant cultivation.

REQUIREMENTS

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 on-site for the purpose of clearing the area for construction or restoring/maintaining the continued ecological function of the on-site bionetwork.

All projects must use—at a minimum—one Declare product for every 500 square meters of gross building area and must send Declare program information to at least 10 manufacturers not currently using Declare.

CHANGES IN 3.0

Projects must include one Declare product per 500 square meters of gross building area.

Projects must send Declare program information to 10 manufacturers.

Case Study

Potomac Watershed Study Complex

Accokeek, Maryland

Registered LBC Project

DECLARE ADVOCACY

The Potomac Watershed Study Complex's project team not only worked closely with manufacturers to identify Red List Compliant products; they also encouraged the manufacturers to sign up for Declare so that future projects might benefit from their advocacy. For instance, the project team's collaboration with Knauf Insulation yielded a notable success. Because Knauf had previously reformulated all of their fiberglass insulation to use a formaldehyde-free, bio-based binder, the project team contacted them early in the design process to inquire if their product was Red List Free. This inquiry prompted Knauf's sustainability team to conduct an in-depth analysis of their products, and subsequently to list their entire fiberglass insulation product line in the Declare database so that they can easily be sourced for future LBC projects. They are now working to eliminate Red List ingredients from all of their products. Knauf is also using this opportunity to improve other critical environmental attributes of their products. Knauf is now lobbying state legislatures to establish glass bottle recycling programs to serve as a sustainable recycled material feedstock for their fiberglass insulation.

CLARIFICATIONS

INDUSTRY ADVOCACY

Currently, only the timber industry has established third-party certified standards for sustainable resource extraction and fair labor practices.

For those industries that do not yet have standards in place, the project team must send one advocacy letter per industry sector to the corresponding National Trade Association or ASTM International, encouraging the development and enforcement of independent, third-party standards that are not funded by the industry being regulated.

Sample letter templates are posted online on the project team resources page. See *Resources*.

DECLARE

Transparency is fundamental to the development of responsible industry practices. Declare labels provide transparent information about building materials ingredients and specific toxicity concerns as well as raw material sourcing location information to better inform a discussion of sustainable resource extraction and management.

EXISTING BUILDINGS

Wood in-situ in existing buildings that are undergoing renovation does not need to be FSC Certified.

SALVAGED WOOD

Salvaged wood does not need to be FSC Certified, but does need to be documented as salvaged.

DOWN & DEAD TREES

Down and dead trees are not considered salvaged. Salvaged wood has already been extracted from the forest and used for some purpose. Use of down and dead trees from the owner's property may be acceptable on a case-by-case basis.

CHAIN OF CUSTODY

A chain of custody, or COC, is required for the millwork shop, as well as for any operation that manufactures or processes the timber product. Brokers or agents, who take neither physical nor legal possession of the products, and retailers, who sell FSC products to end consumers, do not need to become COC certified. With respect to retailers, "product" refers to an item that will not undergo any further modification prior to arriving on the project site.

RENTED FORMWORK

Rented formwork may be considered a salvaged wood product if it was used on another project prior to being used on the current project. The project pursuing certification may not be the first instance of use for the rented formwork to be considered salvage. In that instance, the formwork would need to be FSC certified.

FOREST STEWARDSHIP COUNCIL (FSC) MIXED SOURCE

The Institute recognizes that, depending on the product category, FSC-Mixed may be the only option available for new, wood-based material. It is acceptable for project teams to specify FSC-Mixed when FSC-100% is not available. Project teams must show due diligence to source FSC-100% where feasible.

EXCEPTIONS

All Exceptions require additional documentation. See *I-12 Exception Documentation Summary Table*.

I12-E1 8/2008 Intentional Harvest

On-site timber harvest is allowed if the project team can show that the tree removal was required for construction or as part of a reforestation/ restoration program, and if they can document that the harvest was minimally invasive.

The project team must provide an explanation about why tree removal was required for construction or necessary as part of a reforestation/restoration program, as well as details of the harvest and milling process to create the finished goods.

I12-E2 1/2013 Pending Forest Stewardship Council (FSC) Certification

To encourage market transformation, wood from entities with pending FSC certification is acceptable if the timber is processed (either harvested or milled, as relevant) after the FSC certification audit has occurred, even if final certification of the mill or forest is still in progress. The FSC certification audit is Step Two in the FSC Steps to Certification, per <http://ic.fsc.org/5-steps-to-certification.36.htm>

I12-E3 8/2008 Invasive Species

Wood that does not carry third-party certification but was sourced from either trees infested with invasive species or trees that are an invasive species and need to be removed to maintain the health of a forest, is allowed. Invasive species Exceptions have strict parameters and require prior approval from the Institute so that they do not unintentionally provide loopholes for unsustainable timber practices to enter Living Building Challenge projects. Three examples of previously granted exceptions are:

Pine Beetle Wood: Due to the sheer scale of infestation by the pine beetle in British Columbia, Canada, harvesting infected timber from this area meets the intent of this Imperative.

Western Juniper: The proliferation of juniper in Oregon, USA, compromises the surrounding ecosystem, and careful extraction of those trees can provide a functional product, an alternative to harvesting healthy trees, and an income source for the local community.

Black Locust: Black locust is native to the Southern Appalachians and the Ozarks but has been planted now in 48 states. It spreads clonally as well as by seed, and its dense thickets have a tendency to crowd out native vegetation. Black locust is a legume, meaning it fixes nitrogen, and sheds more leaves than native trees leading to soils with higher nitrogen and elevated levels of calcium and phosphorus. This aids in the spread of weedy nitrogen loving, non-native plants that can alter patterns of succession.

In states and regions where black locust has been officially identified by a federal or state environmental agency as an invasive species, project teams may selectively harvest the trees to improve the overall ecology and to take advantage of the wood's pest and rot resistant properties.

Project teams must provide:

- An official statement that the targeted species is considered to be invasive or overpopulated in a particular region. The statement must come from a named authoritative body that has made an official assessment, has demonstrated expertise, and does not have a direct commercial interest or other conflict of interest.
- A narrative explaining how harvest practices met the extraction standards of the Forest Stewardship Council and ensured effective collection to limit the spread of the invasive species.
- Photographs to support the narrative.

I12-E4 11/2014 Underwater Salvaged Wood

Underwater salvaged wood is allowed if the salvage company is certified by, or can show they address the applicable provisions of, the Rainforest Alliance Underwater Salvaged Standard, including:

- Permitting & ownership documentation
- A narrative regarding Indigenous people's rights
- Advocacy to the harvester that they certify under the Rainforest Alliance certification system.

SCALE JUMPING

Not applicable.

Case Study

Tyson Living Learning Center
Eureka, Missouri
Certified LBC

INTENTIONAL ON-SITE HARVEST

The Living Learning Center (LLC) is located on the Tyson Research Center, a 2,000-acre forested property that also contains an environmental field station for Washington University in St. Louis. In keeping with the LLC's broader research and teaching mission of ecological sustainability, the project team decided to sustainably harvest lumber from within the Tyson property itself. The oak, walnut, and ash used on the project came from storm-downed or dead trees harvested near roads to minimize disturbance to the ecosystem. Both the eastern red cedar used for the siding and the hard maple laid for the flooring are able to grow in shallow soils only when fire has been suppressed, as it has been for decades at the Tyson Research Center. These species are therefore considered invasive; they were already slated for removal as part of a restoration plan to improve the ecology of the property. This strategy, which aligns well with the regenerative principles of the Living Building Challenge, prompted the LBC team to create an exception allowing the intentional on-site harvest of invasive trees in order to restore damaged ecosystems.

DOCUMENTATION REQUIREMENTS

BASIC DOCUMENTATION

All projects must provide all Basic Documentation, unless noted otherwise.

I12-1

Wood Documentation

Documents correlating wood in the project with FSC, salvaged or intentionally harvested sources, including:

- Receipts referencing FSC-certified wood acquisition and final chain of custody numbers
- Receipts from the seller/broker of all salvaged wood procurements
- An illustrated narrative documenting both why tree removal was required for construction or as part of a reforestation/restoration program, and the milling process to create finished goods

I12-2

Advocacy Letters

Copies of letters written to the National Trade Associations and/or ASTM International requesting third-party standards for the metal, stone and rock industries.

EXCEPTION DOCUMENTATION

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

I-12 Exception Documentation Summary Table

EXCEPTION		I12-a Explanatory Narrative	I12-b Technical Documentation	I12-c Advocacy Letter	I12-d Photographs
I12-E1	Intentional Harvest	x			x
I12-E2	Pending FSC Certification		x		
I12-E3	Invasive Species	x	x		x
I12-E4	Underwater Salvaged Wood	x	x	x	

I12-a

Additional Narrative

Narrative with photos as necessary to show compliance with Exception requirements.

I12-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

I12-c

Advocacy Letter

Letter written to non-certified party advocating certification by the organization listed in Exception requirements.

I12-d

Photographs

Photographs or other graphic documentation verifying that Exception requirements were met.

DEFINITIONS

Invasive Species

A species that is non-native to the ecosystem under consideration and whose introduction harms human or ecosystem health.

Salvaged

Used building materials that can be repurposed wholly in their current form or with slight refurbishment.

RESOURCES

Declare

The ingredients label for building products

declareproducts.com/

FSC

Northwest Natural Resource Group, FSC Labels Explained:

nnrg.org/news-events/news/fsc-label-types-pure-recycled-mixed

FSC Certification Database

Database to find suppliers and verify FSC COC numbers

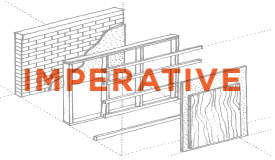
us.fsc.org/fsc-certificate-database.311.htm

To waste, to destroy our natural resources, to skin and exhaust the land instead of using it so as to increase its usefulness, will result in undermining in the days of our children the very prosperity which we ought by right to hand down to them amplified and developed.

Theodore Roosevelt

MATERIALS

LIVING ECONOMY SOURCING



13

BUILDING



RENOVATION



LANDSCAPE + INFRASTRUCTURE



INTENT

To support investment in local economies that stimulates local economic growth, strengthens community ties and development and minimizes environmental impacts associated with transportation of products and people.

REQUIREMENTS

The project must incorporate place-based solutions and contribute to the expansion of a regional economy rooted in sustainable practices, products and services.

Manufacturer location for materials and services must adhere to the following restrictions:

- 20% or more of the materials construction budget must come from within 500 kilometers of construction site.
- An additional 30% of the materials construction budget must come from within 1,000 km of the construction site or closer.
- An additional 25% of the materials construction budget must come from within 5,000 km of the construction site.
- 25% of materials may be sourced from any location.
- Consultants must come from within 2,500 km of the project location.

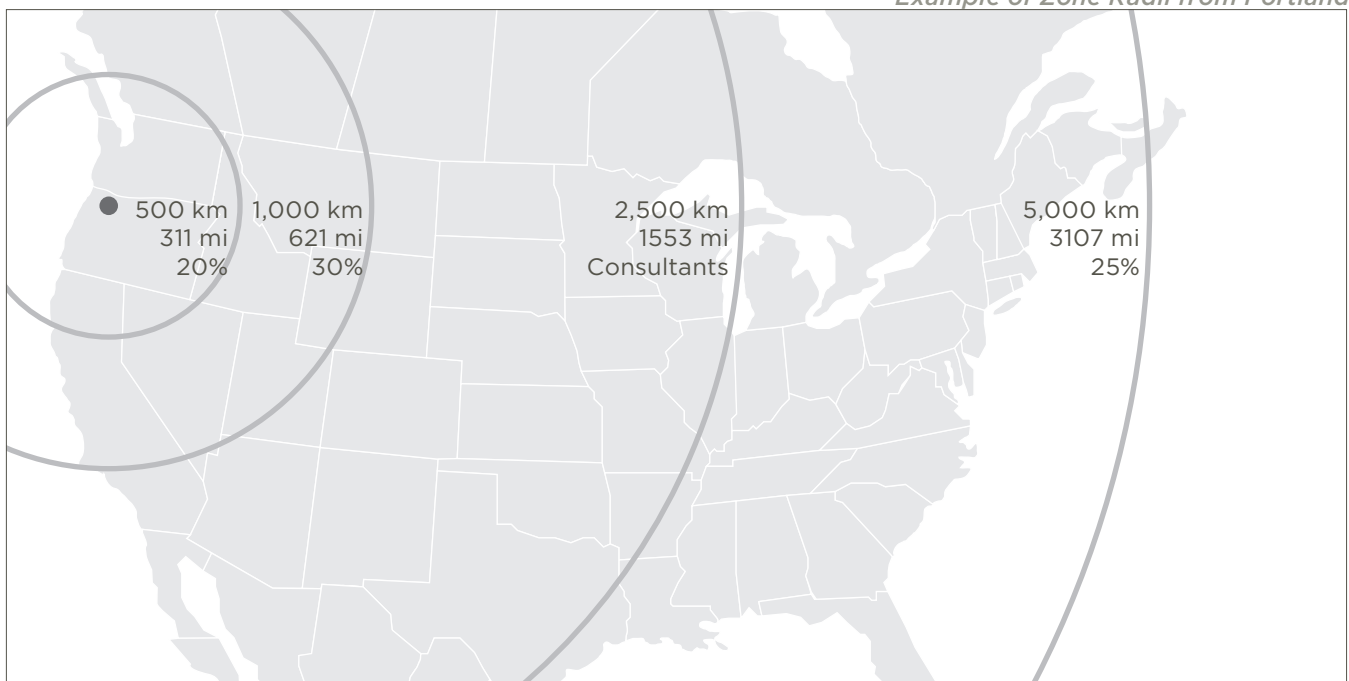
CHANGES IN 3.0

Materials tracking is based on economic impact rather than density or CSI division.

Up to 25% of the project's materials construction budget does not need to be tracked for manufacturer location.

Source location is no longer tracked, unless the raw product goes to the project site.

Example of Zone Radii from Portland



CLARIFICATIONS

MATERIALS CONSTRUCTION BUDGET

The Materials construction budget includes all material costs and excludes, labor, soft costs and land.

SALVAGED MATERIALS

Salvaged materials may be counted at double their material cost.

DECLARE PRODUCTS

Declare products may be counted at double their material cost.

NATURAL MATERIALS

Certain natural materials may include labor in their calculation, such as rammed earth or straw bale construction, where on-site labor accounts for the majority of project cost and materials are extremely low-cost and locally supplied.

The Bullitt Center represents both a milestone for collaboration and a model to drive innovation. Goldfinch Brothers is already working as a glazing subcontractor for two additional Living Building Challenge projects ... and continues to see a growing demand for higher standards of energy efficient envelope design. 100+ year old companies can and should lead in building the clean energy economy and our eyes remain open to new opportunities for our business, our community and solving our climate crisis.

Greg Goldfinch, Owner of Goldfinch Bros., Inc.

Case Study

Bullitt Center Seattle, Washington

Undergoing Preliminary LBC Audit

LOCAL SOURCING

In order to achieve the aggressive energy efficiency targets necessary to meet the Energy Petal, the Bullitt Center's project team had to use extremely efficient windows. Schuco in Germany, which was outside the project's desired sourcing radius, was the only company that produce windows meet the necessary performance requirements. Goldfinch Brothers Inc., the local glazing contractor for the Bullitt Center, was able to work with Schuco to import the manufacturing technology to Washington State in order to produce the window locally. Through this innovative licensing arrangement, the project team was able to procure technology that allowed them to achieve their energy efficiency targets while meeting the sourcing requirements of the Living Building Challenge, supporting the local economy and building regional capacity for advanced green building technology.

SPECIALTY CONSULTANTS

Specialty consultants and subcontractors may travel up to 5,000 kilometers.

CONSULTANT TRAVEL

The maximum distance that may be traveled by major project team members, measured from their primary place of work to the project site, is 2,500 kilometers. Temporary residency within the allowable Zone for the duration of the project meets the intent of this Imperative.

Consultants include all major project team members, such as the general contractor, architect of record, mechanical, electrical, plumbing and structural engineers of record. Specialty consultants and subcontractors are included if they are regular participants and are required to travel regularly to the project site or its vicinity.

MANUFACTURER LOCATION

The manufacturer location is where the final product is fabricated or assembled. A distribution facility does not qualify as a product's manufacturer location.

EXCEPTIONS

None at time of issue.

SCALE JUMPING

Not applicable.

Case Study

Te Wharehau O Tūhoe

Taneatua, New Zealand

Registered Project

LOCAL LIVING ECONOMIES

By commissioning a Living Building for their new tribal authority headquarters, the Ngāi Tūhoe tribe has created an economic, ecological and cultural beacon for restorative design not only for their community but also for the New Zealand construction industry as a whole. The project team's decision to select intensely local, non-toxic and natural materials minimized the project's ecological impact while simultaneously building expertise and capacity in the local community.

The timber used on the project was harvested near the project site from the Urewē'a, a forest that has cultural significance to the Ngāi Tūhoe. The wood was processed by nearby mills, enabling local students from the tribe to receive training and practical experience, inspiring a new generation to become leaders in the engineering and construction fields. The project team arranged a series of public workshops to teach community members the art of making clay bricks from local soils. Over six thousand of the natural bricks produced in these local workshops were incorporated into the project.

DOCUMENTATION REQUIREMENTS

BASIC DOCUMENTATION

All projects must provide all Basic Documentation, unless noted otherwise.

A Materials Tracking Table* that includes cost information must be completed and provided in a sortable Excel format. See *I10-1 Materials Tracking Table*.

*Cost information will be added to the Materials Tracking Table format in 2014. Project teams may be required to provide backup documentation of listed costs.

- | | |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I13-1 | Distance Map
A map showing 500 km, 1000 km, 2500km and 5000 km radii from the site. |
| I13-2 | Project Team Roster
Roster of each organization or individual participant on the Team, including name, role, office location, and proximity to the project site (in kilometers). |
| I13-3 | Supporting Documentation
Documents stating manufacturer location information for each tracked product. Acceptable options include: <ul style="list-style-type: none"> • Declare ID • Manufacturer documentation (cutsheet, letter or other document that states the manufacturer location information) |

EXCEPTION DOCUMENTATION

None at time of issue.

DEFINITIONS

Manufacturer Location

The final point of fabrication or manufacture of an assembly or building material.

Materials Construction Budget

All the material costs delivered to the site, excluding labor, soft costs and land.

RESOURCES

Declare

A voluntary product labeling program through which manufacturers disclose ingredients and source locations of their products.

declareproducts.com

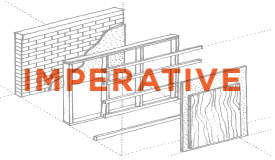
Business Alliance of Local Living Economies (BALLE)

BALLE is a network of values-aligned entrepreneurs, business networks, and local economy funders in North America.

bealocalist.org/

MATERIALS

NET POSITIVE WASTE



14

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 (M²)

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.

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

$$\text{Diversion Factor} = \frac{\text{Weight of Material}}{\text{Total Diverted Weight of all "other materials"}}$$
4. Determine the weighted diversion rate (%)

$$\text{Weighted Diversion Rate (\%)} = \text{Diverted Rate} \times \text{Diversion Factor}$$

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 = $100 \times 0.4 = 40$
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	I14-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

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*



LIVING BUILDING CHALLENGESM 3.0

A Visionary Path to a Regenerative Future

living-future.org
info@living-future.org

August 2014



INTERNATIONAL
LIVING FUTURE
INSTITUTETM