USEFUL WASTE: RE-PURPOSING CONSTRUCTION MOCK-UPS







BACKGROUND

Mock-ups play an integral role in the construction process by demonstrating quality and establishing procedures for building systems, sequencing, and installation. Both the contractor and the architect use the structure as a performance metric to perform tests, understand material compatibility, and demonstrate design aesthetics.

PROBLEM

However, with construction mockups allowances ranging from \$5,000 to \$20,000+, mock-ups are high-cost structures that traditionally serve a singular construction need over a short time period. Since mock-ups are seen as temporary structures, they typically end up in a landfill after their use has been served on the construction site.

OUR SOLUTION

The Useful Waste Initiative encourages material diversion, community service, and aims to re-frame views on waste management during the design and construction process. It guides the process to re-purpose and utilize an overlooked material resource exterior envelope construction mockups.

This initiative aims to intentionally integrate a more sustainable process into existing construction practices. While encouraging new methods that extend the life of building materials, it also provides opportunity to support community efforts by addressing pressing social needs within local communities.



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When considering the option to re-purpose a specific project construction mock-up, we encourage the project team to explore options for reuse both on-site and off-site.

BENEFITS:

- if used on-site, little to no transportation costs or coordination
- promotes community investment in cause chosen (i.e.Housing First)

CONSTRAINTS:

- if used on-site, liability of conversion build volunteers
- if used off-site, transportation and coordination of mock-up

USES

ticket booth for sports field/event





HOW DO WE **RE-PURPOSE** OUR CONSTRUCTION **MOCK-UP?** OWNER ١ ١ Ń **PRE-DESIGN** -----1) Set project goal to reduce waste and 1) Sign agreement to DESIGN

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CONSTRUCTION CONVERSION





SUSTAINABILITY

Benefits:

- Diversion of material from landfill
- Reduce embodied carbon energy
- Builds healthier communities and provides for local needs
- Promotes community
 investment
- Earn sustainable certification credits (LEED, Earth Advantage, etc.)
- Decreased use of natural resources

LEGAL

Benefits:

 Increases public awareness to reduce and reuse waste

Constraints:

- Location of build-out and converted mock-up
- On-site project space

IMPLICATIONS

Constraints:

 Risk/Liability
 Building Code requirements (as applicable)

FINANCIAL

Benefits:

- Possible tax deductible with charitable donation of materials to local organizations
- Minimal cost impact due to material reuse
- Mock-up costs included in Bid

d in Bid

mock-up additions

Constraints:

 Additional labor costs (as applicable)

Construction cost of

 Project Funding Requirements (check with lender/investors as applicable)

LOGISTICS

Benefits:

- Diversion process ties into existing construction timeline
- Architect draws mockup drawings prior to construction

Constraints:

- Coordination with Project Team throughout project's timeline
- Transportation of mock-up (incl. loading/ unloading)



Example: Baseline Specifications

Reference the below specification language against your project specification, which can be adapted by the project team for each project. This language is suggested to be located under Division 01, Quality Requirements.

In each section where "mock-up" requirements are referenced, add statement that directs people back to Division 01. For example, "Refer to Division 01 for specific integrated exterior envelope mock-up requirements."

I.I QUALITY CONTROL PLAN

A. Integrated Exterior Envelope Mock-ups:

I. Construct exterior mock-up according to approved Shop Drawings.

2. Coordinate installation of exterior envelope materials and products for which mock-ups are required in individual Specification Sections, along with supporting materials.

a. Max size constraints: 10'-0" wide x 12'-0" long x 10'-6" height
b. Provide electrical rough-in for receptacle, light fixture, light switch, radiant heat panel, and smoke/CO² alarm, as shown. Verify with Architect.

B. Mock-ups:

1. Before installing portions of the Work requiring mock-ups, build mock-ups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work.

2. Build freestanding mock-ups in location and of size indicated or, if not indicated, as directed by Architect.

3. Notify Architect 7 days in advance of dates and times when mock-ups will be constructed.

4. Employ supervisory personnel who will oversee mock-up construction. Employ workers that will be employed during the construction at Project. Coordinate with Architect as needed.

5. Demonstrate the proposed range of aesthetic effects and workmanship.

6. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.

7. Allow 7 days for initial review and each re-review of mock-up.

8. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed Work, in accessible location for removal from site.

9. Prepare for removal and relocation of mock-up when directed unless otherwise indicated. Coordinate removal with appropriate third-party organizations and personnel.

10. Notify Architect 7 days in advance of dates and times when removal of mock-up will happen.



Exam	ple: Bas	se-level Development for Sleeping Pod use:
I)	Size:	
		i) No larger than 10'-0" wide by 12'-0" long
		ii) Not to exceed 10'-6" high
2)	Floor:	
-		i) Framing - min. 3/4" CDX plywood bottom with 2x6 joists at 16" o.c., attached to perimeter joists with Simpson joist hangers using 9D nails. Include wire mesh at bottom.
		ii) Foundation - (2) 4x4 P.T. skids to be bolted to the bottom of the floor system to elevate the
		structure for moving using a pallet jack. All wood in contact with the ground must be pressure treated.
		iii) Floor underlayment - ¾" plywood or equivalent
		iv) Insulation - Fiberglass or mineral wool insulation (R-21)
3)	Wall:	
		i) Framing - min. 2x4 (or 2x6), must be return at least 2'-0" in one direction at corners ii) Sheathing - min.1/2" plywood min exterior grade
		iii) Siding - min. 1/2" plywood sheeting, exterior grade and protected by exterior grade latex primer, paint or equivalent. Lightweight siding material, coordinate with project
		iv) Door - 3'-0" exterior door (re-lite preferred), outward swing, coordinate with project
4)	Roof:	
,		i) Rafters - 2x6 at 16" o.c., attached with three 12D toenails per connection, or Simpson hurricane ties with 9D ioist nails or 12D toenails per connection.
		ii) Sheathing - ½" plywood or equivalent
		iii) Insulation - Fiberglass or mineral wool insulation (R-19 or R-21), formaldehyde free
E)	Heatin	iv) Rooting - appropriate flashing and light colored material preferred
5)	neaun	8. i) Electrical outlet and epider hav (for connection to outdoor grade avtension cords).
6)	Coolin	i) Electrical outlet and spider-box (for connection to outdoor grade extension cords),
0)	Cooiiii	δ· i) Install 2 opposing windows for cross air ventilation
		ii) Operable roof vent that closes tightly to prevent air/water leaks
		in Operable root vent, that closes upinty to prevent any water reaks

Example: High-Level Development

The fully enclosed structure includes above requirements plus finishes including:

7) Floor:

i) Provide sheet flooring material

- 8) Wall:
- i) Finish resilient and non-flammable interior finish walls and ceiling min. 3/8" gypsum board or 1/4" hardboard panel or equivalent

ii) Insulation - Fiberglass or mineral wool insulation (R-11/15), formaldehyde-free

iii) Door hardware - Provide door hardware with lever handle - contact CPID for further information.

Note: Refer to standard details. Contact CPID for list of standard product features, including hardware, radiant panel, etc.



Example: Schematic Design Drawings scale: 1/16" = 1'-0"



Example: Schematic Floor-Wall Detail (baseline build)

scale: 1-1/2" = 1'-0"



Example: Schematic Floor-Wall-Roof Detail (partial build)

scale: |-|/2" = |'-0"



Example: Schematic Floor-Wall-Roof Detail (full build)

scale: 1-1/2" = 1'-0"





Waiver, Release And Hold Harmless Agreement

This Waiver, Release and Hold Harmless Agreement ("Release") is made on this _____ day of ______, 20__ by _____ ("Recipient").

WHEREAS, ______ ("Donor") provides construction materials to the Recipient to repurpose the materials for construction-related projects serving the community. ("Material Repurposing Program").

Donor provides the materials at no charge to and for the benefit of not-for-profit and faith-based organizations to solve construction and engineering-related problems faced by such organizations fulfilling their missions and in serving the community; and WHEREAS, in consideration of the willingness of Donor to provide such materials at no charge, Recipient is willing to execute this Waiver, Release and Hold Harmless Agreement;

NOW THEREFORE, Recipient, on behalf of itself and its heirs, assigns and all other persons or entities claiming by, under or through Recipient, represents, covenants and agrees as follows:

1. Recipient acknowledges that in the course of providing materials for the purpose of assisting Recipient serve the community, Donor or its employees, officers, agents or representatives might cause injuries, death, property damage or other harm to Recipient or to third parties. Recipient accepts and voluntarily incurs all risks of any such injuries, damages, or harm which arise during or result from any services or materials provided by Donor or its employees, officers, departments, affiliates, employees, officers, agents, representatives or insurers ("Released Parties").

2. Recipient waives, releases and forever discharges all claims against any of the Released Parties for any injuries, damages, losses or claims, whether known and unknown, which arise during or result from any materials or services provided by any of the Released Parties under or in connection with the Material Repurposing Program, including but not limited to any such injury, damage, loss, or claim arising from any materials or services provided as part of the Material Repurposing Program, except only to the extent caused by the negligence or other fault of any of the Released Parties.

3. Recipient agrees to indemnify and hold the Released Parties harmless from all losses, liabilities, damages, costs or expenses (including but not limited to reasonable attorneys' fees and other litigation costs and expenses) incurred by any of the Released Parties as a result of any claims or suits that (i) Recipient, (ii) anyone claiming by, under or through Recipient, or (iii) any third party, may bring against any of the Released Parties to recover any losses, liabilities, costs, damages, or expenses which arise during or result from the materials or services supplied by



any of the Released Parties in the Material Repurposing Program, except only to the extent caused by the negligence or other fault of any of the Released Parties.

4. Recipient acknowledges that all materials donated to the Material Repurposing Program are donated "as is". Once donated, any and all material and system warranties are void. Recipient waives, releases, and discharges the Released Parties from any claims related to deficiencies in the materials donated.

5. Recipient acknowledges having carefully read and reviewed this Waiver, Release And Hold Harmless Agreement, and Recipient represents that it fully understands and voluntarily executes the same.

EXECUTED this day of	
Name of Organization	
Ву:	(signature)
	(printed/typed)
Title:	



CASE STUDY #I

CONSTRUCTION TYPE:

Light-gauge steel framing

PROJECT TYPE: Office/Institutional

LOCATION: Project - 4th & Montgomery, Portland, Oregon

ARCHITECT:

SRG Partnership

CONTRACTOR:

Andersen Construction

CONVERSION BY:

Andersen Construction & Anderson Foundation



THE STORY BEHIND THE BUILD:





As a commercial project in an urban area, this eight-story shared office building brings together Portland State University, Oregon Health and Science University, Portland Community College, and the City of Portland. The building aims to foster collaboration between all partners focused on enhancing sustainable and responsible development in Portland.

This project used Integrated Project Delivery, which allowed close communication and coordination among the full project team. This delivery style benefited both the project and mock-up, supported the team to work through complex details, and it facilitated personal relationships to build which aided the effort to divert the mock-up.

The mock-up had intensive QA/QC review to ensure the mock-up met the visual and performance criteria necessary for the project. The mock-up represents the full height window of the primary building with a metal panel angle that matches the building geometry. The Architect noted that if the mock-up was not intended for donation, the mock-up would have been larger measuring at 16 feet tall, to be an exact representation of the building.

TIMELINE:









AUG 2018 PREDESIGN

 SRG advocates for material diversion

SEPT - OCT 2018 SCHEMATIC DESIGN

- Project team sets goal to reduce waste and contacts CPID
- Owner signs agreement to donate

NOV - FEB 2019 DESIGN DEVELOPMENT

- Contract document set with mock-up dwgs sent to contractor for pricing
- SRG sends mock-up dwgs to CPID for review

APRIL - JUNE 2019 CONSTRUCTION

- Project team fills out liability waiver
- Mock-up built
- Contractor maintains and protects mock-up
- CPID team coordinates location and scheduling of

conversion build

JULY 2019 CONVERSION

- Contractor coordinates transportation and delivery of mock-up from site to new location
- CPID coordinates conversion build



T FOURTH AND MONTGOMERY - PERFORMANCE MOCK-UP SLEEPING POD BUILD OUT



PERFORMANCE MOCK-UP - VIEW FROM OUTSIDE CORNER

Scope of Work: The project benefited from the full building enclosure being included in the Bid Set. This allowed all materials and structural elements for the exterior envelope to be priced accurately and accounted for.

PERFORMANCE MOCK-UP - VIEW FROM INSIDE CORNER

Construction Champion: The project superintendent was a key advocate for having the mock-up completely finished for donation as a sleeping pod. This allowed all finishes to be coordinated with the Subcontractors and the Andersen Foundation.

Mock-up Built Off-site: It was successful to have the mock-up built off-site in the Contractor's yard, both for maintaining site space in the urban area, and for building the complete sleeping pod in tandem to the primary building.

WHAT WE

CASE STUDY #2

CONSTRUCTION TYPE:

Wood frame construction

PROJECT TYPE: Multi-family Housing

LOCATION: Project - NE 42nd Ave & Holman, Portland, Oregon

ARCHITECT:

Carleton Hart Architecture (CHA)

CONTRACTOR:

LMC Construction

CONVERSION BY:

TBD



THE STORY BEHIND THE BUILD:





"Nesika Illahee" translates to "our home" in the local Chinook language and provides a symbolic and physical representation to this three-story, multi-family apartment building. Focused on serving the Native American community in collaboration with NAYA, the Confederated Tribe of Siletz Indians, and Community Development Partners, this new construction project provides 59-units of affordable housing to the NE Portland community.

Through the design process, the architecture team included mock-up drawings within the Bid Set which included: floor plan, elevations, roof plan, and section. The project team discussed the donation of these materials from the Design Development (DD) phase and then the Owner reconfirmed its donation early Construction. The roof was omitted during the value engineering process due to concerns about the mock-up work being out of sequence with the larger building. The mock-up was also revised during Construction to include a section of storefront at the Contractor's request. The team continued the discussion throughout construction, where the Architect and Contractor discussed options for subcontractors to donate additional work, including, electrical rough-in, roof framing, and insulation. These items were not installed due to limitations with the primary building's construction schedule. Exploring opportunities for pre-fabrication or modular interior pieces for coordination with the Contractor can assist successful material donation.



TIMELINE:

AUG 2017 PREDESIGN

 CHA advocates for material diversion

MAY 2017- MAY 2018 DESIGN

 Project team sets goal to reduce waste and contacts CPID

MAY - OCT 2018 PERMITTING

- Owner agrees to donate
- Mock-up is temporary structure with building permit

OCT 2018 - NOV 2019 CONSTRUCTION

- Project team fills out liability waiver
- Mock-up built
- Contractor maintains and protects mock-up
- CPID team coordinates location and scheduling of conversion build

SEPT 2019 CONVERSION

- Contractor coordinates
 transportation and delivery
 of mock-up from site
- CPID coordinates conversion build





2 ROOF PLAN





-Timeline: It is beneficial to include the mockup drawings in the drawing set prior to Bidding if not earlier, so that the Contractor and Subcontractor can review and understand the scope of work and associate a realistic cost to the work.

- Scope of Work: It is beneficial to have a list of items outlining additional work/materials that could be donated by the construction team. These items include those that are outside the original scope of mock-up work, so that if during construction, the subcontractor or contractor are amenable to providing donated work/material, it is clear what can be provided per the guidelines.

-Wood Platform: To provide more longevity and protection, the wood base could have been pre-fabricated with a wire mesh bottom and insulation within the joist cavity.

WHAT WE

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OUR WEBSITE:

www.centerforpublicinterestdesign.org/ useful-waste-initiative

CENTER FOR PUBLIC INTEREST DESIGN

The Center for Public Interest Design (CPID) is a research [+action] center at Portland State University that aims to investigate, promote, and engage in inclusive design practices that address the growing needs of under-served communities worldwide. Through research and design, fieldwork, and public outreach, we promote a mode of practice that is socially conscious, environmentally sustainable, and economically accessible to all.

