

BUILDING A BUILDING OR TAKING ONE DOWN

WHAT IS THE IMPACT OF BUILDING A BUILDING OR TAKING ONE DOWN?

NATURAL RESOURCE CONSUMPTION

- The U.S. Geological Survey estimates that construction activities consume 60 percent of the raw materials, other than food and fuel, used in the U.S. economy.
- 11 percent of global CO2 emissions come from the production of construction materials according to A 1999 United Nations study.

WASTE PRODUCTION

- In the U.S., nearly 160 million tons of waste is derived from annual building construction, renovation, and demolition, which accounts for nearly one-third of the nation's non-hazardous solid waste generation.
- EPA 2003 U.S. C&D Waste Generation Estimates
 - Demolition
 - Non-residential – 65 million tons
 - Residential – 19 million tons
 - New Construction
 - Non-residential – 5 million tons
 - Residential – 10 million tons
 - Renovation
 - Non-residential – 29 million tons
 - Residential – 37 million tons
- 60% of the nation's building related C&D waste ends up in landfills.
- In Pennsylvania, construction and demolition waste makes up approximately 17.5 percent of the municipal waste stream (In 2005 Pennsylvania disposed over 2.25 million tons of C&D waste).

PROJECTIONS

- More than one quarter of the buildings that existed in 2000 are expected to be replaced by 2030.
- The USDA Forest Service Products Lab that 1.8 million cubic meters of salvageable structural lumber is demolished each

Concepts

C&D Waste: C&D or construction and demolition waste consists of building waste such as concrete, bricks, tiles, cement, plaster, asphaltic substances and wood that must be disposed of at the Centre County Solid Waste Authority Transfer Station or a facility outside Pennsylvania. If a substance is uncontaminated and can be reused, recycled, or used as clean fill or consists of vegetative material from land clearing it is not considered C&D waste and can be disposed of at a recycling or compost facility.

Embodied Energy: The amount of energy consumed to produce a product, in this case building materials, including the energy needed to extract the resource, manufacture the materials and transport the materials. Preservation of embodied energy through deconstruction and materials reuse minimizes the need for further energy use.

Lifecycle Construction: The design of building materials, components, information systems, and management practices to create buildings that facilitate and anticipate future changes and eventual adaptation, disassembly, or dismantling for recovery of all systems, components, and materials.

Deconstruction: Demolition of older buildings not designed for deconstruction, with reuse of salvaged materials in mind.

Designed for Deconstruction (DfD) and Materials Reuse: Construction of new buildings using design techniques tools to maximize reuse at end of life and incorporating salvaged building materials in current construction.

year (250,000 single-family homes) or the equivalent of three percent of the annual U.S. softwood harvest.

LIFECYCLE CONSTRUCTION

BENEFITS

Resource Conservation and Emissions Reduction

- Deconstruction helps preserve a material's "embodied energy" and extends the life of previously harvested natural resources

Economic Benefits

- New end use markets are created for salvaged materials
- Job creation
- Avoided demolition debris disposal costs
- Tax deductions for donated salvaged material

Historic Preservation

- Preservation of historic materials: moldings, doors, mantels, and other artistic elements are highly valued and the easiest materials to deconstruct.

Community Support and Revitalization

- Offers the community lower cost options for building materials
- Preserves cultural traditions

LIMITATIONS

Cost

- An average 1,500 sqft wood-framed house can take an average of eight to ten days to deconstruct with a crew of four to six workers, whereas it may take only two or three people two days to demolish the same building.
- Highly deconstructable houses are easy to deconstruct and have valuable materials. Examples include:
 - Wood-framed buildings
 - Buildings containing specialty materials
 - Buildings constructed with high quality brick laid with low quality mortar
 - Structurally sound buildings that are weather-tight
- Non-structural deconstruction is less expensive than structural deconstruction. Salvaging items such as finish flooring, cabinetry, windows/doors, trim, appliances, and fixtures does not require careful deconstruction of the components which contribute to the structural integrity of the building.

Hazardous & Undesirable Materials

- Lead containing materials
- Asbestos containing material

- Universal Wastes (Fluorescent bulbs, mercury switches)
- Painted, pressure-treated, or roofing wood

Building Codes & State Laws

- Materials verification by a third party may be required before a building that incorporates reused materials can pass inspection
- Lumber may need to be re-graded to meet requirements
- Beneficial reuse and processing must occur at a permitted facility (obtaining a permit costs \$1,750)

OPPORTUNITIES FOR IMPROVEMENT

ORDINANCES & VOLUNTARY AGREEMENTS

- Design for Reuse Agreement: the architect is provided with an inventory of available materials, design guidelines, and potential uses for materials. The architect then creates a list of the buildings potentially reusable materials categorized by building assembly or component, estimated quantity, and condition to be used when the building is deconstructed.
- Adaptive Reuse Ordinance ([Example](#))
 - Provides incentives or expedited permitting for adapting an existing economically obsolete building for a new more productive purpose.
 - The Historic Preservation District, Zoning District R-3H is an adaptive reuse ordinance, but lacks significant incentives.
- Construction & Demolition Debris Diversion Program ([Model Ordinance](#), [Example 1](#), [Example 2](#))
 - Projects that meet a certain threshold must comply (e.g. residential addition, new construction, or demolition of one thousand sqft or tenant improvement of 3,000 sqft or more of gross floor area)
 - Requires a set diversion rate by percent of weight
 - Requires completion of a waste reduction and recycling plan ([Example](#), [EPA Toolkit](#))
 - May require a diversion security deposit.
 - Requires completion of a compliance report no later than thirty days from completion of the project
- Require buildings to be designed or constructed to accommodate recycling by building occupants and require owners to provide for storage of discarded lamps, batteries, and other household hazardous waste.
- Green Building Certification Programs
 - National Green Building Standard allots a number of points for:
 - Points for preserving, reusing, or disassembling existing buildings for recycling
 - One point for every 10 percent of total building materials that are reused, deconstructed, or salvaged during demolition,
 - Points for using reused materials and recycled materials,
 - Points for a waste management plan
 - Points for on-site recycling
 - Points for the use of recycled materials, resource-efficient materials and indigenous materials

- Points for a life cycle analysis
- Leadership in Energy and Environmental Design
 - Points for using salvaged materials (up to 2)
 - Points for using recycled content or rapidly renewable materials (up to 3)
 - Points for using regional materials (up to 2)
 - Points for using certified wood (1)
 - Points for maintaining parts of the building intact (up to 3)
 - Points for 50-75% diversion rate (up to 2)

Recycling Toolkits

- [The Associated General Contractors of America C & D Recycling Toolkit](#)
- [Portland's Construction Salvage and Recycling Toolkit](#)

PARTNERSHIPS

- [Habitat for Humanity ReStore of Greater Centre County](#)
- [Penn State University's Hamer Center for Community Design](#)
- [Glenn O'Hawbaker Recycling Center](#)
- [WasteCap Resource Solutions](#) – non-profit which provides waste reduction and recycling assistance to businesses
- [The Associated General Contractors of America C & D Recycling Toolkit](#)

Notes