

A GUIDE TO DECONSTRUCTION



*An overview of
deconstruction with a
focus on*

COMMUNITY DEVELOPMENT OPPORTUNITIES

*complete with
deconstruction project
profiles and case studies.*



JOB TRAINING
OLD BUILDINGS
ENVIRONMENT
LABOR STRATEGIES
**COMMUNITY
DEVELOPMENT**



U.S. Department of Housing and Urban Development
Office of Policy Development and Research



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*451 Seventh Street SW, Suite B133
Washington, DC 20410
202-708-4250 (fax)
e-mail: pathnet@pathnet.org*

A Guide To Deconstruction

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Prepared by:

NAHB Research Center, Inc.
Upper Marlboro, MD

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We at HUD are always pleased to present innovative tools, both large and small, to help make communities more livable. Deconstruction is such an innovative tool. Deconstruction is actually a new term to describe an old process—the selective dismantling or removal of materials from buildings before or instead of some elements of demolition. What is innovative and exciting is how communities can use this process—deconstruction—to support and complement other community objectives. Deconstruction can be a link to job training and economic development efforts. It can create job training and job opportunities for unskilled and unemployed workers; also, small businesses could be created to handle the salvaged material from deconstruction projects. Further, deconstruction benefits the environment by diverting valuable resources from crowded landfills into profitable uses. In so doing, deconstruction helps pay for itself by generating revenues and reducing landfill and disposal costs.

A Guide to Deconstruction provides a brief, but cogent, overview of deconstruction—its components, its benefits, case examples, and how to make it part of a community revitalization strategy. While it is especially timely for public housing authorities implementing modernization and HOPE VI strategies, the guide is also intended for community leaders seeking innovative ways to enhance and improve their community revitalization efforts.

Susan M. Wachter
Assistant Secretary for Policy
Development and Research

WHAT IS DECONSTRUCTION?



*Greenhouse frame assembly—
Walter Reed Army Hospital.*

Deconstruction is simply building disassembly and material salvage. It means taking apart or removing some building components for reuse. In contrast to demolition where buildings are knocked down and materials are either landfilled or recycled, deconstruction involves carefully taking apart portions of buildings or removing their contents with the primary goal of reuse in mind. Deconstruction can take place prior to standard demolition, be an integral part of demolition, or largely take the place of conventional building removal. It can be as simple as stripping out cabinetry or as involved as manually taking apart the building frame.

Before you read any further, consider the following benefits that deconstruction may offer your community as a whole:

- **Job training** – A great way to understand how things are made and how they work is to take them apart. When you lever and pry out a rafter or floor joist, or locate and remove the fasteners on a kitchen cabinet, you learn a lot about how buildings work. And all this usually with a few simple hand tools.



Stair removal – Riverdale Village.

- **Old buildings as a resource** – When a building is no longer fit for use and has to come down, does this happen just as all of its parts and components wear out? Most old buildings have some systems and materials with useful lives. The trick is efficiently identifying them and getting them out of the building. When redeveloping property, it's pretty hard to see the old buildings as anything but obstacles but it's important to consider whether their contents or components may actually be resources that have net value.

- **The environment and your community** – It's not easy to measure, but there are real environmental benefits to building disassembly and material salvage. It saves landfill space, reduces the pollution and energy consumption associated with manufacturing and production of new materials, and it can reduce site impacts in terms of dust, soil compaction, and loss of vegetation or ground cover.

Due to its labor intensive nature, deconstruction can also lead to the creation of new jobs and businesses. Reduced unemployment strengthens the local economy directly as well as indirectly in areas such as retail sales and housing.

DECONSTRUCTION

- **Funding sources** – Increasingly, government agencies are incorporating language into their Requests for Proposals to encourage environmentally sound building practices. Deconstruction is one way that PHAs can address this goal and strengthen their proposals. The side bar quote says it all.

HUD's *Economic Development Grants* and *Neighborhood Initiative Programs* encourage multi-faceted projects that benefit low-to-moderate income people and eliminate slums and blight. PHAs and Not-for Profits may be able to partner with local governments to incorporate deconstruction as part of a larger project that aims to stabilize and revitalize a small community or neighborhood.

You are encouraged to design programs that incorporate sustainable construction and demolition practices such as the dismantling or "deconstruction" of public housing units, recycling demolition debris, and reusing salvaged material in new construction.

—From the 1999 U.S. Department of Housing and Urban Development's HOPE VI "Super NOFA."

What does deconstruction mean to community development?

Deconstruction can be a way of keeping resources in the community and a way of developing job and small business opportunities. This report will give you the tools and answers you need to consider the role that deconstruction might play in your organization.

There are two basic questions you need to answer to determine how you might turn deconstruction to your advantage:

1. How do we know if our organization has the right type, number, and condition of buildings for deconstruction?
2. What role should our organization play in deconstruction if it turns out we have the right buildings/materials?

Take a look at the information that follows to determine just how deconstruction may work for your organization. See how some organizations have made it work for them.

BUILDING ASSESSMENT

What types of buildings are likely to be good candidates for deconstruction?

The most important part of assessing the feasibility of deconstruction is a detailed inventory of how and what the building is made. In general, buildings exhibiting one or more of the following characteristics are likely to be good deconstruction candidates:



Building assessment – Walter Reed Army Hospital.

DECONSTRUCTION

PROJECT PROFILE

Project:	Warner Homes; Peoria, IL
Players:	Peoria Housing Authority (PHA) Joint Apprenticeship Training Committee (JATC)
Building Description:	400 three-story single family homes; exterior: masonry and brick; roof: trusses, plywood, asphalt shingles; interior: wood framing, lath and plaster.
Project Description:	Softstripping by PHA maintenance staff; demolition by private contractor; hazardous material removal by specialty contractors (asbestos, buried fuel oil tanks); two-year job training program with certification as Building Maintenance Repairer
End Use:	Reuse by PHA
Contact:	Bob McFall – (309) 677-7339

- *Wood-framed* with heavy timbers and beams, or with unique woods such as douglas fir, American chestnut, and old growth southern yellow pine;
- Constructed with *specialty materials* such as hardwood flooring, multi-paned windows, architectural mouldings, and unique doors or plumbing/electrical fixtures;
- Constructed with *high-quality brick* laid with low-quality mortar (to allow relatively easy break-up and cleaning);
- *Structurally sound*, i.e., generally weather-tight to minimize rotted and decayed materials.



Equipment warehoused at Peoria PHA Facility after removal.

Who should perform the building assessment?

- Builder, carpenter, architect or anyone with expertise in the methods and materials of residential construction; or
- Tradesman experienced in repair/restoration of equipment, appliances, materials; or
- Structural engineer/materials inspector who can provide information on the structural integrity of building components and/or the existence of hazardous materials requiring special handling; or
- One who has a solid understanding of the salvage value of building materials in the local market.



Floor system disassembly.

DECONSTRUCTION

PROJECT PROFILE

Project:	Walter Reed Army Medical Center; Washington, D.C.
Players:	Walter Reed Army Medical Center, Ellen Wilson Pre-Apprenticeship Training Program, Environmental Protection Agency
Building Description:	Four 20' x 100' Jenco greenhouses. Foundation: concrete and brick; structure: aluminum frame with bolted and screwed connections; glazing: 2' x 2' glass panels.
Project Description:	Manual disassembly of frame and glazing by job trainees of the Ellen Wilson Neighborhood and Public Housing Authority. Partial salvage of steam heat and misting system. Demolition of foundations and site cleanup by private general contractor.
End Use:	Re-assembly at St. Elizabeth's Hospital, Fort Meade
Contact:	Ed Pinkard – (202)-328-6247

What tools are required to perform a thorough building assessment?

- **Insight** – Careful, experienced visual inspection can provide a great deal of information regarding a building's suitability for deconstruction.
- **Inspection Forms** – An inspection form is an excellent way to ensure that you have collected all of the information you need. Contact the NAHB Research Center for an inspection form. (See the Riverdale Project Profile on page 5.)
- **Camera** – Photographs can be helpful in recalling important characteristics of the building and the site.
- **Hand/Power Tools** – Some intrusive investigation may be useful once a preliminary assessment indicates that the building is likely to be a good candidate. Looking behind drywall or beneath finish flooring can verify the size and condition of structural components or the existence of hazardous materials.
- **Respiratory Gear** – Respirators or dust masks should be worn whenever any cutting, drilling, or removal of materials is done. If hazardous materials are suspected, a certified professional should be consulted.



Greenhouses – Walter Reed Army Hospital.



Hardwood flooring removal.

DECONSTRUCTION

How long will a building assessment take?

A thorough assessment can take anywhere from 2-8 hours depending upon the size of the building and the nature of the materials to be salvaged.

EXTENT OF DECONSTRUCTION

Deconstruction can take a variety of forms. A project need not entail the complete removal of a building by hand.

Soft-stripping – Soft-stripping refers to the removal of specific building components or equipment prior to demolition of the structure. Examples of items that may be of value or use to a PHA include: plumbing or electrical fixtures, appliances, HVAC equipment, cabinets, doors, windows, hardwood and possibly tile flooring.

Individual assemblies – Frequently, particular building assemblies may be targeted for removal prior to demolition. Rafters, floor joists, wall framing members, and perhaps, sheathing materials may be of a size, material, and condition to warrant salvage.



Riverdale Village – Baltimore, MD.

PROJECT PROFILE

Project:	Riverdale Village; Baltimore, MD
Players:	Maryland Office of Housing and Urban Development, Environmental Protection Agency, NAHB Research Center
Building Description:	2000 sf two story masonry and brick building; wood framed interior partitions, joists, and rafters. Salvageable doors, windows, cabinets, hardwood flooring. No unusual or special value materials.
Project Description:	With funding from the EPA and the support of the Maryland Office of HUD, the NAHB Research Center closely documented the deconstruction of one building on the site. The detailed data that was accumulated provided information about: <ul style="list-style-type: none">• Time required for specific deconstruction activities• Task sequencing, operations layout, tools and workers required, and flow of materials• Market opportunities and values of salvaged building materials
End Use:	Direct marketing via site sale
Contact:	Peter Yost, NAHB RC – (301) 430-6242

DECONSTRUCTION

PROJECT PROFILE

Project:	Fort Ord Pilot Deconstruction Project; Monterey, California
Players:	Fort Ord Reuse Authority (FORA) comprised of local county and city government officials, University of California Santa Cruz Extension, Presidio of Monterey Base Realignment and Closure (BRAC), representatives from construction, regulatory agencies, and the salvage industry.
Building Description:	Four representative wood-framed one and two story buildings. Exterior: douglas fir and cedar siding; roof: dimensional lumber, 1" x 12" sheathing, asphalt shingles; interior: drywall, multiple layers of flooring including tongue and groove fir; hazardous materials: asbestos, lead based paint.
Project Description:	Pilot project funded by the David and Lucille Packard Foundation to assess the feasibility of deconstruction as one means of removal of approximately 1,200 substandard buildings on the base. Local contractors provided eight employees for the deconstruction crew in anticipation of the benefits they would receive from the OSHA training, Lead Worker Training, jobsite safety instruction, and hands-on deconstruction experience.
End Use:	Contaminant-free materials: sold onsite at public sale or donated to Goodwill Industries. Hazardous materials: asbestos containing materials disposed of by certified contractor at approved site; high value douglas fir siding warehoused for further research in removal of lead-based paint. Other: unpainted drywall composted; asphalt shingles landfilled; representative pieces of dimensional lumber re-graded and strength-tested.
Contact:	Stan Cook, Project Manager – (831) 883-3672



*Pilot deconstruction project at Fort Ord, north of Monterey, CA.
(Reprinted from Biocycle, November 1998)*



*Lumber bundled and stacked for resale.
(Reprinted from Biocycle, November 1998)*

DECONSTRUCTION

Key Feature — Hazardous Materials
Fort Ord - Fort Ord Reuse Authority (FORA)

The preliminary building assessment revealed the presence of asbestos in the vinyl tile flooring and lead based paint on the exterior siding and some interior finish materials. The deconstruction crew was trained and certified to work in an “unknown lead environment.” Air sampling was conducted during representative tasks to ascertain the levels of exposure and determine appropriate protective clothing and equipment. A Hepa-vac was also used throughout the project to keep the work area clean and protect workers from exposure. Workers were given blood tests at the beginning and end of the six month project with no increase in lead levels. This was primarily attributed to removing and isolating contaminated materials before full scale deconstruction got underway.

A Certified Asbestos Abatement Contractor removed and disposed of the friable asbestos. Non-friable material was double-wrapped and disposed of at the Monterey Regional Waste Management District landfill at twice the normal cost.

The pilot deconstruction project provided a great deal of information regarding the removal of other buildings on the base. Because greater amounts of hazardous materials were discovered during the initial project, more rigorous methods of investigation were developed to assess the presence of lead or asbestos. Destructive investigation was used on future projects. In addition, new efforts have been made to review and organize the numerous regulations that pertain to hazardous material removal—especially those that apply to the transfer of property from the Army to local jurisdictions.

PROJECT PROFILE

Project:	Stowe Village; Hartford, Connecticut
Players:	Hartford Housing Authority, Stowe Village residents, private development firm.
Building Description:	Three-story multi-family apartment buildings. Foundation: concrete slab; exterior: brick; structural components: dimensional lumber; interior: wood framing, sheetrock, hardwood flooring.
Project Description:	With a history of offering residents more than simply housing, the HHA developed the joint venture to provide employment experience and job training to interested residents. After initial training by the International Laborers Union, the crew removed three buildings and warehoused salvaged materials.
End Use:	Concrete slab: excavated, ground up, and reused for fill and roadbeds; brick: sold for re-use; dimensional lumber: reused for concrete forms; wood flooring: reused; copper wire and plumbing: salvaged and sold as scrap.
Contact:	Gregory Lickwola, Special Assistant to the Executive Director, Hartford Housing Authority – (860) 275-8425

DECONSTRUCTION

Key Feature — Soft-Stripping *Peoria Housing Authority*

Faced with a tight construction schedule, the Peoria Housing Authority was able to salvage a wealth of building materials from 400 single family homes slated for demolition. Among the materials retrieved were:

- Boilers
- Water Heaters
- Ranges
- Refrigerators
- Toilets
- Sinks
- Cabinets
- Doors

At roughly \$2500 worth of materials per unit, Bob McFall, Director of Maintenance for the PHA, expects the soft-stripping to save approximately \$1,000,000.

These materials are stored in a PHA-owned warehouse and re-used as needed to replace equipment in existing public housing units.

“Although the materials may not appear to be much at first glance”, said McFall, “when you begin to add things up, it’s a different picture. If we can save 1 million dollars through avoided replacement costs, that will make a huge difference in our operating budget.”

Structure – A building is a candidate for complete structural disassembly when the majority of components and materials have potential for reuse or resale. This type of deconstruction project will require extensive pre-planning including:

- A thorough inventory of all materials identifying those for salvage, recycling, or disposal.
- A careful analysis of existing markets or outlets for materials to be sold.
- Sufficient storage space for materials.
- Specific contract language which clearly identifies the intended end-use of the building’s various components.
- Careful scheduling to ensure adequate time for disassembly.

Whether salvaging only a few items or most of the building’s components, it will be necessary to protect the materials both during and after the project. Fencing the site is a must for both security and safety reasons. Access to a warehouse for longer term storage is usually necessary.



DECONSTRUCTION

Key Feature — Complete Structural Disassembly
Riverdale Village - Baltimore, MD

A number of factors made the Riverdale project a natural for complete manual disassembly:

- Large site with room to store materials (2 acres).
- Moderate size building (2 story, 2000sf).
- Building was weathertight and structurally sound.
- Dimensional lumber used throughout. (Plywood and composite materials are more difficult to disassemble.)
- Exterior - High quality brick with low quality mortar made for easier cleaning.
- Other desirable/saleable materials: hardwood flooring, windows, doors, cabinets, plumbing fixtures.

(A detailed project report may be ordered from the NAHB Research Center – (301) 249-4000 or downloaded from the Research Center website - www.nahbrc.org.)

Alternatively, certain specialty buildings also may be candidates for complete deconstruction and ultimate re-construction at another location. Examples include greenhouses, temporary buildings, and metal storage sheds.

Key Feature — Special Buildings
Walter Reed Army Medical Center

In some cases, a building may be of such a specialized nature that its greatest value lies in its existing use. This was the case with the four greenhouses scheduled for demolition at the Walter Reed Medical Center. As stand-alone materials, most of the components had little value for reuse in new or existing buildings. At best, the aluminum frame, galvanized piping, and glazing panels could have been recycled.

Re-construction of the buildings and reuse as greenhouses was the ideal solution. This required “just the right” confluence of circumstances and interested parties. But, public housing authorities should not rule out such a possibility in their own communities.

LABOR STRATEGIES

There are three basic deconstruction labor strategies to consider.

General contractor or demolition contractor – Deconstruction requires a contractor with an understanding of demolition, construction, and the efficient flow of materials. Selecting this contractor is the most critical step in the process, and the property owner should carefully draft a Request for Proposal/Invitation to Bid to solicit key information from bidders.

Contractor Selection

- Match the capabilities and approach of the contractor to the characteristics of the building. Large buildings (more than three stories) and small masonry buildings will probably require heavy machinery for safe and cost-effective structural salvage. Light-framed, smaller buildings can often be most cost-effectively disassembled with manual labor.
- Require the submittal of a Resource Management Plan which outlines how the specified material recovery goals will be achieved.
- Specify separate goals for reuse and recycling, and consider giving reuse greater relative weight.
- Provide as much assistance as possible to reach the material recovery goals. For example, provide a list of reuse and recycling strategies/outlets located near the site.
- Divide the building removal into separate contracts, e.g., hazardous material abatement, building disassembly, processing of materials, and final site restoration. Some contractors may specialize in one of these areas.

Job training – Deconstruction projects offer local employment opportunities. Taking a building apart can be one of the best ways to develop skills in the construction trades. Use of tools, familiarity with various building materials, fasteners and joinery, construction sequence, and jobsite safety are only a few of the skills that can be learned. Deconstruction projects may be an excellent vehicle for unions to provide apprentices with training. The Peoria Housing Authority has partnered with local trade unions to develop a job training program in building maintenance and repair.

The text box that follows gives further description of how two PHAs have combined job training and deconstruction.



On-the-job training.

DECONSTRUCTION

Key Feature — Job Training

Walter Reed Army Medical Center - Ellen Wilson Pre-Apprenticeship Program

The deconstruction and re-construction of the greenhouses offered an excellent opportunity for job training. By the time the last greenhouse components were crated, eighteen trainees were familiar with the use of many hand and power tools, the difference between bolted and screwed connections, the names of different structural members, efficient task sequence, and the importance of jobsite safety.

In addition to technical and mechanical skills, the trainees also gained experience in teamwork, leadership, responsibility, and reliability. As one student put it, “This program will help me in any job whether I work in construction or not.”

Peoria Housing Authority

The JATC, a cooperative committee comprised of representatives from the PHA, local labor unions, and the Contractors’ Association, formed to provide construction training to public housing residents. The 2,000 hour Step-Up Program is non-trade specific and provides trainees with instruction in all aspects of building maintenance and repair. As part of that program, 160 hours is devoted to deconstruction.

The building components and mechanical equipment that were removed from the Warner Homes development offer the opportunity for hands-on experience in a variety of areas:

- Reseal toilet tanks and replace parts
- Replace faucet assemblies
- Repair refrigerator evaporator fans
- Replace range burners and igniters
- Replace burners in boilers
- Refinish cabinets and doors

Joint venture – Partnerships between not-for-profit organizations, resident-owned businesses, developers and/or private general contractors can make a deconstruction project work. Not-for-profits, resident-owned companies, and public agencies often tip the balance in favor of deconstruction over conventional demolition. These groups can also be critical links to outlets for materials or recycling ventures. In addition, residents themselves or in-house maintenance staff may be able to perform a good part of the soft-stripping or prep work prior to deconstruction or demolition by an outside firm. This can help to keep valuable resources in the community.

The private contractor offers a number of advantages related to legal, business, and technical considerations:

- Licensed and insured professional familiar with building codes and permitting process.
- Access to required equipment and tools.
- Access to skilled labor.

Key Feature — Business Strategies - Joint Ventures
Stowe Village - Hartford Housing Authority, Hartford, CT

With partial funding through a HUD HOPE VI grant, the Hartford Housing Authority and a private developer joined forces with Manafort Brothers, Inc., a private demolition contractor to deconstruct two buildings at Stowe Village. With years of experience in the deconstruction and salvage business, Manafort was key to the success of the project. Nine public housing residents were trained during the project and remained in the Laborer's International Union of North America where they now work as subcontractors to Manafort. The project was so successful that the city of Hartford has identified other buildings for deconstruction and provided a warehouse for storage of materials.

SALVAGED MATERIALS MANAGEMENT

Reuse by the PHA – Salvaged materials may be reused by the PHA for the repair of existing housing units or in new redevelopment projects. In either case, the Housing Authority will need warehouse space so that materials may be stored until needed.

Direct marketing to retailers/end users – This is a “yellow pages” approach which involves direct contact with potential buyers. Although few, if any, traditional retail lumberyards will be interested in used lumber, you might find a brick yard, a mason, or a landscaper interested in quality, used brick. Similarly, large construction firms, bridge and road contractors, and formwork subcontractors may be outlets for used lumber. The following websites represent an important part of the salvaged building materials market infrastructure.



Material storage

Web Links for Salvaged Building Materials

Used Building Materials Association (UBMA): <http://www.ubma.org>
The Salvaged Building Materials Exchange: <http://www.greenguide.com/exchange/index.html>
AF&PA's National Wood Recycling Directory: <http://www.afandpa.org/Recycling/Wood/Search.htm>
The Renovator's Resource: <http://www.renovators-resource.com/>
Reuse Development Organization (REDO): <http://www.redo.org/>
Surplus and Scrap Wood Products Exchange: <http://www.woodexchange.com/>
Reusable Building Materials Exchange: <http://www.rbme.com/>
Recycler's World: <http://www.recycle.net/recycle/build/index.html>
Waste Exchange: <http://www.wastexchange.org/>

DECONSTRUCTION

Site sales, auctions, or perhaps a retail store are ways to reach consumers directly. Typical clients include landlords, do-it-yourselfers, and possibly, those seeking specialty items. While direct marketing may bring in a higher price for the materials, there is a great deal more organization and coordination involved in this approach—which undoubtedly will carry larger overhead.

Brokers – A broker is an individual or firm with accumulated information about end users and markets for used building materials. Although a broker may make a single offer for all of the materials, the offer will be a fraction of the materials’ value because of his or her costs of subsequent marketing, transportation, and possible storage.

CONCLUSION

The projects highlighted above are only a few examples of the ways in which deconstruction can offer multiple benefits to your community. Although every project is unique, the tools acquired from others’ experience have broad application.

What is demonstrated by the project profiles are the varied levels of and approaches to deconstruction that are available. Softstripping is relatively easy to incorporate into many projects. In fact, many building owners already remove, prior to demolition, materials or equipment having obvious value. Softstripping requires less planning and coordination, usually does not have a significant effect on project schedules, and offers economic advantages that can be readily calculated. Full scale structural disassembly requires a greater commitment of effort, time, resources, and labor. The financial benefits are not always as easy to measure and often take longer to realize.

There are three important elements to keep in mind when considering a building for deconstruction:

- The contents and/or the components of the building;
- The market or outlets for those materials; and
- The availability of subsidized labor.

Take a closer look at buildings slated for removal and see if they might represent hidden resources for community development.

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